Dynamic IP Strategies for Design-led Start-ups

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Abstract

Design can be defined in many ways, all of which suggest that design solutions involve creative thought that nourishes the generation of ideas. Ideas constitute knowledge assets that are not protected through intellectual property rights (IPR). The latter are legally defined rights related to the solution that uses ideas.

Traditionally designers work upon commission, thus relying on consultancy business models. The intellectual property that is generated in response to commissions is commonly licensed or assigned to the client and related to bespoke design solutions. The designer-entrepreneur uses a different approach. The motivation behind 'an entrepreneurial act' is 'the identification of an emerging need or a new way to meet an existing need' (Abernathy and Utterback, 1978, p.4). Such innovations are often fostered and commercialised independently by small businesses instead of being commissioned. Abernathy and Utterback argue that 'the small entrepreneurial organization and the larger unit producing standard products in high volumes […] are at the opposite ends of a spectrum' (Abernathy and Utterback, 1978, p.3). Consequently, this thesis focuses on individuals and small start-ups who seek to develop and market inventive design propositions that have a potentially disruptive market impact. It examines the significance and effectiveness of intellectual property (IP) in conjunction with the inventors' ambitions to establish dominant designs within existing or emerging market environments. IP is understood here as formal and informal intellectual property rights (IPRs), as well as alternative ways of safeguarding knowledge, such as secrecy and open innovation options which can be used to secure freedom to operate.

This study examines IP in relation to other business development factors such as finance and fund-raising, access to complementary assets (Teece, 1986), as well as market access strategies. It uses a pragmatic approach, combining qualitative Grounded Theory analysis of data obtained through case studies with the analysis of a mixed-method survey into design right infringement. The thesis, which focuses first and foremost on product innovation, juxtaposes technology-led approaches which build on the use of patents, with design-driven approaches (Verganti, Dell'Era, 2014) which use design rights or no IP, and first-mover, i.e. a sales-driven approaches.

The thesis presented here argues that an IP strategy can be seen as an aspect of business development involving a range of factors including formal and informal forms of IP, licensing and collaboration, and that these need to be managed in combination, and as a process which involves the strategy's periodic revision in light of changing circumstances. This implies that well-managed IP strategies can enhance the dynamic capabilities (Teece, Pisano, Shuen, 1997) of businesses, i.e. the range and flexibility of possible responses to potentially unexpected changes in the market environment and in their financial position. The thesis produces a business development flowchart which can be used by designer-entrepreneurs to categorise and illustrate relevant business development factors as well as the dependencies between those. IP strategies are embedded in this chart and can therefore be managed in relation to surrounding business development factors such as complementary assets, market relations, and financial circumstances.

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1. Introduction

This study investigates the significance of intellectual property (IP) for start-up businesses that are formed around inventive design propositions. It reveals how IP can be managed effectively over time in relation other business development attributes so that IP strategies can be deployed to enhance the scope of dynamic capabilities available to designer-entrepreneurs.

The aim of this thesis is to guide designer-entrepreneurs in the development of IP strategies by dissecting, analysing and comparing registered design rights and patents, and by assessing their immediate, short- and longer-term impact on business development processes. This is to enhance the success prospects of designer-entrepreneurs who seek to take their design propositions to market independently.

To achieve this aim, this thesis pursues the following objectives:

- to compare registered design rights and patents in relation to costs and benefits
- to compare route-to-market approaches related to novel product languages to those related to novel technologies
- to investigate finance strategies deployed by designer-entrepreneurs
- to verify and compare the robustness of design rights and patents
- to identify business development attributes surrounding IP
- to establish how different business development attributes affect the commercial success prospects of design-led start-ups
- to establish ways in which IP portfolios can be strengthened through the strategic alignment of multiple inventions

The insights shared in this thesis allow designer-entrepreneurs to take informed decisions on how to set and shift priorities over time. This research sits within the context of innovation studies, design IP, and business management. The thesis is aimed at designer-entrepreneurs and those who support design business development processes in an advisory capacity or as investors.

This study was motivated through an experience in relation to IP that was secured in pursuit of a design start-up initiative. On 11 April 2012 I filed a patent for a design concept that was aimed at enhancing the security of PIN entry devices through the integration of an optical device (Patent No GB1203168.8). The purpose of the invention was to reduce the risk of PINs obtained by fraudsters through hidden cameras or shoulder-surfing. The patent was lodged on 23 February 2012, around two and a half years after an interdisciplinary team had formed around the business start-up initiative. During this early-stage development various business plans had been written and seed funding was secured. The difficulty the start-up team was faced, was to find partners for prototype development and prevent potential collaborators from becoming competitors through adopting the relevant concepts without involving the inventors. The patent examination report was sent out 28 November 2016, over four and a half years after the patent was filed through an attorney. Some claims were rejected as ‘not new’, others as ‘obvious’ (appendix 1) which meant they had already been disclosed in other public documents. In addition, amendments were requested to the patent. However, the project had long been abandoned. Not enough security could be built around the project to warrant further investment of time and funds. This example made clear that the patent route can be very long-winded

and cumbersome for start-ups who rely on informed guesses to decide which development route to pursue. By the time a patent is granted, both a start-up business and the design proposition may have changed substantively, meaning that the patent is often of limited value.

Anti Copying in Design (ACID), an industry stakeholder group who supports designers in the defence of their IP, highlight the need for IP legislation to change, and first changes have been introduced through the introduction of a European patent court, and also through amendments to the UK IP bill that came into force in 2015. The revisions are aimed at strengthening design rights, and to make it easier to litigate design right infringement. Although one may argue that the changes involved fall short of what the lone inventor or the microscale start-up would require in order to consider alternative IP options such as design registrations and informal IP, there is a clear trend towards strengthening the IP framework in the UK. This shows also in ACID's efforts to encourage the UK government to introduce a law against unfair competition following the Brexit referendum in 2016. In his report 'Digital Opportunity: a review of intellectual property and growth' Professor Ian Hargreaves, proposes that the UK 'Government should ensure that development of the IP System is driven as far as possible by objective evidence' (Hargreaves, 2011, p.8).

This study is a mixed-method inquiry, which means that it combines both qualitative and quantitative data to examine business cases in relation to the value of IP, and how this value changes over time. It builds on existing concepts in the field of innovation management to achieve a better understanding of the evolving role of IP in conjunction with the development of proprietary design-led businesses. It compares patents and registered designs to explore how IP management can connect effectively with funding and business development strategies. The study culminates in a propositional model which maps diverse business development attributes in relation to each other.

As indicated in the opening paragraph of this chapter, the research question which this thesis answers is: **How are IP strategies best defined and managed in relation to other business development factors that are to be taken into account in pursuit of design-led start-up businesses?** It is important to note that this question was not defined at the outset of the study. In line with Grounded Theory principles, it evolved gradually in the course of this study from a series of inquiries which are outlined in section 4.4.4.

To achieve its objectives, this thesis comprises the following steps:

- A context discussion (chapter 2) introduces subject-specific terminology, and provides basic set of reference points which help frame the discussions in the following sections. This section explains the focus of this study, which kinds of businesses it is focusing on, and why it is relevant for the creative industries.
- A critical literature review (chapter 3) helps to identify key areas of existing knowledge, which frame the principle argument. This chapter points out current knowledge gaps which this study helps to fill. The concepts discussed in the literature review guide the analysis of case studies in subsequent chapters, and they provide a basis for the PhD argument, which the case studies lead up to. The concepts discussed include matters related to appropriating returns from inventions, assets, market dominance, design business models, disruptive innovation in relation to technology and product languages, innovation development incentives, open innovation principles, as well as a thorough analysis of different forms of intellectual property.
- Chapter 4 explains the research methodology.
- A series of nine case studies (chapter 5) compares the approaches of various designer-inventors to managing IP, and it verifies their perceptions with respect to the significance of IP in conjunction with other business development attributes. This generates an understanding for the concerns and development priorities of designer-entrepreneurs, which provide a first set of components for a business development framework. The examination of the conditions within which design-led start-ups develop is followed by the speculative mapping of business development attributes, i.e. the factors that impact the commercial success-prospects of businesses.
- Two longitudinal case studies (chapters 6 and 7) which involve different forms of IP allow to critically review the perception of designer-entrepreneurs interviewed in chapter 5. The insights gained relate to the risk of infringement, the behaviours of IP owners and infringers, as well as the longer-term consequences of IP infringement. This provides clarity about the range and strength of IP protection options available to designer-entrepreneurs, and also about the long-term significance of other business development attributes.
- A quantitative survey conducted across owners of UK registered design rights (chapter 8) allows for a verification of the robustness of registered design rights. This chapter also examines the way in which designer-inventors respond to IP infringement, and how successful they are in defending their rights. The risk of IP infringement is also discussed in relation to the maturity of the designs involved.
- A final case study investigates a serial designer-inventor's approach to managing IP (chapter 9). The insights obtained help to extend the framework into a model that allows to articulate the dependencies between different business development attributes in consideration of the maturity of the business.
- The conclusions (chapter 10) discuss the model developed through this study and explains how it may aid the strategic decision making of designer inventors.
- The study summarises the contribution to knowledge (chapter 11) and ends with suggestions of how the insights may motivate future inquiries (chapter 12).

2. Context

This study focuses on design-led start-ups as these find it harder to harness their knowledge than large firms who usually have existing income streams and better access to non-financial assets. It investigates to what extent design rights may constitute alternatives to patents, and to what degree both are reliable means of protection, and under what circumstances speed to market is preferable to both IP options from the point of view of a design-led start-up.

In the area of innovation management studies, this thesis builds on and contributes to the dynamic capabilities theory as described by innovation scholars Dodgson, Gann and Philips. According to the authors, 'Dynamic capabilities theory is concerned with the capacity of organizations to reconstruct their resources (Teece, 2009) to fit with changing and uncertain environments.' (Dodgson et al., 2014, p.12). They emphasise the 'ability to adapt as business opportunities change' (Dodgson et al., 2014, p.12) as one of the key aspects. This ability to adapt to emerging business environmental threats and opportunities, requires an 'understanding of organizational dynamics' as highlighted by innovation theorists Tushman and Anderson (1986, p.439). Dynamic capabilities include the ability to adapt and manage resources such as IP portfolios, which is particularly important for the aspiring designer-entrepreneur who is faced with numerous uncertainties.

Intellectual Property Rights (IPR) protect knowledge which constitute intangible assets. 'One of the biggest problems confronting the management of intangibles is the difficulty of measuring them.' (Dodgson et al., 2014, p.17) Associating patenting with innovation is thought to be potentially misleading. Dodgson et al. rate patenting as a proxy measure which may be relevant to some industry sectors but not to others. (Dodgson et al., 2014, p.10) This thesis examines innovations developed by independent designer-entrepreneurs or small independent design teams in order to verify to what extent patenting constitutes a proxy measure here, what other forms of IPR can support the innovation process in addition to, or instead of patents, and what other proxies there are that may help to predict the chances for start-ups to succeed.

2.1. Design IP stakeholders

To succeed in commercialising an invention, designer-entrepreneurs and innovating start-up teams need to connect with third parties, who form parts of stakeholder networks. The value of IP may depend on how individual stakeholders relate to the invention, to the inventor(s) and to each other. This thesis will verify to what extent and in what way the inventor's relationship to the invention, and the relevance of IP may be different if investors are involved by comparison to a situation where the business is self-funded. In their seminal paper entitled as 'Patterns of Industrial Innovation' business management scholars Abernathy and Utterback juxtapose small, entrepreneurial organisations with larger companies with high-volume productions of standard products (Abernathy and Utterback, 1978, p.3). Opposed to the latter is 'A more fluid pattern of product change [that] is associated with the identification of an emerging need or a new way to meet an existing need' which Abernathy and Utterback refer to as 'an entrepreneurial act' (Abernathy and Utterback, 1978, p.4) This thesis focuses on the small entrepreneurial units, which it refers to as start-ups, in order examines their relationship with IP and other business development attributes. It also sheds light into the role strategic partners

can play in the early life of a developing design invention. In addition to these key stakeholders, the role of suppliers on the one hand, and that of buyers or licensees (as well customers in a business-to-consumer model) on the other, will be assessed. Part of the stakeholder network are also potential competitors, and it is worth highlighting that collaborators can become competitors and vice versa. This means that stakeholder systems are not necessarily static. They may change over time, and the existence of design IP and its ownership are likely to influence the relationship between individual stakeholders.

To better understand which industry sectors and stakeholders benefit from design IP, and in what way, the UK Intellectual Property Office (UK IPO) commissioned a study in 2012: The Big Innovation Centre, a London-based business-to-business service initiative for commercial enterprises, academic institutions and public agencies, whose objective is to enhance innovation practices, compiled a report that describes design as a 'knowledge-based activity' (The Big Innovation Centre, 2012, p.26). Knowledge constitutes an intangible asset that can be protected through formalising, i.e. registering IPR under certain circumstances. This means that IPRs are likewise intangible assets, which is why 'IP is sometimes referred to as "hidden value"' (Idris, 2003, p.7, author's inverted commas). Despite their hidden nature, 'patents, copyright and related rights, trademarks, geographical indications and trade secrets are significant contributors to enterprise value.' (Idris, 2003, p.7) Exploiting this value can be challenging for start-ups, because 'It may […] be harder for smaller businesses[1] to select the right type of intellectual property protection, given the diversity of options available. (The Big Innovation Centre, 2012, p.3) At the same time designer-entrepreneurs rely on IPR more than those companies who provide bespoke design service companies, because the latter are 'at a lesser risk of copying' (The Big Innovation Centre, 2012, p.3).

2.2. Scope of the study

The Big Innovation Centre states that 'the nature of design-intensive industries — the businesses that practice and sell design — is remarkably hard to pin down' (The Big Innovation Centre, 2012, p.1). The report proposes to 'think of design-intensive industries as industries that employ designers in large numbers (The Big Innovation Centre, 2012, p.15). With respect to designers, The Big Innovation Centre (2012, p.20f) distinguishes between 'core designers' and 'design-related occupations'. Amongst the core designers, the report lists: design and development engineers, architects, graphic designer, as well as product, clothing and related designers[2]. Under design-related occupations, we find engineers

[1] The European Commission defines companies with less than 10 employees and a turnover of €2m or less as a micro-company, and businesses with less than 50 employees and a turnover of €2-10m as a small company. Medium Enterprises are companies with less than 250 employees and an annual turnover of €50m or less. 'Micro, small and medium-sized enterprises are often referred to by the European Commission as SMEs.' (The Big Innovation Centre, 2012, p.33) Dids Macdonald, CEO of ACID (Anti Copying in Design) highlights that 87% of design companies are micro-companies with 60% having less than 4 employees. She points out that 'there is a £33.5bn spend on design in this country', and thus argues that small companies contribute significantly to the UK's GDP (Macdonald, 2014).

[2] Most of the candidates found in this category are likely to have studied design in an academic context.

(including mechanical, electrical and chemical engineers, production and process engineers), various kinds of technicians, and people working in the field of trades and crafts. The authors of the report justify their categorization in reference to Haskel and Pesole (2011) with the fact that core designers are people who are 'spending at least 50% of their time working on design, while design-related occupations are the occupations that Haskel and Pesole estimated as spending 10% of their time on design […]' (The Big Innovation Centre, 2012, p.20).

This distinction between core designers and design-related practitioners can be questioned based on the fact that the notion of *working on design* depends on what design is considered to be, and definitions of design are wide-ranging and context-dependent. Sam Bucolo from the University of Technology Sydney (UTS) builds his concept of design-led practice on the basis of business growth and design thinking (figure 1). Here 'The "design" of propositions is based on gathering deep customer insights.' (van der Bijl-Brouwer and Bucolo, 2014, authors' inverted commas). Whilst van der Bijl-Brouwer and Bucolo focus on the design process, Haskel and Pesole from Imperial College Business School establish their understanding based on the professional backgrounds of the team members. Existing concepts of design will be explored further down in relation to need-driven and demand-driven approaches (section 3.5), and also in relation to form-giving and technology-oriented principles (section 3.4). With respect to the team building, this thesis will adopt Haskel and Pesole's distinction between core designers and design-related practitioners, because it allows to speculatively characterise the designer-inventors' key skills and capabilities, and to make informed guesses on their initial development priorities. In line with Haskel and Pesole, this thesis builds on the notion of design-intensive industries and claims that a design-led start-up is a company where (core) designers constitute the majority of members in the team.

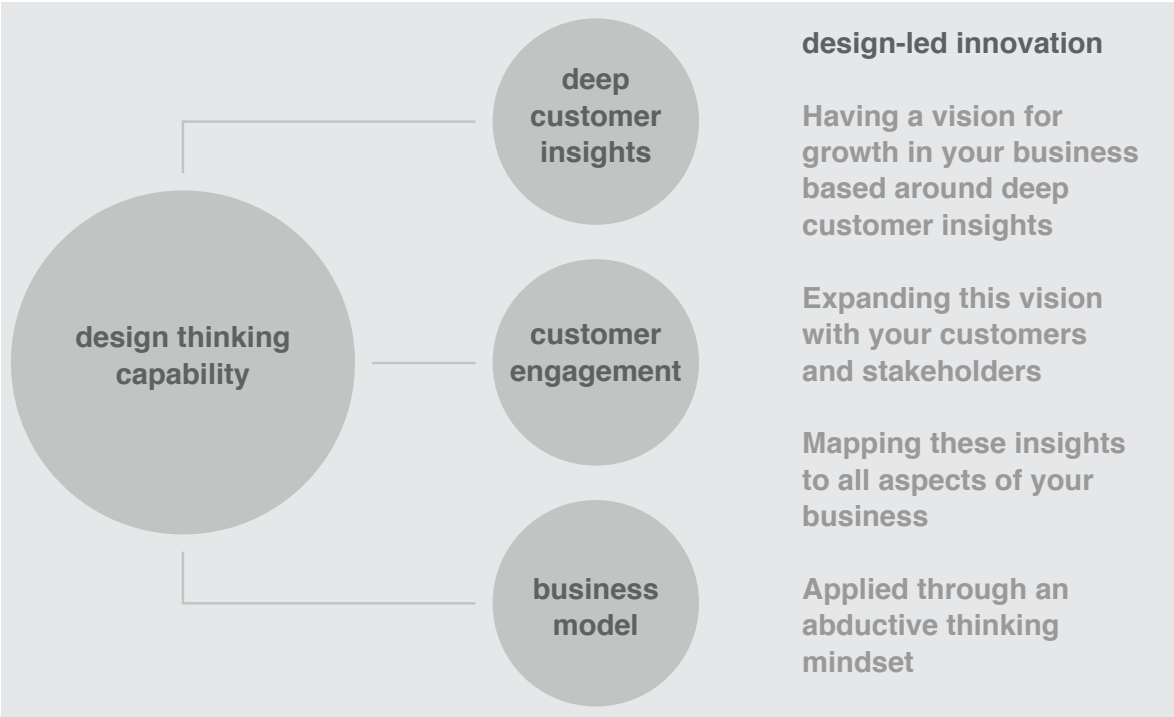

Figure 1: Design-led innovation according to Bucolo

Professional design service activities are commonly triggered through a commissioning process, to which designers or design agencies respond. The results of these design services are tailored towards the needs and expectations of the individual customer. This is understood as design 'as a bespoke service, rather than a codifiable design' (The Big Innovation Centre, 2012, p.3). David Teece, Chaired Professor at the Haas Business School, University of California, differentiates between codifiable knowledge and tacit knowledge, explaining that the latter is 'by definition difficult to articulate' (Teece, 1996, p.287). Tacit knowledge is difficult to transfer, to trade and to protect, except through secrecy. Design-entrepreneurial initiatives may depend on codifiable knowledge, as designer-entrepreneurs often take their inventions to market themselves. To do so, they need to be able to communicate their knowledge, or at least part of it. With regards to the marketing of codifiable knowledge, designers are presented two options: to act as a 'designer-maker' or as a 'design aggregator' (The Big Innovation Centre, 2012, p.4). Designer-makers engage in 'turning designs into finished products, and selling those to customers', whereas the design aggregator develops design solutions which it licenses to other firms. The Big Innovation Centre indicates that the latter tend to be larger business, and Bart Clarysse and Sabrina Kiefer from Imperial College Business School in London state that, 'While patent licensing is an available option, the majority of patents don't earn substantial revenue through this passive method. Obtaining a patent for this reason alone, without starting a business to commercialise products yourself, may not be a worthwhile pursuit.' (Clarysse and Kiefer, 2011, p.106) It follows that start-ups fall by and large into the category of the designer-maker. The Big Innovation Centre makes it clear that the business models mentioned are not mutually exclusive. However, each requires a different approach to IP management. Designer-makers have to be not only inventive, but also responsible for commercialising their inventions and of developing the surrounding business. This sets them aside from design service firms who, according to postgraduate business management researcher Hovanessian, are 'more *reactive* than *proactive*' (2013, p.6, author's italics). A fourth category, 'global manu-services businesses', is not covered in this thesis, because businesses in this category tend to be larger multi-national businesses rather than start-ups.

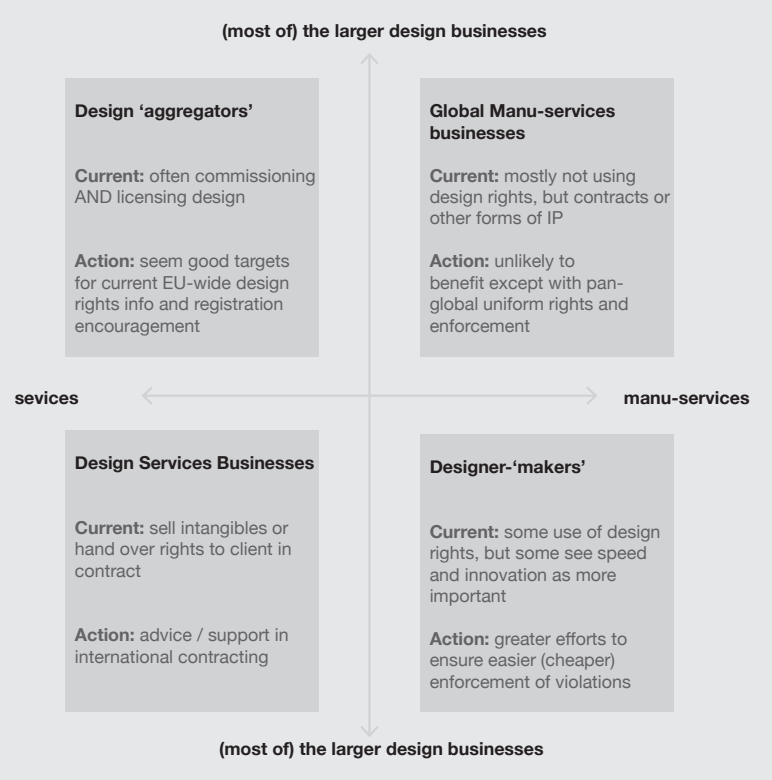

Figure 2: Four categories of design businesses as defined by The Big Innovation Center

The diagram used by The Big Innovation Centre to categorise design-intensive companies (figure 2) suggests that the reliance on IP varies depending on the type of business. Global manu-services companies rely not on design rights but on contracts and other forms of IP, which are not specified in the report. Providers of design services sell or hand rights over to clients, and are thus not concerned with IP enforcement, unless, perhaps, their work is used without prior consent. The key concern of this study is the designer-maker category[3], where IP is of significance, but also problematic due to the costs in enforcing it. The diagram implies that speed to market and renewed innovation is often seen as an alternative to formal IP. However, this may be partly due to the fact that confidence in formal IP is limited amongst designer-makers, who lack the financial resources to litigate IP enforcement.

So-called designer-maker organisations and design aggregators dominate amongst the independent design-led start-ups as they promise the largest possible growth prospects, and according to Macdonald, founder CEO of ACID, they constitute the vast majority of firms in the sector (footnote 1). It is important to emphasise that this study investigates the relevance of IP mainly from a micro-economic point of view. It is not aimed at analysing in detail the benefits, which IP deployment or changes in the IP law may have on the UK economy as a whole. Instead the study aims to establish what benefits and disadvantages the utilisation of IPRs has for the individual start-up.

[3] Throughout this thesis the term designer-entrepreneur will be used instead of designer-maker to avoid confusion with concepts related to the maker-movement which promotes DIY incentives in the context of technology. Although the two areas are connected, this thesis focuses on the commercialisation aspect rather than that of the creation of artefacts.

2.3. Design and design entrepreneurship

The Cox Review of Creativity in Businesses, which was commissioned by the HM Treasury and published in the UK in 2005, defines 'Design' as that which links creativity with innovation. Cox describes creativity as 'the generation of new ideas', which lead to 'new ways of looking at existing problems, or of seeing new opportunities, perhaps by exploiting emerging technologies or changes in markets.' (Cox, 2005, p.3)[4] Design on the other hand is seen as the process of shaping 'ideas to become practical and attractive propositions for users or customers. Design may be described as creativity deployed to a specific end.' Innovation, according to Cox, consists of 'the successful exploitation of new ideas. It is the process that carries them through to new products, new services, new ways of running the business or even new ways of doing business.' (Cox, 2005, p.3) It is easy to see that this notion of design is rather open.

The point of view of Nejdeh Hovanessian, who graduated in design, strategy and innovation at Brunel University, differs, if only slightly. Here the ambition to innovate is what connects designers with entrepreneurs (figure 3). Innovation is the interest that is shared by both, the designer and the entrepreneur. So the differentiation between a designer and the entrepreneur is sustained. However, this does not mean that a designer cannot become an entrepreneur through acquiring new additional skills and interests (figure 4).

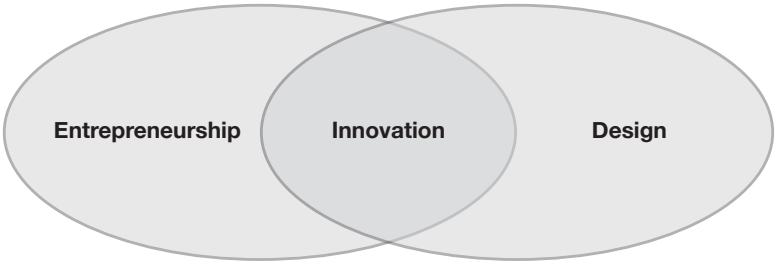

Figure 3: The interface between entrepreneurship and design according to Hovanessian

[4] In his Review of Creativity in Businesses, Cox's allows for his definition of design to be very liberal and generic. This thesis will further differentiate between different concepts of design in Section 3.4.

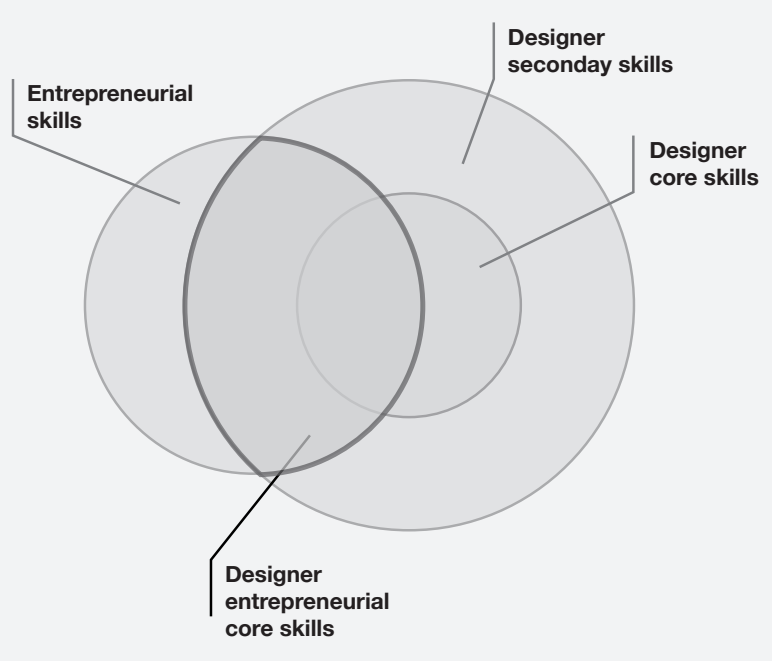

Figure 4: Overlap between entrepreneurial and designer skills according to Hovanessian

Whilst Cox acknowledges the fact that 'It is common for those in business to see creativity and the related area of design as largely concerned with aesthetic considerations such as style and appearance', he proposes for creativity instead to be seen as a 'path to new products and services' and as a 'route to greater productivity'. One could argue that this does not exclude the pursuit of products of new appearances, but it is not limited to such. Cox further emphasises that '"Creativity" cannot be viewed as a skill possessed by the gifted few. It needs to pervade the thinking of the whole business…' (Cox, 2005, p.40, author's inverted commas). Given the increased scope of activities, the designer-entrepreneur is confronted with numerous challenges over and above the design of the product or service. Who to work with? How to connect with the industry? How to brand the business? How to budget and where source funding? How to find partners and collaborators? A lot of these challenges exceed the scope of the traditional design education, i.e. the core and secondary design skills. Thus the designer-entrepreneur needs to develop new skills if taking the step into the entrepreneurial world upon exit from academia. Being creative is not enough. Creativity connects with principles of inventiveness and innovation.

The terms invention and innovation are not to be confused. Innovation adds an entrepreneurial aspect to the inventive step. According to the authors of the book 'Innovation, Intellectual Property, and Economic Growth', 'Innovation occurs at the point of bringing to the commercial market new products and processes arising from both existing and new knowledge.' (Greenhalgh, Rogers, 2010, p.5) As 'An invention or discovery enhances the stock of knowledge' (Greenhalgh, Rogers, 2010, p.5), an innovation is seen as the commercially successful application[5], implementation and exploitation of an inventive step. In pursuit of innovations, the designer-entrepreneur may work alone or assemble a business start-up team. Start-ups are developed from scratch, as opposed to spin-outs which are grown within larger institutions to become independent at a later stage. In this study, the term design-

led start-up will be used in reference to start-up companies whose development has been initiated by one or several (core) designers in pursuit of developing and marketing inventive design propositions.

Designer-entrepreneurs must make sure that their innovations are of potential benefit to a sufficiently large target audience so that the business can grow. This is why the 'codifiability' of knowledge as highlighted by Teece is important. It determines to what extent a business' unique selling point (USP) can be protected and communicated. Innovation involves taking an invention to market, and this constitutes a process rather than an instance. Processes are by default time-based. Therefore relevant analyses must take the time-factor into account. However, common business strategy development tools such as the Business Model Canvas (figure 5) which was incepted by Alexander Osterwalder, a Swiss business theorist and consultant, in collaboration with Yves Pigneur, a Belgian computer scientist, do not take the time factor into account. The Business Model Canvas provides an overview over nine fundamental characteristics of a business. However, IP is not explicitely featured and how these characteristics and their inter-dependencies change over time is not recorded. The fact that revenue streams constitute one of these factors indicates that this model is aimed at operating businesses rather than pre-trade start-ups. The Business Model Canvas allows for the listing of resources and assets, but it is not suitable to describe the way in which the changing circumstances surrounding start-ups are managed because all characteristics are fixed.

Ash Maurya, the creator of the 'lean canvas' (figure 6) describes Osterwalder and Pigneur's original as too simple and argues that it is based on established rather than developing businesses (Maurya, 2012). To allow for strategic options to be assessed with the chart, he replaces four of the original sections: 'key partners' gives way to 'problem', 'key activities' is replaced with 'solution', 'key resources' with 'key metrics', and 'customer relationships' makes way for a section named 'unfair advantage', which he describes as the 'competitive advantage or barriers to entry' (Maurya, 2012). Maurya argues that 'while a Key Resource can be an Unfair Advantage, not all Unfair Advantages are Key Resources' (Maurya, 2012). Maurya's lean canvas may lend itself better than the original to the dynamic response to one emerging challenge. However, it is limited in its capacity to articulate responses to multiple challenges.

The aim of this study is not to redesign either the business model canvas, or the lean canvas. Instead it is aimed at developing a model from scratch that can be used to manage design-led start-ups perpetually in relation to various difficulties which may arise either simultaneously or successively. What is required to generate a comprehensive model that allows for the management of all business development factors involved, is not a chart but a flow chart, a diagrammatic tool to visually articulate dependencies, and to reconfigure those over time. Only through the recognition of temporal change, can models enhance our understanding of development strategies which are designed to monitor progress, and thus increase the designer entrepreneurs' dynamic capabilities. In pursuit of key components, different aspects of innovation management will be examined in the following section.

[5] Success can be defined in numerous ways, in relation to reputational aspects such as peer recognition, awards etc., or in relation to social impact, personal development ambitions and so on. In the context of this thesis it is considered as the development of a profitable venture around a novel design solution.

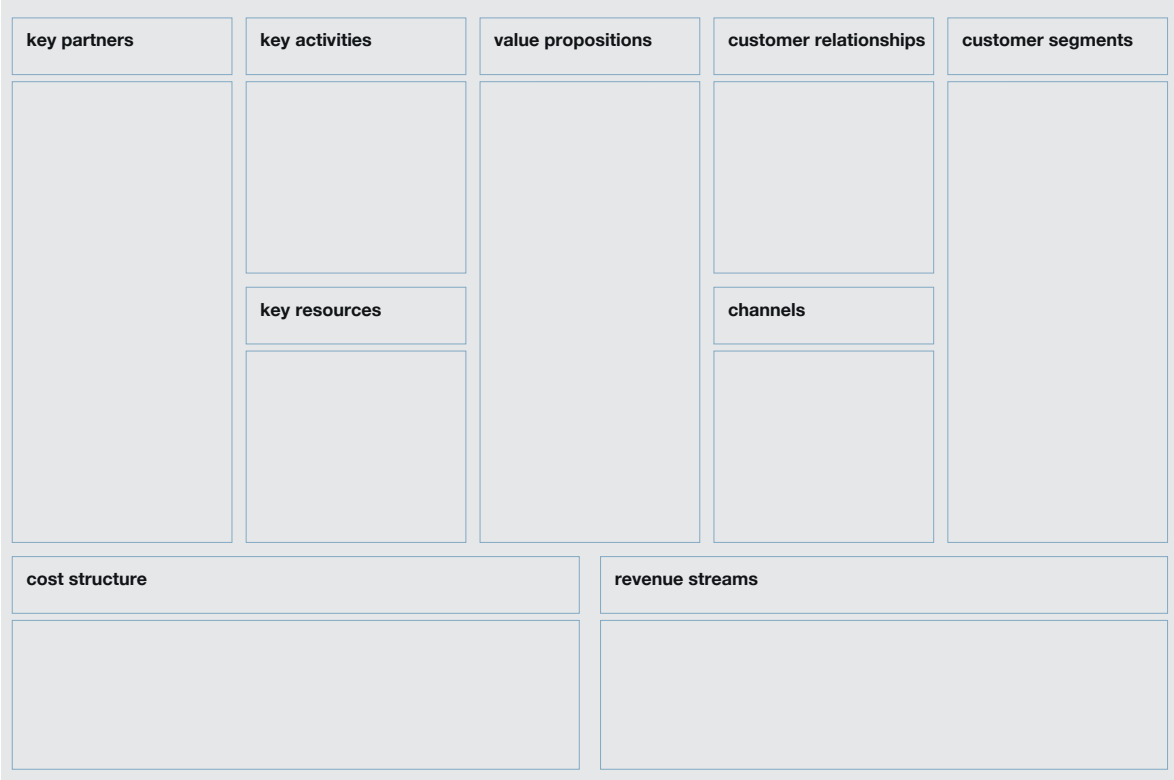

Figure 5: Structure of Osterwalder and Pigneur's Business Model Canvas

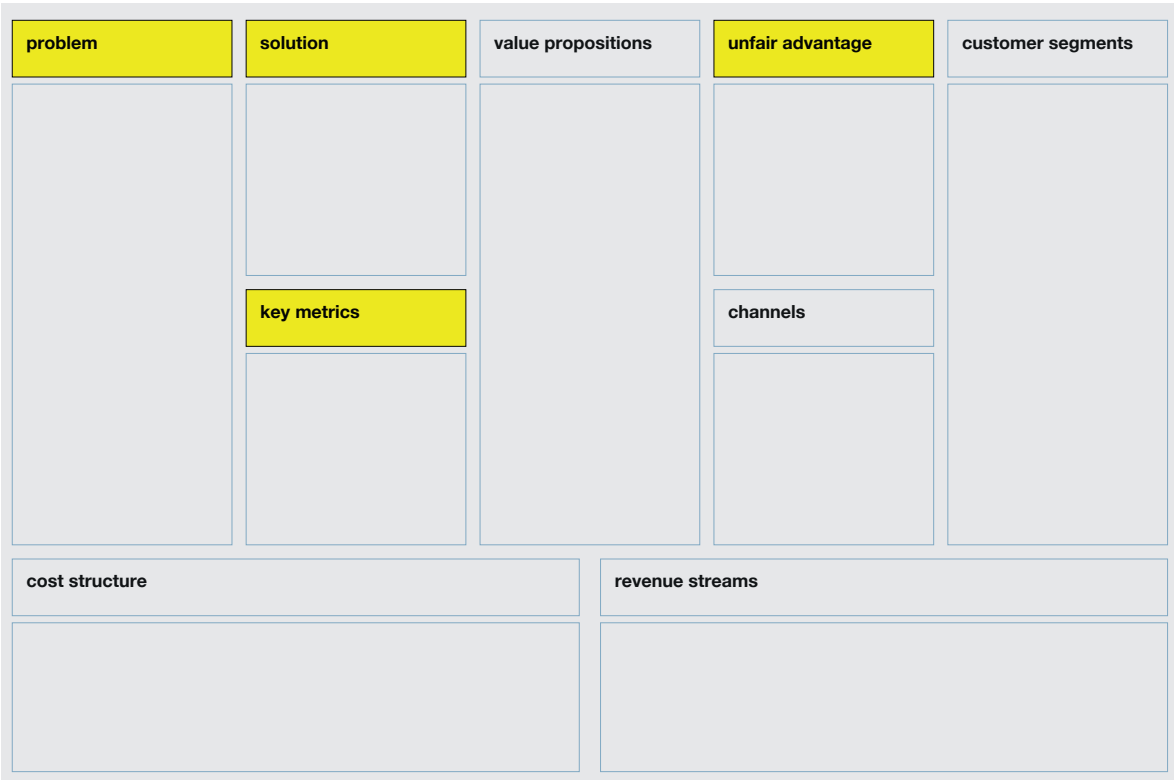

Figure 6: Structure of Ash Maurya's Lean Canvas with four of the entry points altered

3. Literature review

This chapter discusses a range of key concepts that are well-established in innovation management and innovation systems theory in order to verify how the IP management principles which this thesis examines in preparation of a design business development model, connect with existing theories. The chapter starts with a discussion of principles surrounding value appropriation as introduced by David Teece in 1986. This is followed by explanations related to the concept of dominant designs and product life cycles as proposed by Abernathy and Utterback in 1978. In combination, the insights help generate an understanding for product and business developments as well as market capture. Clarysse and Kiefer's entrepreneurial strategy matrix from 2011 connects with the discussion of design industry sectors and practices in chapter two. A dialectical discourse juxtaposing technology aspects and product languages, i.e. the visual qualities of design propositions, is followed by a critical review of the dichotomy between technology-push and market-pull incentives. The question to be resolved here is not only what motivates designer-inventors to follow an entrepreneurial route, and how do they respond to these incentives, but also what implications their responses may have? How does a business development strategy unfold if a designer-inventor focuses on technology innovation as opposed to product languages, and vice versa? A section on open innovation precedes a comprehensive analysis of intellectual property rights which are discussed in relation to numerous criteria such as applicability, costs, life-span, robustness and usage. The literature review summary articulates the concepts to which the remainder of the thesis is anchored. The purpose of this literature review is to deepen the understanding of the value of IP for design-led start-ups, and to clarify how IP connects with other means of value appropriation. This thesis is designed to be theory-building rather than theory-verifying. The majority of hypotheses developed in this thesis are not rooted in the literature, they are grounded in the qualitative findings obtained through qualitative case studies. Whilst the interviews that were conducted to gather the data for the case studies, were arranged in parallel to the literature review, the latter served as an important measure to continually verify the originality and currency of this study.

3.1. Appropriablity, complementary assets and their relationship

In 1986 Teece introduced the term 'appropriability' which sums up 'the environmental factors… that govern an innovator's ability to capture the profits generated by an innovation.' (Teece, 1986, p. 287) Due to competition and the possible need for collaborative arrangements such as outsourcing manufacturing or distribution, the profits captured will always be below the theoretical optimum. The appropriability regime determines to what extent profits can be optimized and how close towards the theoretical optimum the profit generation can be pushed. Teece lists as the most important factors 'the nature of the technology, and the efficacy of legal mechanisms of protection.' (Teece, 1986, p.287) He admits that patents can be of limited benefit in a lot of cases because 'Many patents can be "invented around" at modest cost.' The nature of the technology is of significance, because it is believed that the more complex the technology, the more difficult it will be to circumvent the patents involved. Complexity also increases the potential for sequential innovation, 'where one innovation builds on previous innovations' (Greenhalgh, Rogers, 2010, p.300). In conjunction with appropriability, Teece also discusses the relevance of other business activities, such as 'marketing, competitive manufacturing, and after-sales support' (Teece, 1988, p.288) to succeed in business. This makes it

clear that appropriability comprises numerous factors, IPR included. Teece distinguishes between *tight* and *weak* appropriability regimes, whereas 'Tight appropriability is the exception rather than the rule'. He relates tight appropriability regimes to technologies that are easy to protect, and weak appropriabilities regimes to technologies that are 'almost impossible to protect' (Teece, 1988, p. 287). The term technology is used in a loose sense. Teece lists the formula of Coca Cola as an example for a tight appropriability regime. To prevent confusion, this thesis refers to an invention or an imitation as a design proposition instead of a technology. The latter term is used only for aspects of the proposition that serve a practical function. The question that arises is how different aspects of a design proposition can be protected.

In addition to the dialectical juxtaposition of tight and weak appropriability regimes, Teece distinguishes between fully integrated businesses such as companies that do not rely on third parties to produce and commercialise their products or services, and those who rely on contracts in order to access so-called complementary assets. Complementary asset is another term coined by Teece to sum up the 'additional resources and capabilities needed to bring a technology product to market' (Clarysse and Kiefer, 2011, p.80). These may comprise access to materials, production facilities, customer relations, service expertise etc. The lack of control over required complementary assets, can lead to bottlenecks in the value chain, both upstream, i.e. towards the supply of materials and components, as well as downstream, towards the end customer.

Teece explains that complementary assets can be accessed either through integration or through contractual arrangements. He further relates complementary assets to market power. Both aspects suggest that complementary assets are to be closely linked to the complexity of business environments and to value chain control. The value chain aligns value-adding stakeholders who contribute to the product's journey to the market. Market players can sit upstream or downstream in relation to the position of the innovator. If a technology is licensed, they may also be positioned next to the innovator. The greater the area, that falls under the innovator's control, the greater the returns that can be captured by the innovator. The difficulty for the aspiring designer-entrepreneur is the lack of access to materials and manufacturing facilities (upstream value chain), and to trade channels (downstream value chain). If the market power over complementary assets is tightly controlled through independent asset holders so that the level of integration is low, Teece's model (figure 7) suggests that the entrepreneur relies inevitably on the collaboration with those who control the complementary assets. In this case strong appropriability is essential for the designer-entrepreneur to pursue commercial success. Weak appropriability in combination with a tightly controlled market is likely to lead to the failure of the invention, as independent businesses can easily imitate or circumvent the invention in order to compete with the designer entrepreneur.

In a seminal study known as the Yale Survey, Levin et al. state that 'For small, start-up ventures, patents may be a relatively effective means of appropriating research and development (R&D) returns, in part because some other means, such as investment in complementary sales and service efforts, may not be feasible' (Levin et al., 1987, p.797). This suggests that there is a reciprocal relationship between a company's need for patenting and its access to complementary assets, as the less control the designer-entrepreneur has over the complementary assets needed, the higher the need for a patent. Integration of production is usually unaffordable, in particular if the designer-entrepreneur exits academia and

thus has no, or little connection with the targeted industry sector. Here IPR, such as exclusive access to a patent, may help to access complementary assets because it prevents manufacturers from entering competition with the designer-entrepreneur. It may also induce larger companies to consider strategic partnerships with the start-up. Therefore both IPR and complementary assets contribute to the strength of a business' appropriability regime. In addition, as much as IPR can facilitate access to complementary assets, it can also compensate for the lack thereof.

Appropriability

Teece introduces us to the concept of an appropriability regime to highlight the significance of the environmental factors that surround a business. A detailed examination of these factors will be required to resolve the question of how value can be appropriated from an inventive step is core to the purpose of this study. Teece makes it clear that the strength of an appropriability regime depends on complementary assets which can be acquired through either contracting or integration. Which option to choose with respect to IP depends on how *tight* or *weak* the business' appropriability regime is, as well as on the degree of competition and the competitors' market power (figure 7). Poor access to complementary assets suggests that IP is very important and vice versa. The appropriability regime surrounding most start-ups tends to be exceptionally weak in the beginning. Hence the interest in IP is likely to be wide spread. The objective behind strengthening the appropriability regime is increasing market control (or market power) and value chain coverage. Both market power and value chain control are closely linked and both depend on access to complementary assets. The latter may enhance a business' dynamic capabilities meaning that the appropriability regime, no matter how strong or weak to begin with, is never static or stable. As with IP, whose values depends on the legal system within which a business operates and on the business' ability to implement and defend its IP, the appropriability regime is subject to positive or negative changes during the venture's life cycle. The value of IP also depends on the level of risk of being imitated, and the latter may depend on the business' development stage. Knowing how likely is it for an invention to be imitated prior to market entry, is important for answering the question how prospective developments surrounding IP in conjunction with complementary assets can be framed in relation to time. Which is preferential: To secure complementary assets through first contracting and then integrate them, when sales provide cash flow? Or is it preferential to invest to enhance the bargaining power through early integration of key assets? In order to answer these questions, a business development model is needed which assesses the dynamic interrelations between complementary assets, IP, complexity of invention, market complexity, market power of competitors, in order to allow for the systematic time-based mapping of time based IP strategies that correspond with all the other business development aspects involved.

Figure 7: Contract and integration strategies and outcomes for innovators. Specialised asset case (Teece, 1986, p. 297)

3.2. The dominant design paradigm

In their article entitled as 'Patterns of industrial innovation' from 1978, Abernathy and Utterback state that 'innovation within an established industry is often limited to incremental improvements' and that 'Major product change is often introduced from outside an established industry and is viewed as disruptive; its source is typically the start-up of a new, small firm…' (Abernathy and Utterback, 1978, p.5). The authors further explain that the 'stimulus for innovation changes' as a business establishes itself, respectively its innovative proposition in the market (p.7). This is important because these changes may affect the value and significance of IPR as well as other business development attributes. Tushman and Anderson further explain that 'periods of incremental change [are] punctuated by technological breakthroughs' which may lead to 'competence-destroying discontinuities [that] are [often] initiated by new firms' (1986, p.439). Such discontinuities render existing knowledge obsolete and force established firms to adapt their skillsets. Thus they 'break the existing order' (Tushman and Anderson, 1986, p.446), and trigger 'major changes in the distribution of power and control within firms and industries' (Tushman and Anderson, 1986, p.442).

In line with Abernathy and Utterback, Teece defines the dominant design paradigm as the phase that follows the establishment of new industry standards (Teece, 1986), which Tushman and Anderson refer to as new product classes (1986, p.439). The dominant design paradigm manifests itself when 'one design or a narrow class of designs begins to emerge as the more promising' (Teece, 1986, p.288). Teece further explains that 'Once a dominant design emerges, competition shifts to price and away from design.' (Teece, 1986, p.288) As a design is being adopted within the business environment, a new mainstream standard is established. One problem with this argument is that design-led start-ups are by default far from becoming market leaders, and their appropriability regime is usually weak at the outset. Although it can be difficult for start-ups with no trading history to clearly identify their target markets, in particular when it comes to radical disruptive inventions, Abernathy and Utterback speculate that the 'diversity and uncertainty of performance requirements for new products' might put the small, adaptable start-up at an advantage over large competitors, because economies of scale, i.e. volume production is not a significant advantage in relation to radical innovation (Abernathy and Utterback, 1978, p.4). Similar to Tushman and Anderson, who claim that 'technological discontinuities and dominant designs are only known in retrospect' (Tushman and Anderson, 1986, p. 443), management researchers Salter and Alexy argue that 'the sources and the timing of a radical innovation are unpredictable and even unknowable' (Salter and Alexy, 2014, p.32). The fact that Salter and Alexy distinguish between product, process and service innovation only, seems questionable, because the design sector is more multifaceted than this. This study will examine design in greater detail in section 3.4. in order to shed light into this matter. In his discussion of the dominant design paradigm, Teece refers to the Abernathy-Utterback product life cycle (PLC). This concept suggests shifts between product innovation and process innovation, claiming that:

> 'In the initial "fluid" stage, firms propose an array of different products and designs incorporating the new technology. In the "transitional" stage, a dominant design emerges, and while not necessarily the highest performing product configuration, the design becomes a commonly accepted standard by producers and consumers.' (Salter and Alexy, 2014, p.38, authors' inverted commas)

Tushman and Anderson argue that 'Those firms that initiate major technological changes grow more rapidly than other firms (1986, p.439). Once established as a commodity, the product then enters the 'specific' stage, at which 'competition shifts to price and away from design' (Teece, 1986, p. 288), meaning that the emphasis shifts from product innovation to process innovation. Although Teece builds his concept of a dominant design paradigm on Abernathy and Utterback's PLC concept, he perceives the Abernathy-Utterback framework as unsuitable 'for small niche markets where the absence of scale and learning economies attaches much less of a penalty to multiple designs' (Teece, 1986, p.288). What Teece does not recognise here, is that there is a 'shift from radical to evolutionary [incremental] innovation' (Abernathy-Utterback, 1978, p.6), meaning that dominant designs develop gradually through a process of paradigmatic transition. A dominant design paradigm never applies to a radical innovation at the outset, because radical innovations are juxtaposed with established markets because of their disruptive effect. Once the design has been widely adopted, it ceases to be radical, becoming mainstream. Although securing a dominant design paradigm is desirable in the long term to allow for a high growth trajectory, the dominant design paradigm is of no immediate relevance to the designer-inventor who is in pursuit of taking a disruptive innovation to market. Therefore exclusive IPRs have different short-term and long-term implications, an important distinction because the significance of these implications may vary depending on development and funding strategies. For an early exit, the long-term implications may be less relevant. However, if the strategy relies on iterative innovation, the opposite will be the case, and securing a dominant design paradigm will be beneficial. Strategies needed to get a radical innovation adopted, and to capture a sizeable share of existing markets, are of more immediate significance, because this constitutes the first step towards a profitable business.

The product life cycle

The concept of the dominant design paradigm supports the pursuit of a time-based business model. Here a product goes through three stages, a *fluid* stage, a *transitional* stage and a *specific* stage. The development of design-led start-ups are often closely intertwined with that of a product or a particular design solution, with the development of a start-up business often evolving around the latter. Due to the dependency of the start-up on the product life-cycle, it will be important to map the development cycles of the business against the three stages which Teece has outlined in his concept of a dominant design paradigm.

During the start-up period, i.e. before a design solution is established in the market, it is by default not dominant. However, without exclusive IP it may be difficult for a business to establish a dominant design paradigm around a product, because barriers are needed to prevent imitators from competing with the innovating start-up if the latter seeks to establish a dominant design in the long run. In pursuit of a time-based IP strategy framework, the long-term trajectory must be taken into consideration in relation to a business development management model.

Once a dominant design paradigm has been established, a variety of options present themselves to the designer-entrepreneur such as trade sales, company mergers, continued incremental innovation of existing products, new radically innovative products, and trade territory expansion. It may be difficult to decide such long-term goals at the outset, but understanding the options which may present themselves is nonetheless important, as they may affect the IP strategy.

3.3. Business development matrix

In addition to the omission of a temporal factor, another problem with Teece's theoretical framework is that it does not distinguish between large companies and SMEs. IPR and complementary assets both facilitate the pursuit of a dominant design paradigm. Where complementary assets are out of reach, for example for students who seek to convert their design concepts into viable solutions and take these to market, IPR becomes the designer-entrepreneur's next best option. The accessibility of a dominant design paradigm depends on the business environment and the business model. Clarysse and Kiefer provide us with a matrix that organises entrepreneurial business models in four main quadrants (figure 8). They refer to their diagram as the entrepreneurial strategy matrix which juxtaposes low and high environment complexities (structure) along one axis, and low and high environment uncertainties (accessibility) along another. The term business environment is understood here as 'a chain of players who carry out different value-adding functions in a product's journey to the end market'. (Clarysse and Kiefer, p.128)

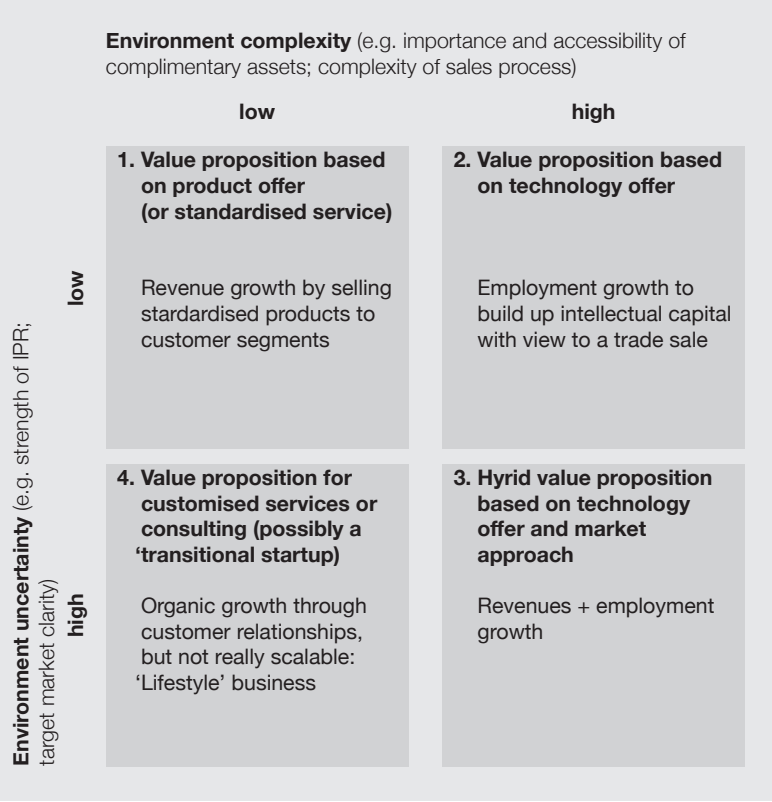

Figure 8: entrepreneurial strategy matrix (abbreviated)

One could argue that the entrepreneurial strategy matrix is an over-simplification and not representative of real-life scenarios. However, this juxtaposition of scenarios shows the difference between bespoke services, which reflects the traditional role of design, and the business built around a 'technology offer', which reflects the case when an inventor or a group of designer-entrepreneurs take a design proposition to market. Limiting design propositions to technology related novelties can be

questioned, and in line with a discussion surrounding the term design (see next section), this thesis will also discuss design proposition that are of a non-technical nature.

Difficult to enter markets are termed complex markets, as they are often controlled by incumbents. According to Clarysse and Kiefer, the more complex a market, the more advisable a patent — or IP investment in general — is for a design company (Clarysse and Kiefer, 2011, p.131). In addition to possible limitations in the access to complementary assets, market complexity is one key criterion for assessing the degree to which IP protection is advisable. Both determine how tight or weak a business' appropriability regime is.

The entrepreneurial strategy matrix (figure 6) produces four quadrants, within which businesses of different growth potential fall. Businesses located at the top left (Quadrant one) face low environment complexity and low level of market uncertainty. The target markets for these companies are very clear in terms of structure and easily accessed. According to Clarysse and Kiefer, formal IP is usually not required to succeed here.

Companies located in the first quadrant tend to 'operate independently without the need for partnerships' through 'direct and trusted relationships with customers' (Clarysse and Kiefer, 2011, p.132f). A full level of integration increases a company's level of independence, and enhances the chances of establishing a dominant design paradigm. But smaller designer-maker initiatives also fit into this category, if they manufacture themselves and trade directly.

Quadrant two, located on the top right, hosts businesses where the environment uncertainty is also low, but the complexity high. This means that there are numerous market players and different possible market entry points. Therefore partnering with existing key players in the market is often essential for accessing the necessary complementary assets. To secure a position in the market, IP is very important as this is usually the kind of situation a design-led start-up aspires to reach prior to its trade sale. The more novel a design-led invention is, the more complex the environment will be as the technology is yet to be proven in terms of its application. Design-led start-ups seeking to trade directly, need to establish complementary assets in terms of distribution channels. Those start-ups who prefer to grow through licensing their technology need strategic partners to secure their place in this part of the matrix. Whilst a dominant design paradigm is still a possibility, the designer-entrepreneur relies on the adoption of the design concept through existing market players.

Quadrant three in the bottom right accommodates businesses, where the environment is both highly uncertain and highly complex. The lack of environment certainty here may be because the design product is underdeveloped, awaiting proof of market, or it is difficult to protect from imitation. Technology design solutions may be located here during the early stages of the business development, in particular if the development relates to radical innovations. These solutions tend to have a disruptive impact on the market environment, which is why there is often a hesitation amongst existing market players.

The fourth quadrant at the bottom left of the matrix, hosts businesses that face a highly uncertain environment, whilst the environment complexity is low. Clarysse and Kiefer identify this area as the

situation for most customised services or consulting firms. Standard design agencies that supply their customers with bespoke services upon commission are usually positioned within this sector of the entrepreneurial strategy matrix. Most design consultancies across the spectrum — product design firms, service design consultancies, advertising agencies, graphic design and branding firms — fall into this category. The issue with these businesses is that the scalability is very limited. Businesses can only grow proportionally to the number of clients, and as the service provided by these companies is hardly ever directly transferrable from one customer to another, the growth potential of the conventional design consultancy is very limited. Clarysse and Kiefer refer to this sort of company as a 'lifestyle' business, which can only possibly expand through franchising the brand name. The growth potential of standard design consultancies is very limited in comparison to technology-based businesses or product-based businesses. Clarysse and Kiefer make this distinction between technology-based businesses and product-based businesses assuming that the latter 'rely on already proven technologies, but employ them in the design of novel products (Clarysse and Kiefer, 2011, p.131). This analysis promotes the idea that innovations are not necessarily bound to new technology developments.

The only way for designer entrepreneurs to escape quadrant four, is to develop a codifiable novelty. This would mean that a design-led start-up would move into the third quadrant, and subsequently through securing exclusive IP and establishing sufficient industry links, progress into the second. Clarysse and Kiefer speak of a 'transitional' start-up here (Clarysse and Kiefer, 2011, p.130). Technology concepts and products constitute intellectual and physical assets that can be traded. On the other hand, professional design services are tailored towards the needs of individual customers. In line with this observation Hovanessian argues that design practices are commonly reactive in their modus operandi and reliant on their client base (Hovanessian, 2008, p.6). As these bespoke services are not easily transferrable from one customer to the next, they cannot be traded on a wider scale. The exception here are services which use service platforms to allow to serve a wider target audience, and so do allow for the development of expandable business models.

Whilst the first quadrant accommodates established businesses such as retailers, and the fourth accommodates consultancy businesses that provide bespoke services to individual customers, the second and the third quadrant are particularly important to designer-entrepreneurs in the start-up phase. The question aspiring designer-entrepreneurs must resolve is what means are needed to prepare a business for the transition from the third to the second quadrant, so that the business can grow. In pursuit of an answer, the value proposition needs to be examined in relation to the appropriability regime that surrounds it, and also with respect to the degree to its potential to become a dominant design.

Entrepreneurial strategies

Clarysse and Kiefer's entrepreneurial strategy matrix maps four types of ventures against two criteria: environment complexity which depends on the accessibility of complementary assets, and environment uncertainty. A business' growth prospects depend on these two factors. The question to be resolved through this thesis is to how IP can be deployed to overcome related challenges. The most significant point here is the notion of a 'transitional' start-up, a business that grows through changing its value proposition. The growth potential depends on the access to complementary assets; greater access means a reduction in the environment complexity. The new factor introduced here is the environment

uncertainty, which can be a barrier for start-ups. But how does the environment uncertainty change over time? How can the surrounding factors be strategically deployed in order to reduce environment uncertainty?

3.4. Design-driven versus technology-led developments

In section 2.2 the term design-led has been defined in relation to start-up teams, whereby at least half of the members are core designers. This understanding of the term design-led is based on Haskel and Pesole's definition of design-intensive industries as discussed in the introduction. The concept of design itself has not been fully discussed. Design and innovation can be found in a variety of context. Roberto Verganti and Claudio Dell'Era from the School of Management, Politecnico di Milano, list 'product design, engineering design, software design, organization design, business model design, market design' as examples (Verganti and Dell'Era, 2014, p.141). In their chapter contribution to the 'Oxford Handbook of Innovation' entitled as 'Design-driven innovation', the two authors argue that 'Studies of innovation management have often focused their investigations on two domains: technologies and markets' (Verganti and Dell'Era, 2014, p.139). However, traditional academic design education does not necessarily focus first and foremost on technology. Whilst engineering and design can be seen as neighbouring and overlapping fields of study in the higher education context, the emphasis with respect to skills and knowledge development varies. Tushman and Anderson state that 'technology is but one force driving the course of environmental evolution' (1986, p.440) suggesting that there are others. The question is if the visual design of products may also be a driving force. This section is to critically examine the context within which innovation is pursued.

Dell'Era and Verganti acknowledge that the term design is 'fluid and slippery' (Verganti and Dell'Era, 2014, p.140). For the benefit of orientation, they offer three possible definitions: design that is 'associated with the form of products, often in juxtaposition to the product function'; 'design as a creative approach to problem solving'; 'design as the "making sense of things"' (Verganti and Dell'Era, 2014, p.140).

Verganti and Dell'Era's first definition leads to 'a narrow perspective' that reduces design to the definition formal-aesthetic qualities, thus leading to a simplistic dichotomy between design and engineering. The notion of separating technology aspects from design might suggest that this first definition suffices the purpose of identifying design aspects in an innovation that are not technically relevant. However, with reference to radical novelties that often do not conform with existing (aesthetic) standards, Verganti and Dell'Era reject this concept of design (Verganti and Dell'Era, 2014, p.140). The juxtaposition of form and function can be contested due to diverse potential qualities that are inherent in the visual, which transcends the common notion of aesthetics:

In her thesis 'Design Semantics of Innovation', Dagmar Steffen, a design historian from University of Wuppertal in Germany, builds on the 'Offenbach Theory of Product Language' which has been developed by Jochen Gros, Professor of Design Theory and Product Language (1974–2003), and Richard Fischer, Professor of Product Design and Sign Functions (1975–99), at the Academy of Art and Design Offenbach, Germany, in the 1970s and 80s. This theory defines the product function as

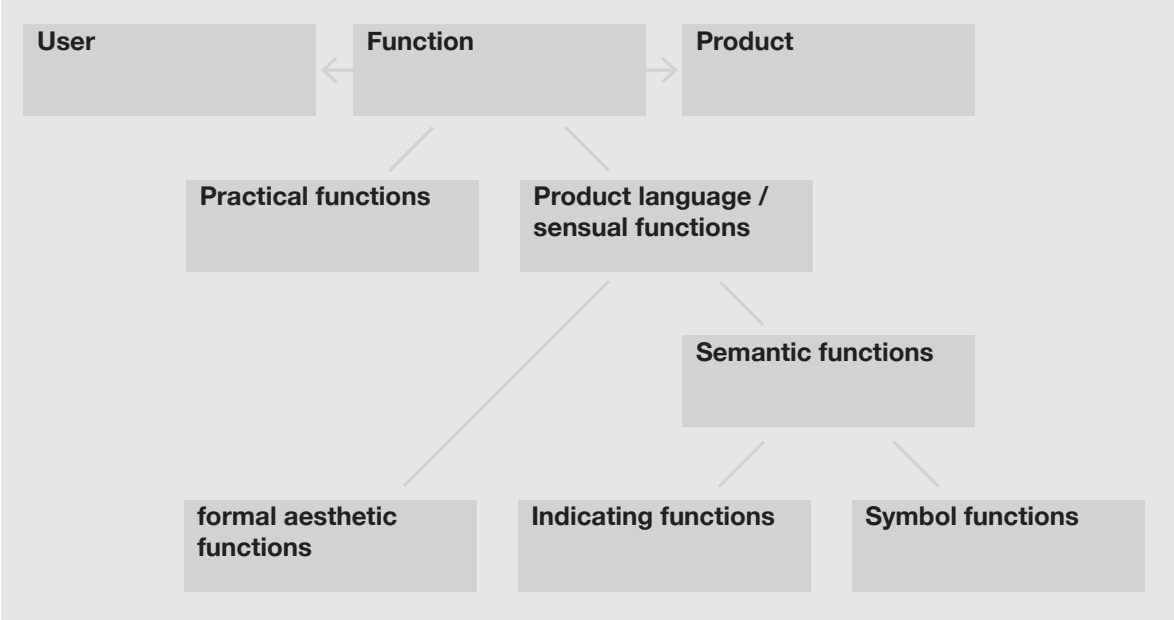

Figure 9: Conceptual model of the Offenbach Theory of Product Language (Gros, 1976) (after Steffen, 2010)

the link between the product and the user, whilst differentiating between practical functions and product languages / sensual functions (figure 9). The product language comprises formal aesthetic and semantic functions, the latter of which can be either indicative in that they 'visualise and explain the various practical functions of a product and how it should be used' (Steffen, 2010); or they can be symbolic, building on the imaginative capacity of the user. Where semantic functions are symbolic they generate associations through the processes of denotation and connotation. Where symbol functions are attached to a product, the visual impact of the latter transcends that which is necessary for its appropriate use.

Verganti and Dell'Era's second definition of design, which sums design up as 'all major creative activities and professions that produce a modification in the environment' (Verganti and Dell'Era, 2014, p.141), builds on a lateral understanding of design thinking[6] that falls in line with Cox' understanding of creativity as a 'path to new products and services' and as a 'route to greater productivity' (Cox, 2005, p.40). Pursuing design-problem solutions through the use of design thinking methods tallies with Sam Bucolo's concept of design-led innovation mentioned in section 2.1. Of course, from a business point of view, the designer-entrepreneur must apply creative thinking not only to the development of the product, but also to the way in which necessary assets are sourced,

[6] Professor Richard Buchanan from Case Western University, who has discussed design thinking in relation to 'wicked problems' (Buchanan, 1992) presented four concepts of design thinking in his keynote speech at the Design Management Institute conference in London in 2014 (Buchanan, 2014). The term remains subject to interpretation, and Verganti and Dell'Era do not clarify their understanding of design thinking. Instead their third definition builds on 'design in its broader meaning, [which] concerns all major creative activities and professions that produce a modification in the environment' (Verganti, Delll' Era, p.141)

and developmental challenges solved, and, although design thinking is beneficial to designer-entrepreneurs, and despite the fact that most will make use of relevant skills, be it inadvertently or intentionally, this second definition of design is too lateral for the benefit of investigating the relevance of IP in conjunction with early-stage innovation initiatives. In order to analyse the relevance of IP, it is useful to restrict the notion of design to the development of the commodity, and to separate this design activity from surrounding creative efforts. As it lacks in analytical detail, this second definition of design does not lend itself to the identification and analysis of suitable forms of IPR to protect the form and function of an invention.

Verganti and Dell'Era's preferred definition is the third, which proposes design as an activity 'concerned with making things more meaningful' (Verganti and Dell'Era, 2014, p.142). This concept introduces meaning as a new criterion. The legitimacy of this perspective is to some extent supported by Steffen's thesis mentioned above. The Offenbach theory uses the term *indicating functions* instead of *signalling functions*, the term used by Verganti and Dell'Era. Attributing a functional value to the visual qualities of a product can be useful to assess appropriability options because such qualities can impact a product's commercial prospects. Verganti and Dell'Era's model suggests that product meanings can be promoted by the designer and, if done successfully so, will be adopted by the audience through cultural discourse. The scholars argue that '…rather than resulting from a process of problem solving, meaning change derives from a process of "interpretation" (or better re-interpretation) of the reason why people buy and use the product.' (Verganti and Dell'Era, 2014, p.151, authors' inverted commas). This makes it clear that Verganti and Dell'Era's notion of meaning is not necessarily bound to the intentions of the designer, it may equally derive from the signification as it is perceived by the user(s) or customer(s). Verganti and Dell'Era's admit that '… meanings cannot be imposed (they depend on the interaction between a customer and the product).' (Verganti and Dell'Era, 2014, p.143) This implies that value is dependent not only on the degree to which the innovation is of value to users from an objective point of view, it is the degree to which audience members attribute value to novelties in exchange with one another. Value related to meaning can be connected to the look and feel as much as to the usability. As it is re-motivated through social discourse, Verganti and Dell'Era's concept of signification is inter-subjective. Radical innovation has been much discussed in the literature, but mainly in relation to technology developments, not so much in terms of meaning change, although one may be reminded of Barthes discussion of mythologies using the example of Citroen DS (Barthes, 2000, p.88ff). Verganti and Dell'Era argue that 'the subject of design as innovation of product meanings has largely been neglected in management studies' (Verganti and Dell'Era, 2014, p.156). Once the technological aspect of an innovation has been resolved, 'the main challenge for innovation managers […] is shifting from technology development to technology interpretation' (Verganti, Dell'Era, 2014, p.156). Verganti and Dell'Era claim that 'radical innovations of meaning ask for profound changes in the *socio-cultural regimes*.' The products involved 'may contribute to the definition of new aesthetic standards' (Verganti and Dell'Era, 2014, p.146). This reference to aesthetics is useful, because it connects the third definition of design with the first. Aesthetics, semantics and pragmatics (technology function) are re-connected here, not by default, but only if the visual expression carries or triggers semantic connotations. This supports the idea that aesthetic and functional aspects of a novelty may be: A) mutually complementary, and B) equally worth protecting. It is useful to connect product semantics and product languages with design in terms of form-giving, because product languages can be potentially value-creating, and such value can be commercially appropriated. This is why, for

the purpose of this thesis, design will be defined in line with Verganti and Dell'Era's third definition as a process of defining the product language, i.e. shape, look and feel of a product in recognition of potential signalling and symbol functions.

Where novel product languages lead to changes in *meaning* within the socio-cultural regime surrounding the product, Verganti and Dell'Erra speak of *design-driven* innovation. The authors argue that design-driven innovation is capable of creating demand through establishing a design as the *dominant product language*, which re-enforces demand following the launch of the invention / innovation (Verganti and Dell'Era, 2014, p.142f). 'Design-driven innovation is therefore *pushed* by a firm's vision about possible breakthrough meanings that people could love.' (Verganti and Dell'Era, 2014, p.145f, author's italics). The fact that Verganti and Dell'Era's use the concept of *design-driven* innovation exclusively in conjunction with radical innovation, can be questioned because the impact on the audience cannot be predicted with certainty, and what impacts one audience positively may affect another differently. As it depends on the social discourse, the impact inevitably escapes the designer's control to some degree. On the other hand, one could argue that the impact / adoption rate of technology-led innovation, can be equally difficult to predict. Innovators rely on informed guesses when establishing their focus of attention in relation to their development ambitions, and it is this ambition at the outset, the innovators' focus of attention and the development strategy, which are of primary interest in conjunction with this thesis. In line with Verganti and Dell'Era, the term *design-driven* innovation is understood here as a development process that focuses on the visual definition of a design proposition in terms of both aesthetics and semantics[7]. As such, it is a process, which, if extra-ordinarily successful, may lead to a change in meanings as proposed by Verganti and Dell'Era. This study consequently compares design-driven innovation, which defines the product language, to technology-led innovation, which is a process of defining the functionality of an design proposition, be it of a mechanical, electric, or electronic nature. This is not to suggest that these two processes are mutually exclusive. They constitute two different development aspects, and the innovator needs to assess the relevance of both in order to set priorities with respect to development-strategic decision and funding.

What remains to be clarified is to what extent Verganti and Dell'Era's notion of a dominant product language falls in line Teece's concept of a dominant design paradigm. The two terms are not synonymous, because Verganti and Dell'Era refer to visual qualities of an innovation in terms of the product language, whereas Teece's notion of a dominant design paradigm relates to technological and scientific innovation. Like Teece (1986), Verganti and Dell'Era refer to William Abernathy and James Utterback's (1978) definition of a dominant design, which derives from 'the successful synthesis of individual technological innovations introduced independently in prior products', and 'wins the allegiance of the market place' (Verganti and Dell'Era, 2014, p.148). Verganti and Dell'Era introduce the concept of a dominant product language to allow for a discussion of the market impact which novel product languages may have. They acknowledge that 'unlike dominant designs emerging in technological fields (Abernathy and Utterback, 1978, Utterback, 1994), several dominant languages

[7] In conjunction with this thesis the term design-led is used in relation to the start-up team as explained in Section 2.1.

[may] coexist in the same industry' (Verganti and Dell'Era, 2014, p.149). However, the same can be said with respect to dominant (technological) designs that are introduced to niche markets, where multiple radical innovations can co-exist, as pointed out with reference to Teece in section 3.2.

The use of the term design in this section may seem confusing here as it is used in relation to technology innovation, whereas the term product language is used in relation to the visual form (the definition of semantic qualities included). This distinction is important and necessary to allow for the comparative analysis of IPRs connected to (visual) design aspects on the one hand, and IPRs connected to technology aspects on the other. This study will further distinguish between a dominant design paradigm, as the market dominance of a technology innovation, and a dominant product language which may re-enforce a dominant design paradigm. The designer-entrepreneur needs to decide which of the two aspects, i.e. the visual and the technical, ought to be protected through IPRs, how much investment is needed to assure such protection, and at what time within the development process the relevant protection is best taken out to minimise investment and to optimise the scope of exploitation.

From dominant designs to dominant product languages

This section distinguishes between design-led start-up teams and design-driven initiatives, whereby the latter stand in juxtaposition to technology-led initiatives. In this section, the focus is shifted towards the invented commodity, the design proposition. In light of design-driven initiatives product semantics and product languages can produce valuable selling points that can be protected through IP. This gives way to a second IP route which can be integrated into an IP strategy. The above text introduces the notion of a dominant product language to complement the concept of a dominant design which was discussed in section 3.2. A design-led start-up team can pursue either of the two, or both. In the latter case, it may require shifting priorities from time to time, which again suggests that an IP strategy needs to be mapped not only against surrounding present appropriability factors, but also across a timeline which comprises potentially emerging appropriability factors.

3.5. Technology-push versus demand-pull

Verganti and Dell'Era do not only contrast technology-led with design-driven innovation, they triangulate both aspects with market-pull which they equate to user-driven innovation. Their diagram suggests potential overlaps between technology improvement and design-driven meaning change (figure 10), which supports the argument that design-driven and technology-led innovations are not mutually exclusive (section 3.4). Rather they can be complementary. Verganti and Dell'Era's claim that market-pull (user-driven) developments cannot be radically innovative because the 'user-centred approach […] operates within existing socio-cultural regimes' (Verganti and Dell'Era, 2014, p.146). In line with Donald Norman and Roberto Verganti one could argue that radical innovation requires several steps of 'small changes in a product that helps improve its performance, lower its costs, and enhance its desirability' (Norman and Verganti, 2012, p.6) in order to increase a product's adoption rate in the market. This suggests that incremental innovation follows radical innovation whilst a design proposition is being established in the market, which tallies with Teece's point that competition shifts from design to price as articulated in section 3.2. As explained in the same section, this can only happen after radical innovation ceases to be radical. To claim that user-driven developments cannot

lead to radical paradigm changes seems far-fetched. It would imply that users engage in innovation processes blindly without any possible learning involved. This would further mean that any social innovation that involves co-creative user engagement would be incremental by default, and the shift from innovation that is managed by trained designers to innovation where everybody designs, as proclaimed by Liedtka et al. (2017, p.7) would progressively limit radical innovation in the future. On the contrary one can argue that, although market-demand may predominantly revolve around existing offerings based on which the audience judge their needs, engaging users in design research and prototype testing, can lead to unexpected insights which in turn may pave the way to radically new ideas and user behaviours. Future forecast strategist Alexander Manu explains that people's 'desires, goals and motivations change, and this is where we can now find what generates a business. Synchronicity is launching the iPhone at the precise moment when every Apple user was ready to engage in the behavior of using it.' (Manu, 2010, p.9)

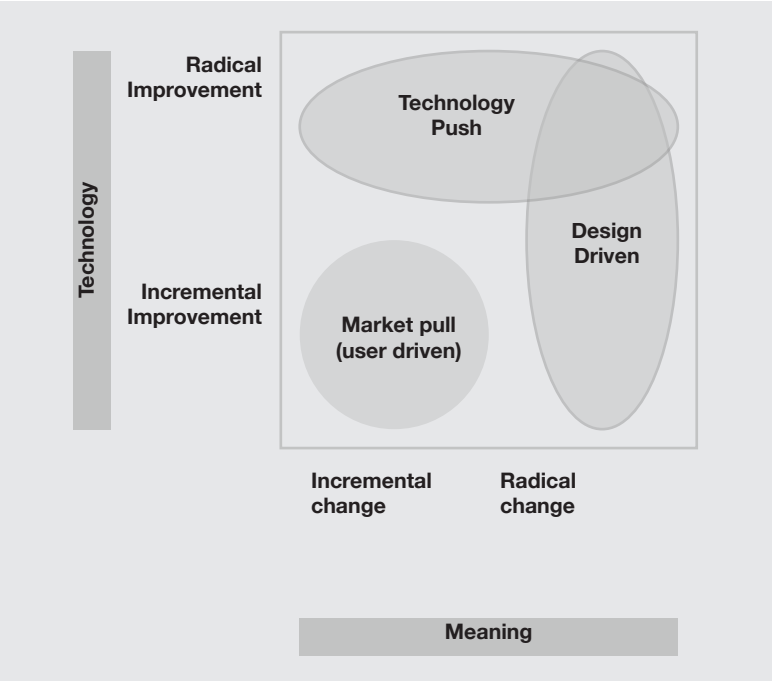

Figure 10: Radical versus incremental change according to Verganti / Dell'Era (2014)

With their diagram (figure 10), Verganti and Dell'Era suggest that breakthrough technological changes are often associated with radical changes in product meanings, that is to say, shifts in technological paradigms are often coupled with shifts in socio-cultural regimes. (Verganti and Dell'Era, 2014, p.147). To exclude market-pull from both radical design-led innovation, and from radical technology changes, is questionable for the reasons explained above. In order to further examine the significance of technology-push and market-pull forces, the following section will provide a critical review of existing models.

Clarysse and Kiefer juxtapose technology-push and demand-pull as two polar opposites, but admit that 'entrepreneurial opportunities don't always fit neatly into one category' (Clarysse and Kiefer, 2011, p.11). Verganti and Dell'Era's model does not contradict that Clarysse and Kiefer's. They simply add a new dimension suggesting that technology-push combined with design-driven innovation can create demand over time by setting new standards through novel product languages. This shift in the paradigmatic regime ties in with Teece's concept of the dominant design paradigm although it extends the argument from a pragmatic manufacturing-based context into a socio-cultural one. Verganti and Dell'Era refer to 'breakthrough product meanings', whereby 'designers act as brokers of design language' (Verganti and Dell'Era, 2014, p.154). The demand that emerges from design-driven innovation is not first and foremost the 'Economic and market demand' (Godin and Lane, 2013, p. 31), but rather demand in the loose sense. Godin and Lane, the authors of a paper on the 'The Hi(story) of the Demand Pull Model of Innovation', describe this meaning as 'demand [that is] part of a semantic or then-emerging discourse' (Godin and Lane, 2013, p. 31). This is when a product becomes a *must-have* item, which is hardly ever due to people's true needs. People's *want* plays a far greater role. As neither of the two models recognise that an entrepreneur's emphasis on demand-orientated problem solving, technology development and visual design may shift over time, it is worth examining the forces involved in greater detail. Managing the shifts in developmental priorities is key to the development of a time-based innovation management model.

3.5.1. Demand-pull and knowledge push along a time axis

Verganti and Dell'Era's use the term market-pull, whereas Clarysse and Kiefer use the word demand-pull. Godin and Lane's paper mentioned above, explores the development history of market-related push and pull concepts, and in addition it introduces the concept of need-pull. What exactly is the difference? Inventors may respond to a perceived need, although the market does not *demand* it. Godin and Lane describe need as potential demand (Godin and Lane, 2013, p.21). So how do demand-pull, market-pull, or need-pull connect with technology push? Godin and Lane note that 'The history of the demand-pull model is intimately linked to that of the linear model of innovation [Figure 11]. The linear model (basic research or scientific discoveries as the initiating force for innovation) is the background to every discussion of the demand-pull model, which emerged as an alternative explanation for innovation.' (Godin and Lane, 2013, p.7) They further explain that 'By the mid 1980s, researchers had stopped discussing the demand-pull model except as an object of the past. Multidimensional models made their arrival and succeeded one another depending on the writers.' (Godin and Lane, 2013, p.31f) Clarysse and Kiefer previously mentioned admission that it is difficult to categorise entrepreneurial endeavours supports the idea that the dialectic juxtaposition of technology-push and demand-pull is insufficient to assess development incentives.

Godin and Lane criticise multidimensional models for being mostly linear. They argue that 'most of the new (multidimensional) models remain technology-push overall, and have not, despite the aims of their authors, really abandoned the old assumptions.' (Godin and Lane, 2013, p.32) The reason why linear models do not always lend themselves to guiding the process of design-inventive activities is because the latter are not always linear in nature.

In his paper on 'Wicked Problems in Design Thinking' Richard Buchanan argues that:

> '… many scientists and business professionals, as well as some designers, continue to find the idea of a linear model attractive, believing that it represents only hope for a "logical" understanding of the design process. However, some critics were quick to point out two obvious points of weakness: one, the actual sequence of design thinking and decision making is not a simple linear process; and two, the problems addressed by designers do not, in actual practice, yield to any linear analysis and synthesis yet proposed.'
> Buchanan, 1992, p.15 (author's inverted commas)

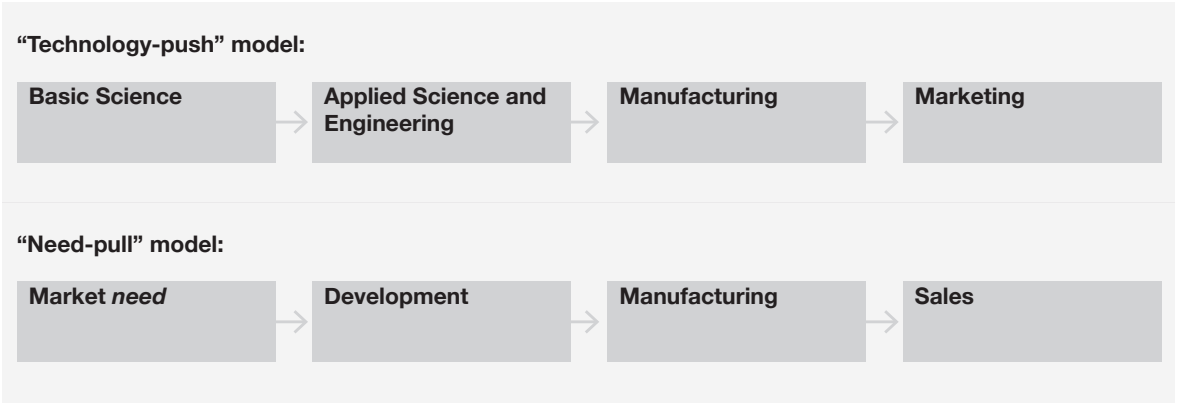

Figure 11: Rothwell's Diagram, 1985 (after Godin and Lane)

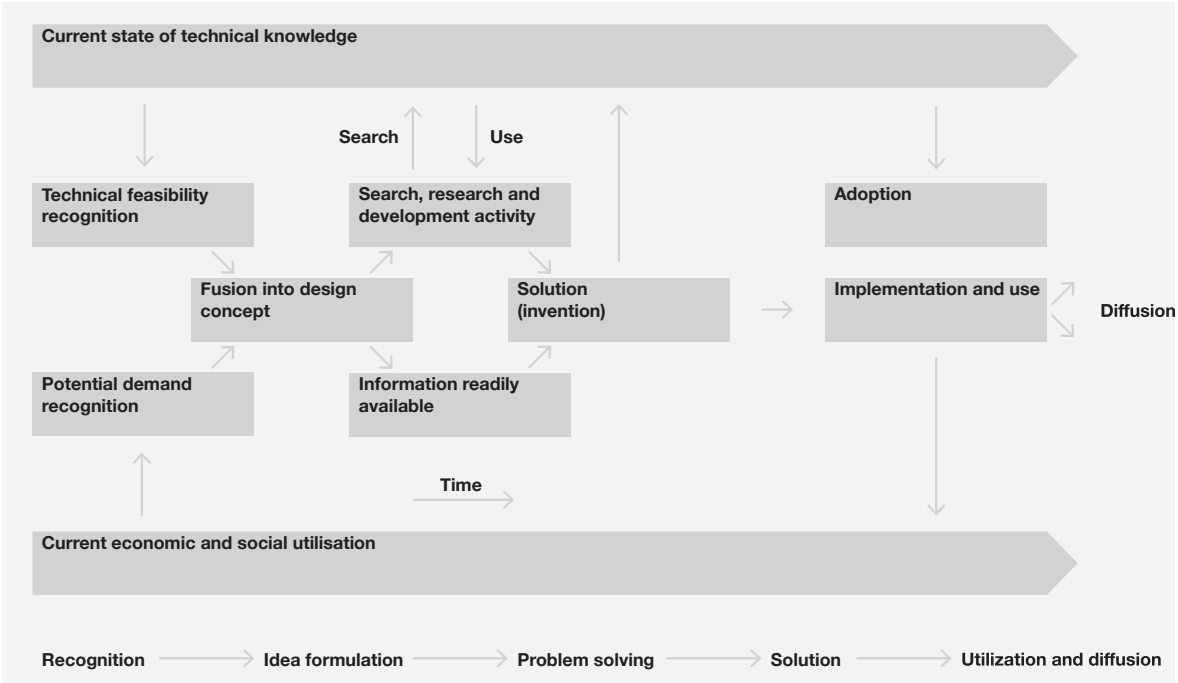

Figure 12: The Myers and Marquis Model, 1969 (after Godin and Lane)

In light of Buchanan's point it is useful to verify possible non-linear, i.e. multidimensional models. When examining the origins of demand-pull and technology push models, Godin and Lane claim that 'Two authors came to be identified as the fathers of the two alternative models: Joseph Schumpeter (technology-push) and Schmookler (demand-pull).' (Godin and Lane, 2013, p.19). They discuss a model which, instead of prioritising either technology-push or demand-pull, incorporate both aspects into a multidimensional system, the Myers and Marquis model from 1969 shown in figure 12.

The linearity of the multidimensional model can be made apparent through sketching a plausible case scenario against the Myers and Marquis Model. A designer-inventor may start with a design idea or a basic design concept following some more or less sudden insight, be it due to a personal experience, or following some basic research into a given problem. Following the ideas development, a designer-inventor needs to verify technical feasibility as well as the potential market demand or societal benefit. The 'indeterminacy' of certain design challenges, according to Buchanan means that 'there are no definitive conditions or limits to design problems' (Buchanan, 1992, p.15). Therefore, instead of working in a linear fashion, designer-inventors may need to work backwards through part of the model, or pursue cyclical developments. Development loops may occur during the early development process. For example, a perceived demand may give an inventor an incentive to come up with a technology solution, but then the target market turns out to be impenetrable. The designer-inventor then searches for a different market. Here demand-pull turns into technology-push. Multidimensional models can be useful, because demand-pull and technology-push may drive innovation more or less simultaneously, although one may be more prominent than the other at times. This means that the designer-entrepreneur's focus of attention may oscillate between the two parameters, the technical knowledge development and ideas for the utilisation, throughout the development process. The problem with multidimensional models is that they do not allow for repeat patterns — cyclical movements or development loops — which may be needed to resolve complex problems.

3.5.2. Forms of demand and meanings

To connect the notion of demand with Verganti and Dell'Era's concept of radically new product semantics, it is useful to examine how demand manifests itself where it is not given from the outset. Godin and Lane list three different forms of demand: economic or market demand; social meaning; and loose meaning.

Godin and Lane define the 'loose meaning' as demand that is 'part of a semantic or then-emerging discourse that placed the emphasis on the contribution to innovation of factors external to or other than scientists' pure motivations (i.e.: economic, social, cultural and historical factors).' (Godin and

[8] One could argue that there is a fundamental problem in using work in science to support arguments and claims for designer-entrepreneurs, since practices, histories, theories and paradigms differ. However, to establish how paradigms established in the field of science fall short of needs and expectations in the context of design, they cannot be ignored. Conversely, in order to establish how design-entrepreneurial practices can be improved, theories established in other fields can be of benefit.

Lane, 2013, p.31)[8] This definition of demand is remarkably close to the demand which Verganti and Dell'Era claim evolves from design-driven innovation in that the demand is created and not existent a priori. Godin and Lane state that demand can be 'pushed by the supply of scientific discoveries (inventions) or technological opportunities' (Godin, Lane, 2013, p.27). Although they do not acknowledge the idea of a design-push here, their notion of *demand-push* and that of Verganti and Dell'Era are mutually supportive. One can further argue that the demand-push can be reinforced through cultural discourse, when designs are paraded as award-winning achievements for example, and a design becomes a historic factor if it produces a dominant design paradigm and / or a radically new product language. Therefore 'radical change' creates demand, which in return may trigger a market-pull. This confirms that 'demand is not an independent variable, but the dependent one' (Godin, Lane, 2013, p.27). Instead of market pull, this thesis refers to market demand, which can be triggered or strengthened by design- and technology-push as well as need-pull. Once market demand comes into existence, it turns into a pull incentive. These transitional aspects are often neglected in innovation studies which tend to treat situations as static. It follows that technology-push, meaning change, and market-pull are not mutually exclusive. Not only may they happen in succession, or even simultaneously, these phenomena can also be closely interlinked. Once market-pull manifests itself as a result of design-driven innovation, renewed technology-pushes may be incentivised, and the new product semantics can be transferred onto other products.[9] In light of the above, it is important to distinguish between demand-pull and need-pull, whereby 'The concept of needs refers to specific social issues' (Godin and Lane, 2013, p.27), and also between technology-push and design-driven innovation.

Pushes and pulls

Technology-push derives from a technology-led strategy to innovation, and design-push from a design-driven approach. Shifts between the two are possible and may be advantageous. To assess strategic requirements, it is necessary to examine which forms of IPR lend themselves best to harness design-driven initiatives as opposed to technology-led endeavours. Knowing where and when shifts between design-driven and technology-led phases happen can be important for devising effective IP strategies.

Given that a dominant design paradigm does not manifest itself during very early stages of a business development, the models above may seem of limited interest to the designer-entrepreneur at the outset. However, the impact of imitation through competitors increases significantly as a venture moves from the third (hybrid value proposition) into the second quadrant (exclusive value proposition) in Clarysse and Kiefer's entrepreneurial strategy matrix, as in the latter the designer-inventor fully relies on revenue streams generated through the invention without the option of counterbalancing revenue drops through income generated through consultancy services. To articulate the risk of imitation, Teece

[9] In in 2003 Apple introduced a white iMac to the markets which carried visual features similar to the iBook — white colour rounded corners. The product language was later applied to the iPod Photo in 2004, to the iPod Mini in 2005, (https://apple-history.com). Product languages were cross-pollinated.

strengthens the fact that 'When (…) a dominant design emerges, the innovator may well end up positioned disadvantageously relative to a follower' (Teece, 1986, p.288). Here a strong appropriability regime is of critical importance to fend off competitors. This appropriability regime should cover not only the technology, it should also safeguard the product language, because it strengthens both a business' competitiveness and its growth potential. Brand assets such as trademarks also enter the equation as a design-led start-up begins to establish itself in the market, although it requires time until trade marks obtain market recognition. To understand how to best deploy and time IP protection, one must understand the dynamic interplay between technology-push, radical meaning change, which derives from design-push, and market-demand, which results from the interplay between need-pull and demand-pull. One must almost predict how these forces will interact following the floating of a design in order to optimise the way in which IP strategies are developed and applied over time. Both technology developments and product languages provide possible push incentives. There is a difference between societal need and market demand. Whereas the former is a pull incentive from the outset, market demand can be pushed or be an already existent pulling force.

3.6. Open innovation

The term 'open innovation' was coined by Henry Chesbrough from the Hass School of Business, University of California, as the 'purposive outbound flows of knowledge and technology […] to absorb external knowledge […] for the purpose of internal development, manufacture and sales' (Chesbrough, 2005, p.10). In line with this notion, management scholars Alexy and Dahlander, explain open innovation as 'all flows of knowledge across the boundary of the firm, independent of the form or direction', whilst distinguishing between 'inbound' and 'outbound' knowledge flows (Alexy and Dahlander, 2014, p.442). In terms of inbound knowledge flows, Alexy and Dahlander differentiate between 'acquired' and 'sourced' inputs, noting that acquiring 'relates to buying inputs' whereas sourcing involves scanning the environment for input through working with users and suppliers (Alexy and Dahlander, 2014, pp.445f). When it comes to outbound IP, Alexy and Dahlander distinguish between 'selling' and 'revealing' (Alexy and Dahlander, 2014, table 22.1, p.445). Revealing proprietary knowledge may not be advisable unless part of the knowledge can be retained for commercial purposes, or if the innovator can rely on other factors that allow the firm to appropriate value from the innovation. Two questions one could raise here, are: When is it advisable to reveal proprietary knowledge? And in what way do the benefits which micro-scale start-up derive from knowledge-sharing, differ from those of a medium or large enterprise?

> 'Small firms […] can be flexible and responsive to new market and technological opportunities in ways large firms cannot, and one of the benefits of collaboration is that it combines the entrepreneurial behavioural advantage of the former with the structures and resources of the latter.'
> Dodgson, 2014, p.465

Mark Dodgson defines collaboration as 'the shared commitment of resources to the mutually agreed

aims of a number of partners' (Dodgson, 2014, p.462). According to him, the purposes behind collaboration include 'develop new markets, gain access to production and distribution networks'. Expanding a market can be difficult for an early stage start-up that is yet to identify suitable market access points, whilst in the process of defining and codifying a design proposition.

The fact that collaborative arrangements can lead to 'tensions and unplanned disruptions' (Dodgson et al, 2014, p.470) may deter start-ups to consider open innovation options in the beginning. Where bargaining power remains limited, designer-inventor's may decide against strategic partnerships until sufficient credentials are established. Open innovation exceeds the notion of collaborative arrangements, as it comprises various forms of knowledge exchange including engaging customers in research and product testing.

The growth of the internet communication and of globalisation are contributing to the 'ever-increasing interconnectedness between and among […] different actors' (Alexy and Dahlander, 2014, p.457) and thus facilitate open innovation. Although it has been suggested that engagement in open innovation 'positively affects [a firm's] financial performance and market value' (Alexy and Dahlander, 2014, p.443), questions emerge, in relation to start-ups. Alexy and Dahlander state that 'In open innovation settings, complementary assets are particularly important because their ownership mitigates concerns about loss of intellectual property' (Alexy and Dahlander, 2014, p.451). But start-ups may find it difficult to access complementary assets without IP that secures their unique selling point. Due to their lack of control over complementary assets, start-ups may see themselves 'forced to enter relationships with partners enjoying stronger positions' (Alexy and Dahlander, 2014, p.451). Alexy and Dahlander explain that, 'The more strongly enforced the legal mechanisms that define ownership over intellectual property along clearly demarcated boundaries, the easier it will be for two parties to contract over the exchange of innovation' (Alexy and Dahlander, 2014, p.451). This means that IPRs function as a facilitator for collaboration as much as it can help to secure exclusivity. Alexy and Dahlander explain that IPR allow for setting boundaries around knowledge areas, and that these boundaries help the parties involved to revert to internal knowledge if the collaboration does not proceed. This means that start-ups who hold formal IPR, are attractive to potential collaborators, not only due to their exclusive value proposition, but also due to the fact that the other party can clearly distinguish between internal and external knowledge.

Alexy and Dahlander argue that 'The earlier in its life-cycle a technology is, the more likely that rallying a crowd behind one technology can give one company a lead in establishing a dominant design' (Alexy and Dahlander, 2014, p.452). As a dominant design relies on the adoption of other market players, sharing knowledge can be essential to attract interest. The difficulty is to find suitable partners with compatible knowledge. According to Alexy and Dahlander there is also no 'comprehensive explanation of when and to what extent firms share valuable resources with others will enhance explanatory power'. (Dodgson et al, 2014, p.455) Despite the difficulty of 'coordinating between external people with different interests' (Alexy and Dahlander, 2014, p.454), open innovation provides the potential to accelerate innovation.

Alexy and Dahlander's book chapter makes it clear that, although open innovation is somewhat 'counterintuitive' and does not always enhance a firm's success prospects, the strategic sharing of

specific knowledge can be beneficial for the innovating firm. Effective open innovation is a matter of identifying 'the appropriate degree of openness' (Alexy and Dahlander, 2014, p.446). The key question here is how and in what way open innovation lends itself to the use by start-ups. The fact that they have limited access to complementary assets, puts them in a weak position. Businesses have three options: To safeguard their knowledge through secrecy, to secure exclusivity through formal IPR and to trade it, or to share knowledge freely. It is likely that start-ups need to make use of a combination of all three options, use what Alexy and Dahlander refer to as 'coupled models' (Alexy and Dahlander, 2014, p.457). The question is how to place and shift emphasis over time. All we can conclude from Alexy and Dahlander's paper at this point, is that open innovation is best suited for established businesses who can secure their market position through controlling complementary assets. Start-ups may be best advised to limit outbound open innovation activities to 'selling' and to use 'revealing' only to introduce and to 'sustain incremental innovation' (Alexy and Dahlander, 2014, p.453) once the novelty is established in the main target market. With respect to the future, the need for open innovation may grow even for start-ups due to the 'ever-increasing connectedness between and among these different actors' (Alexy and Dahlander, 2014, p.457). If indeed the need for start-ups to commit open innovation increases, the urgency to secure exclusive IPR will grow as well.

Openness

Open innovation comes in forms of inbound and outbound knowledge flows. Both can involve financial transactions or be free. IP can be very important in both situations. Sharing some knowledge for free can be combined with securing exclusivity over other knowledge aspects, or protecting some knowledge through secrecy. Such coupled options are common. Yet again, the question that arises is how to combine the range of available options and how to play them out over time. Open innovation aspects are significant in relation to a time-based IP management model, since collaboration can help obtain access to complementary assets, e.g. through working with a larger established organisation (senior partner) in a strategic partnership. Open innovation can also help to establish a customer base through user testing or focus group inquiries, for example. Last but not least, collaborative arrangements can also help to expand into new markets or to adapt an innovation for new applications. Open innovation pursued by small start-ups in collaboration with a senior partner can pave the way towards a trade-sale. The relationship between IP and forms of open innovation needs not only exploring in relation to time. The likelihood for partnerships to involve entities of different sizes is also important, since the need for exclusive IP may be greater for the smaller firm involved.

3.7. Intellectual Property Rights (IPRs)

The sections above leave little doubt that the aspiring designer-entrepreneur must not neglect the potential benefits of formal and informal IPR. It is the 'efficacy' of IPR, to use Teece's terminology (Teece, 1986, p. 287), that is at question here. To judge how a designer-entrepreneur can make best use of IPR, requires a contextual understanding for the conditions within which IPRs are being deployed. However, before further examining those surrounding development conditions, the term IPR per se deserves further clarification.

This thesis refers to IP as intellectual property that may or may not be harnessed through intellectual property rights (IPRs). The latter are understood as specific rights that are articulated within a legal framework. The focus is on UK legislation. IPRs such as patents, copyright and design rights differ in what they can and cannot protect. Similar to the design patent in the US and in China, the so-called design right in the UK / EU protects 'the shape and configuration (how different parts of a design are arranged together) of objects' 'for 10 years after it was first sold or 15 years after it was created - whichever is earliest' (UK Government, nd). The novelty aspect is as important in relation to designs as it is in relation to patents: 'a design shall be protected to the extent that it is new and has individual character [7]....' (The Supreme Court of the United Kingdom, 2016). Since 1 October 2006, designs are no longer examined for novelty upon application in the UK (UK Government, 2007b), whereas they are in the USA (United States Trademark and Patents Office (2) nd, p.10). This means that referring to existence of 'prior art' is a common approach for competitors to invalidate registered design rights in the UK. A study conducted in preparation to the design right infringement survey 2016 revealed that 9 out of 12 registered design rights in the UK were invalidated in the IPO Tribunal, either due to the existence of prior art or due to a lack in novelty (appendix 2).

When it comes to formal IP in conjunction with innovations, the majority of literature focuses on patents rather than design rights. In a study commissioned by the UK IPO Collopy et al. explain that 'The paucity of relevant research literature in the field [of design rights] made [their] task much harder than in any other IP sector' (Collopy et al., 2014, p.20).

The problem with patents is that they only protect the technical aspects of the design, not visual-aesthetic qualities. Therefore a design, the novelty of which is purely aesthetic, does not qualify for a utility patent. Conversely a technology that functions irrespective of the form does not qualify for a design patent / design registration. Whilst in design, form and function may be closely linked, in the eyes of the law they are clearly distinct. Since visual elements of a design that relate to a product function are excluded from design right protection in the UK and the EU, a registered design right can be invalidated upon application through a competitor if the design is needed for the way in which a design operates.

In their book, 'The Smart Entrepreneur', Clarysse and Kiefer claim that 'Patents are particularly important when your business is not close to market, because the exclusivity afforded by a solid patent can buy you some time by preventing competitors from encroaching on your idea while you develop applications.' (Clarysse and Kiefer, 2011, p.127) On the other hand a patent application sets the clock ticking. Within 18 months the invention is publicised and the business intention made clear to potential competitors. Even though competitors are not allowed to exploit the invention without the patent holder's consent, they may be able to circumvent it through alternative technology solutions. Premature filing also bears the risk of omitting useful details due to a shortfall in the technology development. Delayed filing bears the risk of losing the priority date. Patenting also reveals the innovator's intent. Circumventing or infringing the IP involved can lead to competition. From a financial point of view, a patent application entails a whole string of events, which cannot be delayed, and which can be costly. Patent protection policies may be needed to cater for the event of infringement through third parties. Company directors may need protection through directors and officers liability insurance. Within twelve months from filing a national application, a decision must be made whether

or not to take the patent global, either through filing a PCT (Patent Cooperation Treaty) application, or through applying in foreign countries directly. Then costs are likely to spiral, and development budgets need to grow accordingly. 'Over the 20-year lifespan of the patent you can expect to pay in excess of £100,000 per invention for reasonable geographic coverage.' (Clarysse and Kiefer, 2011, p.105) This is why the UK Design Council suggests to 'Approach patenting with caution. Multinational cover is expensive and premature filing can do more harm than good' (Designcouncil, nd.). But it is not only costs that constitute a problem. Some patent attorneys advise to delay patent applications as much as possible, because the validity of a patent is limited to five years. Although renewals allow for the lifespan to be extended by up to 15 additional years, premature filing cuts the patent's lifespan short. Every year counts in terms of commercial exploitation, and the period of possible exploitation is reduced if a patent is filed too early. That aside, an aspiring design entrepreneur may also wonder to what extent his or her patent can be enforced if challenged. Clarysse and Kiefer admit that '…a patent suit can cost $10-15 million and drag on for several years' (p.93). At the same time the authors admit that 'IP is still central to many business strategies … if you do possess a solid piece of intellectual property, such as a patent, you're more likely to attract investors for your venture' (Clarysse and Kiefer, 2011, p.90). The situation surrounding design rights is not too dissimilar at first sight. The life span of a registered design right is limited to a maximum of 25 years in the UK and in the EU, and the registration needs renewing every five years. The key difference is the time factor. Whilst it can take years to get a patent application approved, a design registration is processed within weeks in the UK and in the EU. The life span of the US design patent is limited to 14 years. It does not require any renewal processes, but it takes about 15 months to get a US design patent granted.

Patenting increases the sustainability of a micro-scale start-up's value proposition, which is important for the company's growth potential and fund-raising prospects. If patenting is not an option, such as in the case of a service design or software development initiative, secrecy, possibly combined with copyright, may be an alternative. Despite this, there appears to be a more important reason for the designer-entrepreneur to file for patent: IP is often regarded as a possible means to extend the time needed for accessing complementary assets. Entrepreneurs with a design background usually need to also enhance their business skills, and they must try to mitigate the risks involved through collaborative arrangements and marketing efforts. The question is whether or not there is an alternative to costly patents, in particular if a business is design-driven rather than technology-led. Knowing that design registrations protect the shape and form of an object, regardless to what extent this carries semantic or aesthetic value, and patents protect the function of an object, we will compare the two means of protection in the following. Copyright will be ignored in this instance, because it constitutes an unregistered IP, the infringement of which can be difficult to litigate. Trademarks will be ignored as these will be examined later in conjunction with brand values.

3.7.1. Registered and unregistered IPRs

Commonly drawn distinctions within the IPR system are between formal and informal IPR on the one hand, and between registered and unregistered IP. Registered IP comprises any IP that is registered with the relevant authority such as patents, registered designs, design patents (which exist only in some countries such as the USA and China), registered trademarks. In the UK only private initiatives such as Creative Barcode[10] and ACID allow for the independent recording of unregistered IP, such as copyrighted concepts, patterns, and unregistered design rights and unregistered trademarks. Trademark protection constitutes a form of IP that connects with brand values and does not directly protect the specialist knowledge a company generates and seeks to exploit. This is why trademarks will be discussed in conjunction with brand values as a separate appropriability aspect further down in this thesis.

3.7.2. Formal versus informal IP

Informal IP is not necessarily IP in the strict sense. It also comprises similarly useful informal appropriation mechanisms such as secrecy, speed-to-market (lead time), and design complexity (Hall et al., 2012, p.6). The line between formal and informal IP is somewhat difficult to draw. IPR in terms of copyright, patents and design registration constitute key appropriability factors, because they seek to protect a company's specialist knowledge. However, this can also be protected through secrecy or through defensive publications. The latter require a sufficient level of exposure, which means that they are difficult to rely on for a start-up business, whose exposure of knowledge is limited due to their lack of prominence in the public domain unless design awards, exhibitions and press publications facilitate exposure. Although defensive publications can be used to secure a company's freedom to operate (Hall et al., 2012, p.12), they do not secure exclusivity because competitors retain the right to use the knowledge conveyed, except of that which is secured through copyright or design rights. This indicates that defensive publications are of limited benefit and potentially damaging to start-up businesses, which is why they will not be addressed within this study. Secrecy, on the other hand, is a means available to start-ups and will be examined as a potential alternative protection method to patents and other means of formal IP. Hall et al. highlight that 'in most common law countries, including the UK and the US, trade secret law forms part of common law and therefore its protection is weaker than in other countries' (Hall et al., 2012, p.5). The ambition behind the previous discussion of appropriability factors is to establish the circumstances under which formal IP is viable; under what circumstances secrecy is preferable, and under what circumstances both means of IP protection can be neglected on the whole. With reference to a study conducted by Landes and Posner in 2003, Hall et al. argue that 'around 80 per cent of copyright had little economic value' (Hall et al., 2012, p.33). As copyright is not registered in the UK, it can be difficult start-ups to sue for potential infringement of copyrights. In the case of a dispute, a designer-inventor needs to prove when the IP was produced which is difficult

[10] Creative Barcode is a not for profit organisation that provides means to tag artwork to evidence authorship prior to disclosure. Creators and recipients must be members.

without documentary evidence. Due to the limitations in economic value, and the difficulties related to the enforcement of copyrights, these will not be addressed within this study.

3.7.3. Secrecy versus registered IPRs

Although 'commonly secrecy, confidentiality agreements, lead-time, and complexity (of design) are subsumed under the informal IP heading' (Hall et al., 2012, p.6), this thesis will consider secrecy and confidentiality not as IP in the strict sense, but as appropriation mechanisms, which constitute alternatives to registered IP. Even though trade secrets can be secured in writing and enforced in court, separating secrecy from formal IP allows for the comparative analysis of the benefits and disadvantages of both. 'Enforcement of secrecy [can] be costly and may be difficult to achieve in court' (Hall et al., 2012, p.10). Hall et al. also report that high maintenance and enforcement costs in relation to patent (Hall et al., 2012, p.21). Different appropriation mechanisms have very different benefits and disadvantages for the designer-entrepreneur. Hall et al. point out that there is 'a wide range of factors that could be important in the decision to use patents or secrecy' (Hall et al., 2012, p.34). The authors claim that 'firms systematically regard lead-time and secrecy as more important ways to protect their IP than patents.' (Hall et al., 2012, p.23) Here Hall et al. allude to the fact that registered IP such as patents and registered designs are made public and provide competitors with insight into developing innovations. Although they are not allowed to copy those for a period of time, there remains a high risk for competitors to circumvent the inventive steps involved, and thus to come up with alternative design solutions. The problem with Hall et al.'s point of view is that there is no distinction between independent start-up companies founded by individual designers, or small design teams respectively, and spin-outs set up by medium-sized companies and large corporations. The Yale survey, for example, admits to the fact that 'small-scale start-up ventures, important sources of innovation, were underrepresented' (Levin et al., 1987, p.791). In contrast to established businesses, pre-trade start-ups have no additional income-stream, and therefore they rely on their innovation in a different way and to a greater degree than established companies. The lack in differentiation between start-ups and established businesses clearly marks a knowledge gap in the field of innovation management that seeks to be filled.

The reason why trade secrets are difficult to enforce is that 'in most common law countries, including the UK and the US, trade secret law forms part of common law and therefore its protection is weaker than in other countries' (Hall et al., 2012, p.5). In addition to this, it also needs to be noted that secrecy does not necessarily secure 'freedom to operate'. 'If a firm opts for secrecy there is a risk that its competitor will be awarded the patent instead.' (Hall et al., 2012, p.15).

In this thesis, lead time and learning curve advantages are thought of as possible benefits that derive from secrecy rather than as independent appropriation mechanisms following Levin et al. (Levin et al., 1987, p.799). The problem with secrecy is that lone inventors and SMEs often need to convey their concepts, or a significant part thereof, in order to attract business partners, investors and collaborators. Registered IP and secrecy can be combined through keeping some elements of the innovation confidential, whilst securing registered IP for the others. Patents require secrecy up until the filing date. This in combination with the need to find strategic partners and / or investors, may explain why some

start-up businesses file patents prematurely: They need to obtain a status which allows them to share technical knowledge without losing exclusivity.

Some economic theories suggest that firms which produce large innovations, i.e. innovations that lead to large expected profitability, should rely more on secrecy than on patents to protect their IP (Anton and Yao, 2004). While it seems counterintuitive, this result is based on the idea that the disclosure requirement of the patent law may allow competitors to appropriate some of the returns of the innovation while at the same time patent-holders may not necessarily have their rights protected in courts. (Hall et al, 2012, p.25) As the commercial prospects of a fledgling innovation can be unclear to the designer-inventor at the early stages when possible market applications and audiences are still under examination, it may be difficult to decide on the IP strategy at the outset.

Hall et al. highlight that 'the choice between patents and secrecy involves an explicit and fairly stark tradeoff between disclosure and nondisclosure of an inventive idea' (2012, p.8). In other words, the designer-entrepreneur needs to decide between the two options, and this decision needs to be made at a very early stage, despite the fact that once a decision has been taken to patent, it becomes irreversible once twelve months have elapsed after filing. Although patenting strategies can be adapted, secrecy can be sustained long-term only with respect to aspects of the invention not included to the patent. Freedom to operate can be crucial. For an established business with a number of revenue streams, having to circumvent somebody else's IP may be feasible. For start-ups, in particular for those that focus on one proprietary innovation only, facing a competitor during the early-stage development can be very compromising. The trade-off involved in registering IP is less of a sacrifice with respect to designs than it is with patents. Whilst technical novelties can potentially be concealed within a product, the registered design right protects only that which is visually disclosed to the by-stander. Here secrecy ceases to be an option, as soon as a product enters the market.

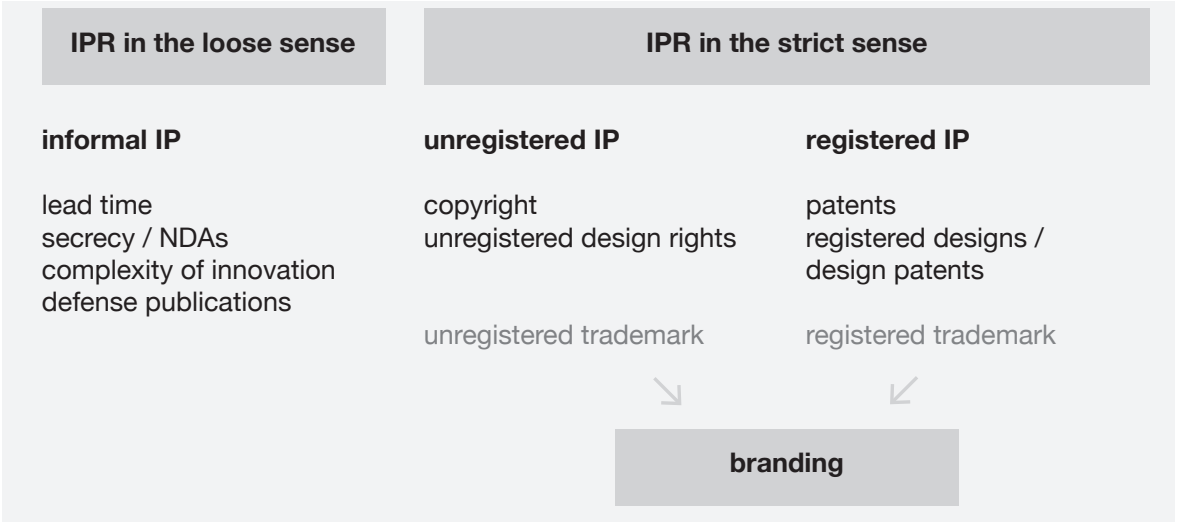

Figure 13: Appropriability mechanisms as examined within this thesis. Informal IP will be referred to as informal appropriation methods or mechanisms

The Gowers Review published by HM Treasury in 2006, states that 'The four most common [IP rights] are patents, copyright, designs and trade marks' (Gowers, 2006, p.13). This thesis will concentrate on registered IP: (utility) patents on the one hand, and registered designs / design patents on the other. What is termed elsewhere as informal IP (figure 13), will be treated as informal appropriation methods within this thesis. These include lead-time and design complexity. Secrecy, another method of appropriation that can be formal (NDA / Contracts) and informal (verbal agreements), will be treated as an alternative option to formal IPR. Trademarks will be discussed as part of brand values, which constitute yet another method of strengthening a company's appropriability regime. Clarysse and Kiefer argue that 'it usually takes a long time and hefty resources for a company to build a solid brand reputation and relationships with clients' (Clarysse and Kiefer, 2011, p.111). Brand values are difficult for start-ups to appropriate during the early stages because they evolve over time around marketing communications and public relations management.

3.7.4. A comparison between Patents and Registered Design Rights

When discussing the choice between formal and informal intellectual property Hall et al. (2012) make no distinction between registered designs and patents, nor does Teece when introducing IPR in conjunction with appropriability regimes. One may be inclined to think that the omission of the distinction is due to the fact that the US equivalent to the European design registration is called design patent and that the arguments are meant to encompass both the utility patent and the design patent is compromising since the two forms of IPR are very distinct. A more likely reason is pointed out by legal scholar Rebecca Thushnet, who suggests that 'The law's traditional bias against, even fear of, the visual may help explain why design patents have been of less interest to many intellectual property scholars than other bodies of IP law.' (Tushnet, 2012, p.409) To establish how much of a difference there is between utility patents and design registrations/design patents, this thesis will first look at the formal requirements for obtaining either.

3.7.5. Costs and duration

Both the design patent and the design registration are inexpensive by comparison to a utility patent. In the UK, it currently costs £60 for the application of a single design registration (£50 if filed online), and £40 per additional design for multiple applications. Filing European-wide with the Office for the Harmonization in the Internal Market (OHIM) in Alicante costs €350 per registered design. Any extra design costs €175 in addition. The processing is fast compared to patents, with applications being processed within a month or two within the UK, even faster if filed OHIM. Within Europe, designers benefit from a grace period of up to 12 months, meaning that the designs can be made public up to a year prior to filing. Through renewals, design registrations can be extended to up to 25 years. The benefit of a design registration over a copyright is that copyright infringement only occurs where a design is actually copied, whereas the registered design excludes designs of similarity regardless of whether or not it is a result of copying. To succeed with a design registration, there needs to be an element of novelty involved. The costs involved in the US design patent are higher, around US$1,500. The UK registered design right costs £50 (if filed online) and £60 if filed through paper. The EU design

right costs €350 for online filing (date of costing: 2017). So design rights are much easier to come by, and less time consuming.

The US design patent differs slightly from the European design registration. The examination process is similar to that of a utility patent, which is why it takes around 12-18 months until the design patent is granted (Wells, nd). The costs are slightly higher than those of a European design registration, but still significantly lower than those of a utility patent. The design patent requires a filing fee of $530 (with a 50% discount for 'small entities', i.e. companies with less than 500 employees), and $1,000 issue fee ($500 for 'small entities'). There is no renewal fee due with the design patent, which somewhat justifies the higher costs compared to the European design registration. The life span of the design patent is 14 years according to the US Patent and Trademark Office (United States Trademark and Patents Office (1)) and thus shorter than that of a European design registration. Both the design patent and the registered design are significantly cheaper than utility patents, and much faster in terms of processing time. The question is how valuable they really are for start-up businesses.

3.7.6. Robustness

The easier it is to contest a form of IP due to the way IP has been defined or commonly interpreted in court, the less robust it is according to the definition[11] used here. IP scholar Tushnet states that 'Design patents are an area of intellectual property law focused entirely on the visual' (2012, p.409). The same applies to design rights in Europe. The fact that neither the design patent, nor registered design right requires any verbal description or claims makes it easy to file either directly without involving lawyers. With the appearance being the key in determining potential infringement, the judgment lies in the eyes of the observer, and perception is known to be subjective. Although a 'Design patent offers a way to protect the aesthetic, nonfunctional elements of a product design' (Tushnet, 2012, p.409), 'the ordinary observer test makes design patent infringement findings harder to review and analyze; as gestalts, they are difficult to dissect' (Tushnet, 2012, p.417). The UK/EU-equivalent to the 'ordinary observer' test is the 'informed user' test. Who is to be considered as a 'user' — a buyer, an operator, a consumer etc. — and to what degree that user is to be 'informed', has been questioned in conjunction with numerous historic court judgments by David Musker, a UK-based IP Attorney, in a presentation given to the European Communities Trade Mark Association (ECTA) in Alicante in 2014. The term 'informed user' remains highly ambiguous. Musker et al. conclude: '… are we talking about a real(istic) consumer or a purely artificial construct? We still don't know.' (Musker et al., 2014)

Are the ambiguities surrounding design right legislation good enough a reason for putting limited faith in this form of IP? Economists Lemley and Shapiro (2005) refer to legal rights granted through patents as probabilistic rights. Expert 4, a solicitor who practices in the area of media, entertainment and intellectual property law, argues that with patents "you are looking sometimes at quite technical issues to deal with, what is original novel in the application, whereas the design to a degree speaks

[11] The term robustness is in this thesis understood in relation to IP along the lines of strength, i.e. the likelihood for it to be successfully defended against an imitator.

for itself." (Expert 4, 2014) The fact that in Europe the registered design is not examined for novelty makes filing processes faster and cheaper. But it reduces the certainty that the design rights will hold up in court. Does this mean that the design patent and the registered design right more probabilistic, i.e. less robust than a utility patent?

3.7.7. The value of IPR

This section discusses the reasons why designer inventors may want to secure IPR. Greenhalgh and Rogers differentiate between three fundamental benefits, stating that 'Market power, licensing and signalling are the basic ways in which firms can benefit from IPRs' (Greenhalgh, Rogers, 2010, p.151).

The signaling effect: Greenhalgh and Rogers argue that patents 'undergo an external quality check [during the mandatory patent search], hence they act as good signals allowing firms to raise finance or attract talented employees.' (Greenhalgh, Rogers, 2010, p. 151) Nonetheless patents can be challenged in court, meaning that, 'even if the patent is granted, uncertainty remains with regard to the outcome of a civil action for infringement of a patent right' (Hall et.al. 2012, p.13). Filing a patent can be expensive, in particular if filed through an attorney. However, signaling investors and competitors one's financial commitment to the business, can be useful because it can help negotiate favourable terms during fundraising, team building and in pursuit of strategic partnerships. The registered design in the UK or Europe is not examined. Hence the ownership of a registered design right provides no objective measure for the novelty of an innovation. One could further argue that the signalling effect in conjunction with registered designs is limited due to the low costs involved. The patent reflects a more serious financial commitment on behalf of the designer inventor.

Market power: Hall et al. (2012, p.4) argue that 'The financial reward to an IP holder derives from the legal right to exclude others from using the innovation.' Market power[12] is a long-term goal, and the risk of IPR infringement is thought to be low until proof of market has been established. Expert 2, a business coach from Belgium and formerly a lecturer at Imperial College points out: "Under the surface, and if you don't make too much money, nobody will care. The moment you do, everyone will snatch if from you if it is not protected." (Expert 2, 24/04/2013) This suggests that competitors refrain from copying technologies that that lack proof of market, and that market power becomes significant only once a dominant design or product language is established.

Licensing: As pointed out in section 2.1. with reference to Clarysse and Kiefer, the chances for the early-stage start-up to generate substantive revenues through licensing, are limited, meaning that profitable license agreements are difficult to secure during the early stages of the business development, whilst the design proposition remains under development. However, if licensing is a way to later expand the business into territories, to which the designer-entrepreneur has no direct access,

[12] Market power can be assessed by examining the degree to which a company controls the value chain within which its innovation is situated.

the licensing option can be built into the long-term business development strategy to attract investors. This suggests that the licensing option can potentially strengthen the signaling effect, in which case licensing should be considered as a means to expand a business rather than as a means to develop it. The Big Innovation Centre report stipulates that 'Intellectual property protection is clearly vital to this model, as licensing requires a clearly defined right to work effectively.' (The Big Innovation Centre, 2012, p.82). It follows that licensing depends on IPR, and the licensing potential relates directly to a venture's growth prospects.

Registered designs can be licensed out and in as much as patents. The registered design in Europe benefits from a maximum lifespan of 25 years which exceeds that of a patent by 5 years. As the possible duration of license revenues stands in direct relation to the licensing value that derives from IPR, one might argue that the registered design is superior a means of appropriating value by comparison to the patent. Renewing a design registration is not only cheaper than renewing a utility patent, but also easier according to Expert 4 due to the differences in procedures (Expert 4, 2014). Renewals are not necessary for a US design patent, although its lifespan is limited to a maximum of 14 years, slightly less to that of a utility patent. However, the lifespan of a product in the market may be much shorter than the possible maximum of design right protection. Whilst electronic devices and fashion design products are often substituted comparatively fast, furniture designs may have a comparatively long lifespan.

3.7.8. Statistics in UK IP litigation

Helmers and McDonagh's paper 'Patent Litigation in the UK' establishes that only a small percentage[13] of IP disputes at the Patents County Court (now the Intellectual Property Enterprise Court or IPEC) are patent-related (Helmers and McDonagh, 2012), with copyright issues and trademark disputes dominating. However, the paper does not distinguish between registered and unregistered design rights. Yet, the combined number of cases of registered and unregistered design right disputes equates to the number of patent disputes, at circa six or seven per year, suggesting that design rights and patents are equally significant to innovators in general.

The situation at Patents Court, at the High Court, the Court of Appeal, as well as the House of Lords/ Supreme Court differs significantly. Helmers and McDonagh explain that the number of cases of patent disputes at Patent High Court (PHC) level is 68 in 2007/2008, constituting 60% of all IP disputes at this level. The cases at PHC mostly relate to patents that protect 'pharmaceutical and chemical compounds and production processes', whereas the cases at PCC [IPEC] level tend to relate to 'patents of lower complexity and value', which are secured to protect inventions of 'mechanical, discrete nature' (Helmers and McDonagh, 2012, p.26). Most of the patents connected to the case studies examined in this thesis fall into the latter category. Patents litigated at IPEC level are said to be mostly less than ten years old, meaning that design-led start-up businesses are predominantly dealing with litigations involving IPEC rather than PHC. At the same time only a small fraction of patent infringements are

[13] only 12 out of 64 in 2007/8 according to Helmers and McDonagh

ever litigated: the combined figure of 40 PCC and PHC cases is miniscule considering that over 2,000 patents were filed in 2008 alone (Helmers and McDonagh, 2012, p.14).

Helmers and McDonagh refer to the UK's 'relatively high costs (compared to other jurisdictions such as Germany)' (Helmers and McDonagh, 2012, p.22) to explain the low numbers of patent litigations in the UK. Since even 'the successful party will recover [only] about two-thirds of its legal fees' (Helmers and McDonagh, 2012, p.21), a decision needs to be based 'on an assessment of the benefits and costs associated with monitoring infringement and taking legal action' (p.3). The statistics above do not suffice to draw credible conclusions on the risk of infringement of either patents or registered designs, because of two reasons: The number of litigations — some 14-15 per year — is too low by comparison to the number of patent filings and design registrations (around 2,000 patents are filed per year), and there is no differentiation between the litigation of registered and unregistered design rights. Dids Macdonald, the CEO of ACID, suggest that the vast majority of design rights in the UK remain unregistered[14].

The Big Innovation Centre report makes it clear that 'companies with design rights tend to be more export facing' (The Big Innovation Centre, 2012, p.69), whether that be through either sales or licensing. As IPR facilitate both international sales and license revenues, they connect with the prospective value of a start-up company. But to understand the potential value of design rights, whether or not these are worth registering, and how the benefits compare to those related to patents, the designer-inventor needs to 'understand what strategies firms use to make money' (The Big Innovation Centre, 2012, p.69). The case studies conducted by The Big Innovation Centre claim that 'design registration only helps a limited portion of design-intensive industries to realize the value of design' (The Big Innovation Centre, 2012, p.69), suggesting that patents are the better means in pursuit of a licensing strategy. However, the report examined no more than 5 design-intensive companies, which are very different in size and nature. The current IPR system in the UK may deter designer-inventors from securing registered design rights and from capitalizing on them. This may have skewed the data.

Both The Big Innovation Centre report (2012) as well as the paper by Helmers and McDonagh (2012) provide insufficient data to produce a credible comparison between the benefits of licensing design rights on the one hand, and patents on the other. The utilisation of license strategies and the number of litigations in the UK are too low in both areas to allow for a credible analysis of the potential value of design IP. What can be said is that the pressure of firming up the IP strategy with respect to licensing is greater in conjunction with patents than it is with registered designs, because the latter benefit from a grace period of one year. The grace period permits designer-entrepreneurs to float a design on the market before investing design registration fees, and thus to test the market response before securing exclusive IP access.

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[14] When asked for an estimate calculation of unregistered design rights versus registered design rights, Dids Macdonald stated in an email that 'ACID receives about 25,000 copies of members' unregistered rights per year. The IPO receives approximately 5,500 registered designs per year and OHIM (now EUIPO) receives on average 2,500 per member state per year although about 5,000 are registered from the UK.' (Macdonald, 20 July 2016)

3.8. Literature review in summary

Salter and Alexy argue that 'Early work on the nature of innovation focused mostly on innovation driven by technical change, usually in the manufacturing sector' and that this has led to a 'focus on the generation and use of new scientific and technological knowledge' (Salter and Alexy, 2014, p.42). To eliminate the blind spots of knowledge, and what Salter and Alexy refer to as a 'protective belt of innovation studies', the authors argue that 'researchers should not give primacy to technological innovation towards other types of innovation'. In line with Verganti and Dell'Era, who argue that design-driven innovation can lead to dominant product languages which can be appropriated (section 3.4), Salter and Alexy propose that 'many innovations are not primarily "technological" in nature' (Salter and Alexy, 2014, p.42, authors' inverted commas).

The dichotomy between design-driven strategies and technology-led strategies is only one of the blind spots addressed in this thesis. Dodgson et al. point out that 'Time is a crucial issue in understanding and managing innovation. The costs of investing in innovation are immediate, while the returns can be long term. The long-term benefits may create value unappreciated at the time of investment.' (Dodgson et al., 2014, p.6). However, most of the concepts described in the literature review above are suitable only to analyse one particular moment in the development of a business or product. The Myers and Marquis Model is one of the few that lends itself to the analysis of a development process, because of the dynamic relations between development incentives and markets. However, it does not suffice to assess the significance of IPR or to comparing the prospective benefits of diverse forms of IPR. Following a series of case studies, including some longitudinal investigations, this thesis will develop a reference framework to assess the latter in relation to other aspects of the appropriability regime of a design-driven start-up. This reference framework will help to better understand the prospective value of innovations and thus to better manage investments.

The situation for lone inventors and start-ups differs from that of established businesses and individual innovators due to the higher level of risk involved. Salter and Alexy claim that 'It is not uncommon in an R&D portfolio, for example, for 10 per cent of projects to account for 90 per cent of all the total returns' (Salter and Alexy, 2014, p.35) to 'the uncertainty —the unknown unknowns — of investment in innovative efforts'. This uncertainty bears a greater risk for start-ups than for established businesses because the former do not have any alternative income streams. The prospective evaluation of IPR in terms of costs and benefits is therefore critical to mitigating the risks involved in the management of innovation. Risk management for independent start-ups differs from that of large corporations, because start-ups are much more volatile than the latter, which means that the penalty for failure weighs much heavier on a start-up than it does on an established firm.

Summary of section 3.1. — appropriability

Teece introduced the concept of an appropriability regime to sum up the circumstances that affect a company's current or prospective market power. He refers to complementary assets and integrated assets which constitute the factors that define a venture's appropriability regime, where assets are built or acquired through either licensing or integration. The core asset of a design-led start-up is

knowledge, which can translate into formal and informal IP. How this knowledge relates to the other assets, and how this interrelationship can change over time will be examined within this thesis. The complexity arises due to the fact that a design-led start-up develops in close conjunction with the design proposition.

Summary of section 3.2. — dominant designs

As the design proposition develops towards becoming a dominant design, the start-up (team, financial position, physical assets) also fledges, producing another layer of uncertainty, which in turn complicates decision-making processes. In relation to the product life cycle and in reference to Abernathy and Utterback, Teece specifies three distinct stages: the fluid stage, the transitional stage, and the specific stage. During the specific stage a product (or design proposition) will have established as a 'dominant design', which means that a start-up will have ceased to be a start-up. Instead it will have become an established business and obtained a leadership position within a market or a market sector. Abernathy and Utterback claim that 'The stimulus for innovation changes as a unit [i.e. a business] matures, whilst 'uncertainty about markets and appropriate targets is reduced' (Abernathy-Utterback, 1978, p.7) Teece uses the term dominant design for product solutions that disrupt the market in that production methods are adapted to the new product solution. The ecosystem surrounding this new product is reorganised in line with what the new product solution requires for ease of production and distribution.

Summary of section 3.3. — business models

Clarysse and Kiefer's entrepreneurial strategy matrix (figure 6) assesses venture development prospects against environment complexity and environment uncertainty. The business growth prospects of a design business depend on the business model. Clarysse and Kiefer outline four fundamentally different concepts here:

A) A business built around the offer of a standardised product or service
B) A business built around a technology offering
C) A consultancy business offering bespoke services to individual clients
D) A hybrid between the second and the third option

A transitional start-up in the Clarysse and Kiefer framework is an initiative that develops from a consultancy business (C) into a hybrid option (D). Clarysse and Kiefer's concept of transition relates to the business model, i.e. the modus operandi that are deployed for revenue generation.

Summary of section 3.4. — product languages versus technology innovation

This part of the thesis differentiates between design-driven and technology-led innovation with reference to Verganti and Dell'Era. It introduces the concept of a dominant product language which provides an opportunity for designers to establish market dominance through meaning change (novel semantics). Design-driven and technology-led innovation are not necessarily mutually exclusive. James Dyson's development of a dual-cyclone vacuum cleaner as described in his autobiography (Dyson, 2003) shows how technological novelties may motivate new product languages which can be harnessed through IP. Here form and technology are closely connected. The business model is

dependent on the relationship between the technology development and the product language in a design proposition. Understanding this relationship, and how it can be appropriated over time, is critical for developing and optimising IP strategies. A design proposition is by default not dominant at the outset. However, IP strategies need to take into consider the long-term prospects of design developments. If establishing a dominant design and or a dominant product language short and long-term perspectives need to be taken into consideration.

Summary of section 3.5. — technology-push versus demand-pull

Both technology concepts as well as product languages can be pushed in pursuit of new market opportunities. Market-need and market-demand are defined in this thesis as two different concepts, though market-need can be articulated — through public relations, advertising or educational activities — to trigger market-demand. Pushes and pulls surrounding both product languages and technology concepts may occur in alternating fashion. This may have an impact on how an IP strategy is constructed and rolled out.

Summary of section 3.6. — on open innovation

Another significant factor in relation to the development of IP strategies is the potential benefit of knowledge sharing. Inbound and outbound knowledge flows can be advantageous for the development and marketing of a novel design proposition. How and to what extent knowledge is best shared with other stakeholders can be difficult to determine a priori. IP strategies may need monitoring and adjusting to optimise knowledge flows. In pursuit of a flexible framework that allows design-led start-up teams to develop and periodically adjust IP strategies in alignment with product- and business development strategies, the dynamics in the relationship between the design proposition and the target market need to be monitored.

Summary of section 3.7. — an analysis of intellectual property

The purpose behind IPR is to secure freedom to operate, and, where possible, exclusive access to knowledge that can be commercially appropriated. The time factor is of great significance in relation to a start-up's IP strategy: the grace period, which exists in the UK in relation to registered design rights but not in relation to patents, determines eligibility, whilst renewal deadlines and maximum life spans affect the commercial value of all registered IPRs. Secrecy, lead time, and open innovation principles constitute informal IP appropriation mechanisms, that can be deployed. However, such informal protection methods bear risks because they can be difficult to sustain for start-ups who may lack access to markets and strategic partnerships. To strategise formal and informal forms of IPR, and to decide how different IP protection mechanisms can be used in combination over time, the efficacy of IPRs needs to be further examined. Whereas patents have been thoroughly discussed in existing literature, there are very few studies on design rights. Greenhalgh et al. identify the signaling effect, market power and licensing as the most prominent reasons for securing IPR. However, only the first is of immediate relevance to the early stage start-up. The remaining two aspects gain in importance as the start-up begins to transition into an established business.

4. Methodology

In his discussion of research approaches Creswell, a professor for educational psychology, distinguishes between four key worldviews (paradigms): Post-positivism, Constructivism, Transformative and Pragmatism. He describes post-positivist approaches as reductionist because they involve segmenting situations into small discrete parts that can be examined individually (Creswell, 2014, p.7f). Constructivist paradigms root in sociological studies which compare multiple varied sets of complex qualitative data obtained through open-ended questioning (Creswell, 2014, p.8f). Transformative approaches tend to be politically motivated and aimed at social change (Creswell, 2014, p.9f). According to Creswell the pragmatist paradigm is not method-driven. Instead 'researchers emphasise the research problem and use all approaches available to understand the problem' (Creswell, 2014, p.10f). Creswell further explains that a pragmatist approach allows for a variety of both quantitative and qualitative approaches. These characteristics reflect the approach that was deployed in conjunction with this study.

In reference to Guba (1990), Creswell explains the notion of worldview as a basic set of beliefs that guide action, often referred to as a paradigm, ontology or epistemology (Creswell, 2014, p6). Strictly speaking, the terms epistemology and ontology are more specific, and related to philosophical concepts of knowing (epistemology) and of being (ontology). For example, Gray and Malins describe the ontology of a positivist paradigm as *realist* and the corresponding epistemology as *objectivist* (2004, p.19). On the other hand, the constructivist paradigm is characterised by a *relativist* ontology and a *subjectivist* epistemology according to the scholars (Gray and Malins, 2004, p.19). Although Gray and Malins draw on the same source, Guba's book 'The Paradigm Dialogue' from 1990, they deduct slightly different sets of categories. As opposed to Creswell, Gray and Malin differentiate between positivism and post-positivism, but omit pragmatism. The reason may lie in the fact that Gray and Malins' book is aimed at art and design researchers, whereas Creswell's target audience is wider. As pragmatism is the predominant paradigm used in this study, the etymological position and the ontological orientation need clarifying. Creswell's explanations do not provide any clarity in this respect because he conflates epistemology and ontology with paradigms. Like Gray and Malins, Guba does not expand on pragmatic worldviews. Nor does the article entitled as 'Competing Paradigms in Qualitative Research' which Guba authored in collaboration with Lincoln (1994). Perhaps the difficulty of aligning pragmatist principles with epistemologies and ontologies roots in the fact that the paradigm is not prescriptive in relation to methods of inquiry. Creswell claims that 'Pragmatism is not committed to any one system of philosophy and reality' (2014, p.11). Hence it can be difficult to pin down. Saunders et al.'s book 'Research Methods for Business Students' confirms this. Saunders et al. suggest that, 'if the research question does not suggest unambiguously that either a positivist or interpretivist philosophy is adopted this confirms the pragmatist's view that it is perfectly possible to work with both philosophies' (1997, p.12). Since this was an inductive study with multiple research questions which were funneled gradually in response to insights obtained, no epistemological position or ontological direction was predefined. Instead there was an interactive relationship between 'the knower' and the 'known' as proposed by Tashakkori and Teddlie (1998).

In line with Gray and Malins (2004, p.20), it could be argued in retrospect that the qualitative element of the study was that of a 'modified objectivist' approach (reality can be approximated) with respect to the epistemology, and 'critical realist' (exploring a 'reality [that] can never be fully apprehended')

in terms of the ontological direction. This would make it a post-positivist inquiry, which according to Gray and Malins suits the adoption of Grounded Theory methods. The quantitative part of the study, on the other hand, is of a positivist nature. According to Gray and Malins (2004, p.20), this connects with a realist ontology and an objectivist epistemology. This alignment is supported by the scholars' explanation that here 'questions […] and hypotheses are stated in advance in propositional form and subjected to empirical tests', which was the case in the questionnaire inquiry. However, with respect to the qualitative inquiries, no preconceived hypotheses were used.

Creswell makes it clear that philosophical worldviews are often not apparent in research (Creswell, 2014, p5f). They underpin the research approach, without necessarily dictating the methods of inquiry involved. This study started out from a pragmatist point of view as indicated in Figure 14. Through introspective inquiries (reflections on the experience as a designer-entrepreneur) and conversations with other designer-inventors, it searched for the prerequisites for a design-led start-up to succeed given the existing sets of circumstances and conditions, e.g. markets, competition, funding sources, economic climate, legislation. In line with pragmatist principles, it was both problem-led and, to use Creswell's terms, 'real-world practice oriented' (Creswell, 2014, p.6). The data collection was initially limited to qualitative data gathered in exchange with individual designer-inventors and firms, and aimed at examining the consequences of their actions. Following an in-depth investigation into available forms of IP in conjunction with the insight that the IP framework in the UK was undergoing changes through new legislations such as the introduction of criminal sanctions to the intentional infringement of registered design rights in the UK (2014), through a proposal of the introduction of a Unified Patent Court across 25 EU member states (2013), the UK Brexit referendum (2016), etc., a transformative element had to be added to the study, because it became apparent that not only the value of IP may change in the course of the life cycle of a firm or a product, the legal framework may also change, and the same may apply to the modus operandi of stakeholders (crowd-funding etc.). According to Creswell, the transformative paradigm, which to some extent connects with Gray and Malins' Critical Theory approach, is of a political nature, 'power and justice oriented', and 'change oriented' (Creswell, 2014, p.6). Therefore, rather than asking *what should a designer-entrepreneur do in light of existing circumstances?*, the question of *how the circumstances ought to be changed through changes in the legal framework*, also emerged. The first connects with the pragmatist paradigm, the second is of a transformative nature.

The occasional triangulation the views of different stakeholders added a constructivist element to the study, because here 'inquirers generate or inductively develop a theory or pattern of meaning' (Creswell, 2014, p.8). Different stakeholders such as the IP owner, the investor, the buyer or licensee, the end user or consumer, as well as the UK economy in general benefit from IP in different ways. Therefore the evaluative framework needed to incorporate not only a time-aspect, it had to also allow for different viewpoints depending on the relevant stakeholder.

To sum up the methodological approach, this study was first and foremost of a pragmatic nature, using predominantly a post-postitivist approach, but positivist, transformative and constructivist elements were occasionally added. In line with a pragmatic research paradigm, this study used a mixed-method approach combining both qualitative and quantitative data in pursuit of a 'more complete understanding' (Creswell, 2014, p.19) of the situation surrounding design-led start-ups.

The combination of qualitative data with quantitative data makes this study a mixed-method inquiry (Creswell, 2014, p.3, Charmaz, 2014, p.323). Adding a predominantly quantitative survey-based inquiry enhances the credibility of this study with respect to some findings, because this allowed for the objectivist verification of some of the hypotheses, including the robustness of registered design rights, which was explored not only through the feedback of a small selection of interview candidates, but also through surveying a representative number of UK design right stakeholders.

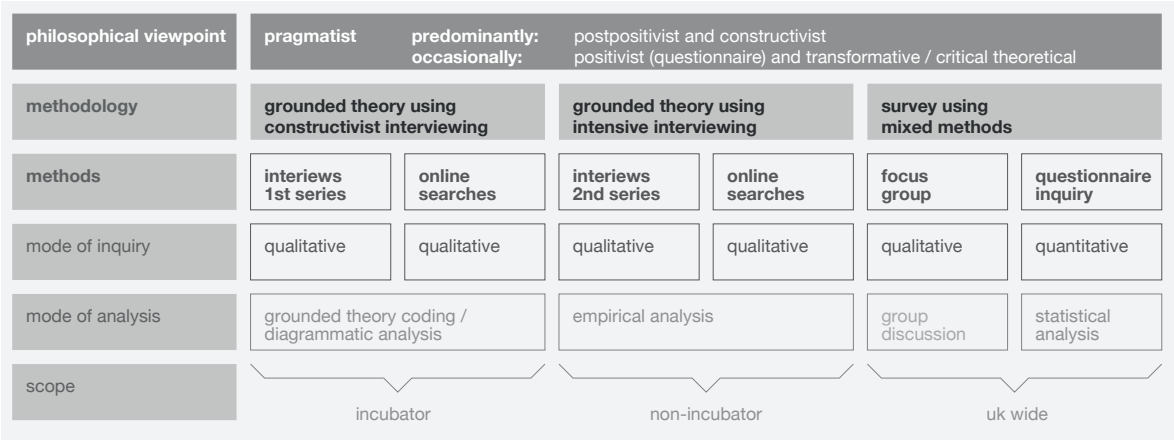

Figure 14: research methodology overview

Figure 14 provides a simplified overview on how methodologies, methods and analyses were combined to establish a balanced and credible perspective towards the research topic and the key question of how IP is best managed throughout the design business development process in light of other business development factors. Various other key questions and preliminary hypotheses that are outlined in section 4.4, emerged in the early part of the inquiry. In line with Grounded Theory principles, the reduction to one single question was avoided in the beginning to sustain an open mind and to allow for unexpected insights as they are common in the context of Grounded Theory inquiries (Strauss and Corbin, 1990, p.37). This study is predominantly of a qualitative nature.

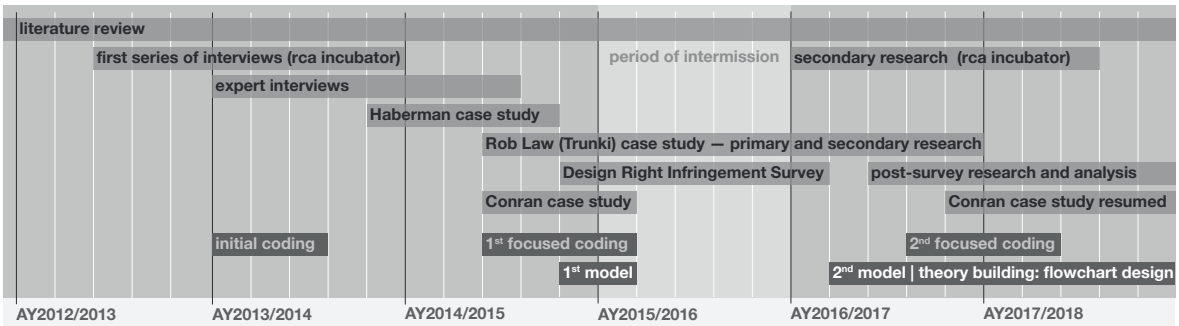

Figure 15: research activities map — the final year, AY2018/2019, which is not shown here, was dedicated to thesis completion, the write-up verification and the viva voce.

During the initial phase of the inquiry qualitative interviews were conducted in parallel to the literature review. The insights obtained through both the literature review and an initial set of interviews, helped further develop and prioritise research questions and to generate preliminary hypotheses. In a second phase the range of case studies were expanded to counteract possible selection bias and to add a range of longitudinal studies. Subsequently a quantitative inquiry was conducted to provide a more objective viewpoint towards the research aspects, including the legal framework within which designers and innovators operate, and to critically interrogate some of the evolving hypotheses. This is where positivist (questionnaire inquiry) and transformative / critical theory (focus group, post survey correspondences) angles were added to the study.

The chart shown in Figure 16 lists the means of inquiries, as well as where and how they were deployed over time to gather and analyse data. It shows when questions and insights emerged, and when preliminary hypotheses were formulated. Articulating insights at peer-reviewed conferences (appendix 10) helped to test the emerging knowledge in relation to its novelty value and also in relation to its significance in the context of design, IP and innovation.

The Design Management Institute (DMI) conference presentation in London in 2014 was followed by an email exchange with the keynote speaker, who had chaired the session at which the paper was presented. The email exchange related to the possibility of diseminating the presented insights through an article in the Design Issues Journal published by Case Western Reserve University. The keynote speaker, a co-editor of the journal, stated that "the paper could be very valuable, but it needs some reworking to reach our audience" (appendix 9, 06/09/2014-15/10/2014). It was perceived as too theory-led. This verdict later motivated the inclusion of the Trunki case study as well as the Conran case study to this thesis.

During a conversation at a gala dinner organised in conjunction with the IASDR conference in Brisbane in 2015, the keynote speaker, a future forecast strategist and professor at OCAD University in Toronto (formerly Ontario College of Art and Design), claimed that IP will retain its signifiance in relation to innovation management in the future (appendix 9, 05/11/2015). Having received a Best Paper Award at the end of the conference, also suggested that the study was on track with generating an original contribution to knowledge.

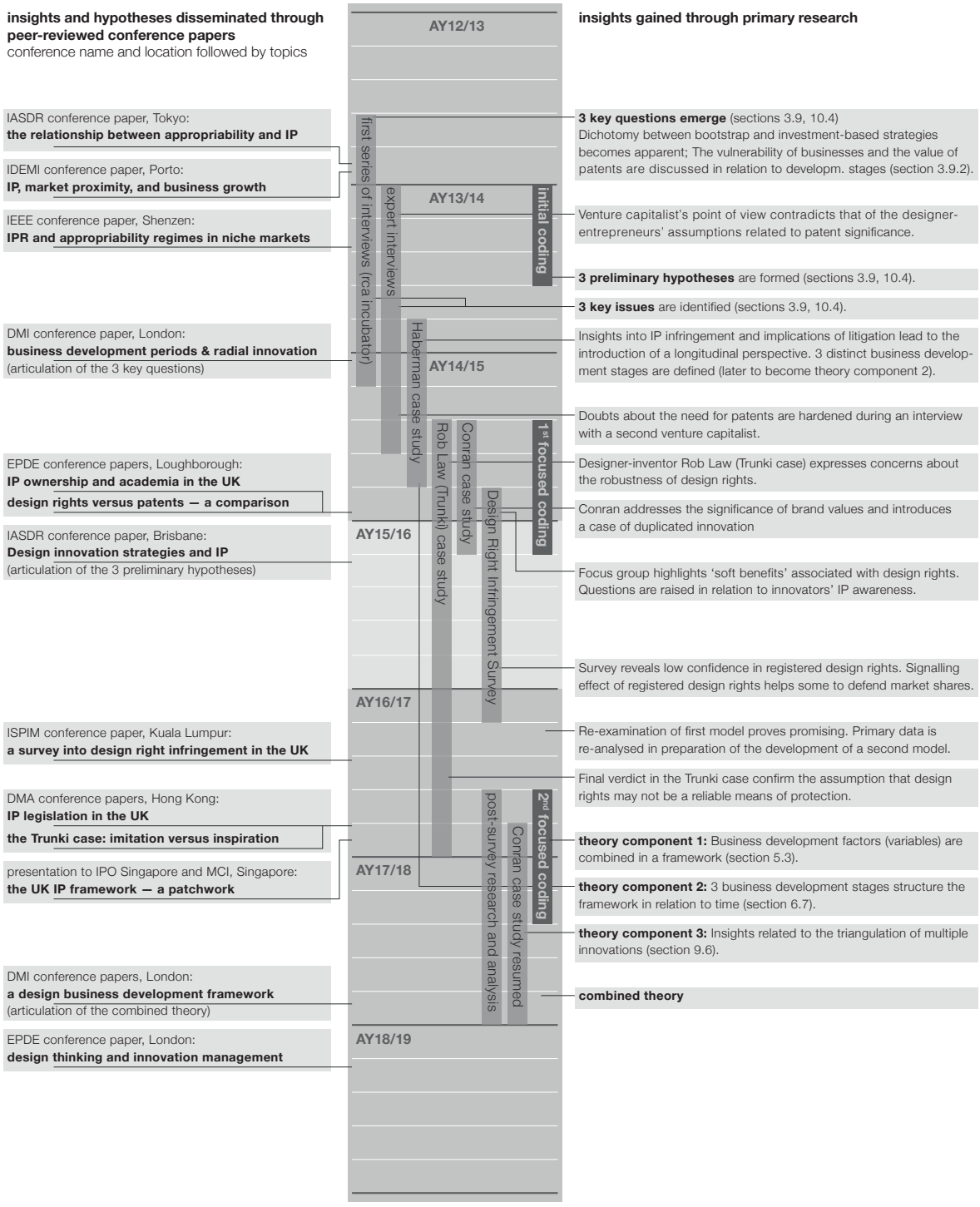

Figure 16: This chart, which draws on Figure 15, shows where and when insights were established, and which method of inquiry triggered new insights. The list on the left shows disemination of acquired knowledge through conference papers. Q&A following paper presentations, helped to direct the focus of attention and to critically review research priorities.

4.1. Case studies: Qualitative inquiry

In order to establish the conditions that facilitate the growth of a design-led start-up business, this study relies primarily on qualitative semi-structured interviews as well as informal conversations with designer-entrepreneurs and with industry experts such as business coaches, economists, venture capitalists, investors and legal experts. The positioning of the literature review in the beginning of this thesis should not deter from the fact that this is predominantly an inductive inquiry. Although there was a strong focus on IPR from the outset, the more specific questions raised during the early development of this study emerged from the feedback obtained through conversations and interviews with designer-entrepreneurs, who expressed their concerns about the required investment of time and funds in patents. At the same time the interviewees had a limited level of faith in the robustness and enforceability of their patents, leading to questions surrounding the benefits and problems in relation to patents, and whether or not there are alternative options for design-led start-ups to secure exclusivity in the market. The issues, which the interviewees raised, were assessed through literature reviews (chapter 3), following the first round of interviews. Existing models were critically reviewed and hypotheses developed. The choice of a qualitative bottom-up approach to collecting data was made very early on in response to preliminary readings of academic articles and government reports on the topic of IP. These sources revealed a lack in differentiation between design and engineering, which appears to have led to an over-emphasis on patents in the public discourse. The majority of existing studies also omit references to start-up businesses, which tend to be too small to be captured by top-down investigations. To examine the designer-entrepreneurs' views, industry experts were interviewed about the same topics, so that the responses could be compared.

4.1.1. Case selection

In the course of the first two years, nine design-led start-up businesses of slightly varying nature were examined in order to conduct comparative case studies and ensure a credible range of data sources. It has to be acknowledged that each of these ventures is closely linked to postgraduate studies conducted at the Royal College of Art (RCA), and that most of the designer-entrepreneurs involved have participated in a business incubation scheme, either as part of the Design London incubator, or the Innovation RCA incubation scheme. Nonetheless the experience gained varies significantly amongst the designer-entrepreneurs involved, with some making full use of mentoring and funding, whilst others took advantage of office space only. Concrete Canvas, the oldest venture under examination, preceded both incubation schemes. Here the founders made use of advice and access to premises only. Other variations were due to the stages at which the incubator scheme was at different times. In the beginning, when it was named Design London, applicants could apply as individuals; however, later they needed to apply as interdisciplinary teams. The management underwent staffing changes over the years. Design London was set up in 2007 and became InnovationRCA in 2011. It then moved from Imperial College to the Battersea site of the Royal College of Art. Despite the diversity of design business cases, there has been a growing suspicion that the entrepreneurs' choices of IP may be affected by the way in which the incubator is managed, and by the guidance provided. Even sponsorship may have influenced the priorities at times. Design London was funded by the National Endowment for Science, Technologies and the Arts (NESTA), and InnovationRCA receives sponsorship

from Dyson. To verify the degree to which design-led businesses have been influenced through the incubation process, three case studies that did not go through an incubation scheme were added: Haberman Associates; Magmatic; and Conran Associates. These three are mature businesses, the study of which allowed for longitudinal insights (figure 17) into the modus operandi of a design-led start-up business.

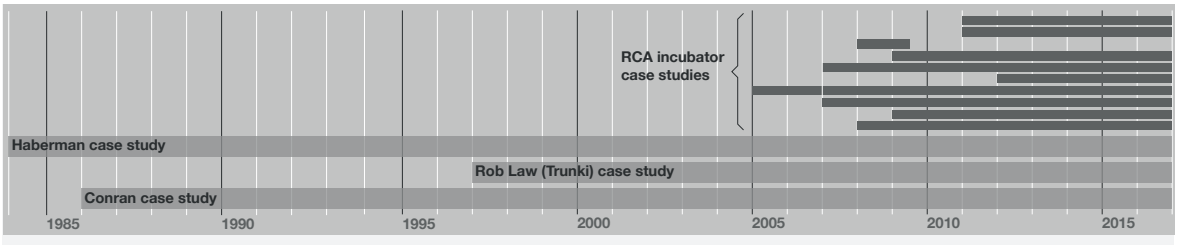

Figure 17: Timeline of case studies showing the life spans of businesses

Two of the longitudinal case studies investigate serial inventors, Haberman and Conran. The latter developed enterprising initiatives gradually over the years from within a consultancy business (transitional start-up). Haberman and Rob Law focused exclusively on their inventions. The RCA incubators (dark-coloured bars in figure 17) are shown in greater detail in figure 23 (section 5.1).

4.1.2. Data collection

Semi-structured interviews, held in person over the period of 30-90 minutes, constitute the main source of data. In line with Strauss and Corbin (1990, p.37f), who pioneered Grounded Theory research, initial questions were broad and open, and subsequently became progressively focused. Emphasis was placed on the phenomenon of design-led start-up successes and failures, with a view on how IP was managed. Notes were taken, interviews were recorded and transcribed upon completion of each interview. Note taking during the interviews was scaled back after the first two to three trials, because it reduced the attention given to the interviewees and their responses. Instead interview recordings in combination with transcriptions were used as data sources. Bar one exception towards the end of the study, I have transcribed all interviews myself in order to increase my theoretical sensitivity (Strauss and Corbin, 1990, p.41f). The latter also benefitted from conducting part of the literature in parallel to the case studies. As much as possible, interviews were conducted through physical meetings, so that body language and facial expression could be taken into account, and a research relationship could be established (Charmaz, 2014, p.91). Where geographical distance and time pressures did not allow for physical meetings, conversations were conducted via phone or Skype. Speaking to interviewees in person was important to be able to react to their answers to open questions, and deepen the conversations. Although the initial conversations were largely led by the interviewees to allow them to 'encourage unanticipated statements and stories', a list of 'open-ended non-judgmental questions' (Charmaz, 2014, p.65) was prepared a priori and used to verify that a consistent set of data was collected. Charmaz refers to this as an interview guide (2014, p.62ff). The interview guides used for longitudinal studies differed, and consisted of a small number

of bullet points instead of a list of questions. In addition to the interviews, informal conversations over the phone, through email or during informal meetings were used to were used to complement the interview data. Newsletters, website data, online articles, blogs and online videos were carefully analysed to critically distinguish between objective facts and subjective views, and also to complement the data obtained through interviews. Some candidates were interviewed two or three times, which provided an opportunity to discuss insights and hypotheses, but also to critically verify data obtained through secondary sources such as news feeds and articles.

There are three kinds of interviews:
- Interviews with RCA graduates who developed a start-up following their studies
- Expert interviews with business coaches, incubator managers, lawyers, and investors
- Interviews with designer-entrepreneurs who did not go through an incubation scheme

The third round of interviews conducted in conjunction with longitudinal case studies helped to extend the scope of the inquiry beyond the Design London / InnovationRCA incubator, so that the incubator settings can be taken into account as a possibly influencing factor in the development of start-ups. How the different stages of data collection connected in terms of time frames, can be seen in Figure 15. As indicated in figure 14, the approach used for interviewing RCA graduates was of a constructivist nature. They initiated 'interactions and triggered exploration, emergent understandings, legitimation of identity, and validation of experience' (Charmaz, 2014, p.91). On the other hand, the longitudinal studies were pursued with what Charmaz terms 'intensive interviewing'. These interviewees were 'open-ended yet directed, shaped yet emergent, and paced yet unrestricted' (Charmaz, 2014, p.85). This set of interviews served the 'in-depth exploration' of topics in which the interviewees were exceptionally knowledgeable, which helped to increase 'the analytical incisiveness of the resultant analysis' (Charmaz, 2014, p.86). 'The flexibility of intensive interviewing' (Charmaz, 2014, p.85) also allowed for unexpected insights which contributed to the theory development.

4.1.3. Data analysis

This study relied on a combination of empirical analysis and Grounded Theory methods, which Karin Locke, a management research theorist, advocates as an appropriate means for the comparative analysis of case studies (Locke, 2001, p.19) because it benefits the examination of phenomena in situations that are subject to change (Locke, 2001, p.41). Grounded Theory methods were used to identify and map out the main problems, which designer-inventors encounter at the outset of their ventures, through a process of data analysis using open coding, axial coding, and selective coding according to Strauss and Corbin (1990, p.58).

The open coding process was marked by the comparative analysis of the data sets related to the RCA incubator case studies. These interview transcripts were analysed line-by-line in search of significant concepts taking into consideration the sentences within which the concepts were embedded (Strauss and Corbin, 1990, p.73). An initial set of labels was assigned to the concepts, and properties and dimensions were assigned where appropriate in pursuit of relationships between the concepts. Through a process of gradual revision and examination of the relationships between individual

concepts, meta variables were identified as categories, to which the remaining concepts (sub variables) were allocated. This axial coding process (Strauss and Corbin, 1990, p.96ff), which overlapped with the open coding process[16] comprised a number of steps amounting to a set of categories which accommodated all sub variables. Indicative priorities could be established based on the frequency with which concepts came to be mentioned. Strauss and Corbin describe selective coding as 'the process of selecting a core category and systematically relating it to other categories' (Strauss and Corbin, p.116). The validation of relationships and the pattern observation that is associated with selective coding (Strauss and Corbin, p.129ff) was pursued in this study through the development and analysis of a series of diagrams, out of which the business development framework gradually emerged. The step-by-step process as prescribed by Strauss and Corbin proved non-restrictive and it allowed for a rigorous, logical process that left sufficient room for the data interpretation that was required for the development of a consistent and logical framework of references. The empirical analysis of longitudinal case studies (figure 17) helped the identification of core categories, which this thesis refers to as meta variables, and their interdependencies.

In line with Charmaz (2014, p.18) an initial coding preceded the focused coding (figure 15). The focused coding was conducted twice, prior to the final stage of selective coding. The first process of focused coding was perceived to be insufficiently rigorous. Here the concept identification was not consistent enough, because there was not enough understanding of the phenomena involved, and it was conducted across a few case studies only. To ensure category saturation (Charmaz, 2014, p.18), the original interview transcripts were re-examined before establishing the final set of categories, based on which the business development flowchart was developed. During the selective coding process the term *label* was replaced by *variable*. Creswell's differentiation between independent variables, intervening variables and dependent variables (Creswell, 2014, p.56) allowed for better clarity with respect to the way in which the concepts related to each other by comparison to Strauss and Corbin's differentiation between concepts and intervening conditions.

As this PhD study was aimed at the development of a theory that is grounded in data, the study used principles of constructivist and interpretative Grounded Theory as discussed by Charmaz (2014) and Locke (2009). This allowed for 'shared history, experience and communication' (Locke, 2001, p.9) to generate an understanding for a 'reality' that emerges from shared perceptions. As the qualitative part of the inquiry was not a collaborative initiative, interview transcripts and analyses were done by the same person as was the data collection. In relation to Grounded Theory methods, it is recognised that a degree of subjectivity is inevitable, because 'researcher agency in formulating judgments cannot be eliminated' (Locke, 2001, p.9). The triangulation of methods, i.e. combining interviews with the empirical analysis of secondary research findings, was used to mitigate this degree of subjectivity which can lead to bias. There was a risk that the direct contact with interviewees could have contributed to their knowledge on IP and relevant development strategy, and that this knowledge increase could affect the interviewees' decision making. In line with action research principles, the likelihood

[16] According to Strauss and Corbin (1990, p.58) 'The different types [of coding] do not necessarily take place in stages. In a single coding session, you might quickly and without self-consciousness move between one form of coding and another, especially between open and axial coding.'

of influencing the businesses under observation in such a manner, was limited through open and unbiased questioning (Borgatti, 1998), and through refraining from using and sharing insights and opinions. Non-disclosure agreements were not signed in order to avoid limitations in disseminating the results of this study. Information that was considered as sensitive, or the publication of which could be disadvantageous to the businesses' prospects, was be kept confidential in order to avoid harm to the businesses, which would not only be potentially unethical, but would have also impaired the credibility of the findings. In pursuit of a theory, this study generated business strategy development model which was assessed empirically and in light of the data gathered.

4.1.4. Problems and means of mitigation

The first problem to be addressed in this inquiry was secrecy. The thesis focused mainly on IPR and alternative IP protection mechanisms and on how these can be aligned most effectively with business development and route-to-market strategies. Secrecy is known as one of the options available, and also constitutes a necessary requirement for anticipated patent filings. Designer-entrepreneurs can be protective of their knowledge, and some details remained undisclosed, potentially without the researcher's knowledge. To complement the interview data, online surveys were conducted to establish what formal IP such as patents, registered designs and trade marks, individual businesses had registered. There is always a certain delay in the publication of such information through the IPO, and these delays can amount to one or two years in the case of patents.

To mitigate against the issue of secrecy, online searches and interviews were conducted in an iterative fashion to minimise the possible omission of relevant information. Secrecy can impair the acquisition of sensitive data, such as sales figures, investments and shareholdings. Some entrepreneurs were more forthcoming than others, and some case studies were excluded from this inquiry since not enough information could be established due to an overly protective attitude of interviewees. However, the entirety of data collected in the course of the study provided a credible amount of data density, sufficient for establishing a sound basis for the pursuit of the research question.

The second problem was potential bias. The business coaches who were interviewed were familiar with some of the ventures under observation. Their perceptions differed at times from those of the designer-entrepreneurs. Personal preferences and bias can skew the data in some areas. Gathering views from different angles helped mitigate the risk and contradictory data was treated with caution. Where there was persistent doubt about the accuracy of certain information, this information was ignored in the analysis. On some occasions designer-entrepreneurs were able to comment on other ventures, which provided useful information in addition to the interview data. The main supervisor knew many of the interviewees and most of the ventures. Although this facilitates the access to interviewees, who were encouraged to provide detailed information, the advice received from the main supervisor could have limited the investigator's objectivity, and led to bias.

To mitigate against potential bias, a range of expert consultants in the field of design and innovation were spoken to, in particular about topics where there was suspicion of prejudice, such as IP ownership and validity, as well as finances and fundraising initiatives.

The third problem related to data density. In particular designer-entrepreneurs whose ventures had reached an advanced level, were often too busy to commit to iterative meetings. This has limited the amount of data that could be obtained, and affected in particular data needed in relation to future-oriented questions.

To ensure that sufficient data could be collected, the study was conducted over a seven-year period. This helped to fill knowledge gaps and allow monitoring the longer-term progress made by designer-entrepreneurs. Email inquiries have been conducted in addition to interviews to resolve individual questions. The limitation in the amount of information that could be obtained in relation to individual ventures was compensated through the range of case studies. Conducting this part of the study as a lateral comparative inquiry allowed to produce multiple complementary sets of data.

The fourth problem related to comparability. The businesses under observations varied in terms of the nature of the innovation, the start-up teams, the business maturity, and also in relation to the market environments which the inventions were aimed at. The answers to the research questions varied depending on these contextual factors.

Where comparisons were drawn between start-ups, the variations in the market environments and maturity of businesses were taken into account. The fact that there were slight variations in terms of the business development stages helped to extend the scope of the study. The differences between ventures in terms of market proposition and target market environment helped to test emerging hypotheses and theories against a variety of scenarios. For example, some businesses were working in a business-to-business setting, whereas others were consumer oriented, or pursued a mixed route-to-market strategy by combining business-to-business and business-to-consumer approaches.

4.2. Design rights — quantitative inquiry

The currency of this study is underlined by the fact that the UK government was in the process of making amendments to the IP law, aimed at strengthening IPR in the UK. Changes to the system surrounding registered designs were particularly noticeable. The introduction of a Unified Patent Court is hoped to facilitate the application for European patents, and to reduce translation costs. This thesis is a response to these on-going changes, and addresses their future implications. During the third year of the study, the UK IPO issued a tender for a survey into Design Right Infringement. I assembled a small research team, and successfully applied for the research commission. I pursued the Design Right Infringement study as Principal Investigator for the first 15 months (May 2015 – August 2016), during which the research methodology was developed, and the investigation into the infringement of registered design rights took place. Thereafter the focus of the project was shifted towards the infringement of unregistered design rights which are not examined within this thesis. In this thesis only findings in relation to registered design rights were taken into account. As research project leader, I acknowledge the contribution of Dr. Robert Pitkethly, Silvia Baumgart, Professor Ruth Soetendorp, and Nick Coutts. I led the project through throughout the initial phase which comprised an initial focus group meeting, the questionnaire design, the pilot study and the collection of data related to the

infringement of registered design rights. I conducted the data analysis of responses to the infringement of registered design rights independently and published the results in the form of peer-reviewed conference papers (appendix 10) which are referenced within this thesis.

4.2.1. Focus group meeting

A focus group meeting was held in July 2015 in preparation of the survey design. The meeting was conducted under the Chatham House rule, so the identity of the delegates were not revealed and citations not attributed. Four members of the research team were present, as well as one representative from the IPO and five delegates. The latter included one SME designer, two legal representatives from other design firms, and two representatives of different design stakeholder groups.

The delegates perceived costs as the biggest issue, in particular in relation to international design right protection. On the other hand, low registration costs were highlighted as an incentive for designers to commit to registering designs. It was felt that design rights first and foremost applied to product designs and retail industries. Survey responses later received, supported this point of view. One delegate stated that the over the last decade (2005-2015) the life span of design products has shrunk from 15 years to approximately four years, so limiting the value of designs and the way in which value is appropriated. The maximum timeframe between ideas inception and market entry for product design was estimated as 18 months. The focus group session revealed that the questionnaire needed to include a verification of the respondents' awareness for the particular characteristics of the various forms of design right protection. It also highlighted that in IP research so-called soft values such as attribution are not given sufficient attention.

4.2.2. Questionnaire design

The survey method was inspired by the Weatherall and Webster's study into Patent Infringement in Australia from 2009. Many questions were formulated similarly to Weatherall and Webster's questionnaire. However, due to a greater range of objectives, such as investigation of awareness for design rights, differentiation between UK and EU registered design rights, the Design Right Infringement survey needed to be adapted. It was designed to work as both a postal and online survey. The questionnaire (appendix 3) was constructed to capture the responses of alleged infringers (defendants) as well as the responses of those who saw their rights infringed (claimants). It comprised of 46 questions. The aim was to limit the number of questions as much as possible whilst allowing for all questions raised in the tender to be answered. The reason for keeping the number of questions within limits, was partially to entice recipients of the questionnaire to commit to the survey, to mitigate the risk of survey fatigue, and to keep printing and postage costs within limits. As the research team did not have access to email contacts, printed questionnaires had to be sent through the post instead of digital ones that could have been emailed. Digital filing of design registrations was introduced both in the UK and in the EU in 2015. However, since the survey was designed to reach out to all UK-based owners of valid registered design rights, it was targeted at recipients who had registered or renewed

rights from 2010 onwards, and neither the UK IPO nor the Office for Harmonization of the Internal Markets (OHIM, now EU IPO) held a sufficient archive of email contacts. An online questionnaire was designed and a url was included to the printed questionnaire to encourage respondents to complete the questionnaire online. Whilst this would have helped to keep transcription costs down, most respondents chose to use the printed questionnaire.

The target audience were owners of active registered design rights, which were registered or renewed no more than five years ago. To source the necessary contacts, contact lists provided by both the Office for Harmonization of the Internal Markets (OHIM — now: EU IPO) and the UK IPO were analysed. Duplicate entries were removed, as were those with invalid or incomplete postal addresses and those with postal addresses outside the UK. Owners of multiple design rights, and those entries who were listed multiple times with different addresses or under slightly differing names were reduced to one entry. As a result, 12,522 unique design right holders were identified as respondents.

4.2.3. Data collection

Response rates were calculated in using the survey sample size calculator created by Fred Van Bennekom. During a pilot, 300 letters were sent out. In the first instance nine responses were received during the pilot study which represents a response rate of 3%. Following a reminder letter that was sent to the pilot target audience in combination with another copy of the questionnaire and a free post return envelope, the response rate was increased to 5% (15 responses in total). The responses were included to the main survey since only minor adjustments needed to be done to the questionnaire following the pilot.

In combination with the 15 responses received during the pilot, the main survey into registered design rights, triggered 706 responses, of which there were 680 full responses, and 26 partial responses. This equates to a response rate of 5.64%. However, it later emerged that a sizeable proportion of these response were invalid, since the data analysis revealed that around 22% of the respondents (176) owned neither a UK registered design right nor a EU registered design right. The analysis used for the purpose of this study is based on a set of data that is exclusive of the responses of those who did not own a valid registered design right at the time of the survey. So the total was 530 responses.

The majority of responses were submitted on paper. These responses were transcribed into an online database by a project administrator from the University of Hertfordshire. I developed transcription protocol to mitigate the risk of erroneous data entries. One of the qualitative comments received suggested that the respondent had completed both the printed questionnaire and the online questionnaire. The entry within which the comment was found was disqualified in this study to avoid the duplication of entries and thus the distortion of results. So the total number of responses used in conjunction with this thesis was 529 responses (706-176-1). This equates to a response rate of 4.22%.

4.2.4. Data analysis

The data analysis was done using an Excel spreadsheet and formulas which calculated the number of responses to specific questions. The numbers were subsequently converted into tables and charts. In some cases, the responses were dissected into defendants' and claimants' responses. During the data analysis, response rates were taken into account to verify the credibility of results. Data in relation to questions that received a low number of responses, were treated as not statistically representative. In conjunction with the design right infringement study, the use of SPSS data analysis software was trialed in order to analyse cross-tabulated data which would have allowed for more detailed analysis such as industry sector specific results. However, this analysis proved to be flawed, since the data set was contaminated with invalid responses. Therefore, only manual filtering allowed for a credible set of data to be established.

4.2.5. Problems and means of mitigation

The first problem experienced in conjunction with the quantitative inquiry related to terminology — In an IPO-commissioned study that preceded the Design Right Infringement survey 2016, Collopy et al. highlight the need for 'clearly defined terminologies' (Collopy et al, 2014, p.11). Whilst no reliable ontology existed for IP in the UK, the questions needed to be formulated with precision to ensure that respondents were be clear about what was asked. As clarity about infringement cases can only established through court judgment, terms such as *copying* could be interpreted in multiple ways.

In response to this challenge, vocabularies used in the questionnaire were carefully selected and explained. In some instances, definitions were added to make sure that all respondents would understand what is meant. For example, radical innovation was related to *designs which have a disruptive impact* (appendix 3). Discussions within the research team helped to choose the most appropriate terms. Instead of referring to *profit* or *sales*, *revenues* were used as a reference point to assess financial losses due to design right infringement.

The second problem related to sample sizes. Previous studies raise questions about the percentage of companies whose IPR has been infringed revert to the courts, because 'companies have relatively little confidence in design rights either as a defense against copying, or as a means of turning designs into an economic asset' (Big Innovation Centre, 2012, p.80). Business scholar William Kingston found that with respect to patent infringement only one in five SME patent holders in the EU actually used the courts to defend their IPR (Kingston, 2000, p.9), with fear of the cost of litigation presenting the greatest inhibiting factor. Weatherall and Webster found that the most prominent reason for patent owners to not file in court was that the 'Potential gains didn't justify the costs' (Weatherall, Webster, 2010, table 13, p.24).

To mitigate against the possibility of questionnaire recipients refraining from responding to the inquiry due to possible assumptions that it may be concerning court-litigation cases only, the questionnaire referred to *perceived infringement* and *alleged infringement* instead of *infringement* per se. A dispute

was defined as *any kind of awareness of, or correspondence (pre-court, in court or out-of-court) related to the actual or potential infringement of IP*.

The third challenge was to survey those respondents who had experienced more than one case of design right infringement. For example, the costs incurred in relation with design right infringement such as legal costs, losses in revenue, needed to connect with particular incidences of design right infringement in order for the research team to be able to draw reliable conclusions.

To provide guidance to those respondents who had experienced more than one case of infringement, the questionnaire asked respondents to answer one set of questions with respect to *one particular dispute and preferably the dispute which best represents those you have been involved with* if they *had been involved in more than one (1) dispute surrounding design right infringement*.

The fourth problem related to the need to filter responses. As indicated above manual filtering was required to eliminate invalid responses, such as responses from those who did not own a registered design right[17]. Both EU registered design rights and UK registered design rights were taken into calculation here. As both were listed in separate Excel columns, manual as opposed to automatic filtering was required.

To ensure that the data was not contaminated with invalid responses, all duplicate entries and responses from those who did not own any registered design rights were eliminated.

4.3. Methodology: Summary statement

This study was guided through pragmatic principles and used a combination of exploratory and explanatory sequential mixed methods approaches (Creswell, 2014, p.15f): Figure 15 shows that the qualitative research phase related to the incubator case studies precedes the quantitative phase (exploratory), whereas the Conran case study followed the quantitative inquiry (explanatory). The qualitative inquiry related to the incubator case studies served 'the identification of factors' (Creswell, 2014, p.20), some of which could be investigated in greater depth during the quantitative phase. The latter was followed by the Conran case study which helped to further explain some of the quantitative findings (Creswell, 2014, p. 20). The qualitative Grounded Theory inquiries were important to identify the variables which were initially unknown (Creswell, 2014, p.16). The views of designer-entrepreneurs

[17] The reason why some of the respondents did not own any registered design rights, despite the fact that the list of contacts for the mail shots were drawn from registers held by UK IPO and OHIM, relates to an online call for responses to the online survey, which was issued by The Chartered Institute of Trade Mark Attorneys on 5 May 2016 (CITMA, 2016). This call did not distinguish between registered and unregistered design rights, and was made whilst the postal survey aimed exclusively at the owners of registered design rights was underway. Owners of unregistered design rights were thus encouraged to contribute to the survey in an untimely manner. How the CITMA learned about the survey and who authorised the advert is not known.

helped to identify key research questions and provided a direction for the literature review. The paucity of studies in the area of design-led start-ups and in the field of design rights required an initial qualitative exploration of the subject area. Hypotheses needed to be generated through constructivist Grounded Theory methods (Charmaz, 2014, p.13f), before they could be verified through qualitative longitudinal studies, and quantitative survey inquiries. As the study of the landmark case surrounding the perceived infringement of design rights related to Trunki (Rob Law) was conducted in parallel to the quantitative survey (design right infringement questionnaire) in 2015 and 2016, and both related to UK design right legislation and recent changes thereof, this part of the study constitutes an example of transformative mixed methods research. Here 'a theoretical lens drawn from social justice' (Creswell, 2014, p. 20) provided an overarching perspective, and the qualitative and the quantitative inquiry informed each other. The quantitative inquiry provided an objectivist angle due to the bigger sample size involved and the use of closed questions. This allowed for the verification of multiple hypotheses, in particular those related to the robustness of design IP. It also helped generate a methodology that would lend itself to the periodic verification of trends and changes in the area of IP utilisation. The quantitative inquiry, which was commissioned and guided by the UK IPO, falls short of potential because it treats IPR as an isolated phenomenon. As opposed to the qualitative case studies in this thesis, the survey does not connect the utilisation of IP to other factors that are essential to the success of a design-led businesses, such as the business model or possible route to market strategies.
This is why this thesis added the Conran case study which helped contextualise the findings in pursuit of a theoretical framework, the business development flowchart, which can be used for strategic decision-making.

From a philosophical perspective, this study started out as a constructivist Grounded Theory study that examined the significance of IP in relation to other business development factors or attributes (figure 15). Here IP-advocacy was discussed in dialectical juxtaposition to IP critical views, and in relation to finance-related matters. The longitudinal case studies (figure 16) used a post-positivist approach, which acknowledges the impossibility of an objective truth (Gray and Malins, 2004, p.20). Instead truth can only be observed indirectly and incompletely through the triangulation of multiple viewpoints. The insights gained through longitudinal studies and expert interviews led to the design of a business development framework suited for designer-entrepreneurs who seek to develop and harness independent start-ups. The design right infringement survey was predominantly of a positivist nature. Here questions and hypotheses were developed in propositional form a priori (Gray and Malins, 2004, p.20), and in search of an objectivist *truth*. 12,522 owners of UK registered design rights receive the same questionnaire with mostly closed questions, which were supplemented by a few open comment boxes (appendix 3). The focus group inquiry which preceded the survey, as well as the conversations with experts which followed, were of a transformative kind, where elements of critical theory were used to establish clarity about issues surrounding design right legislation.

4.4. Framing the study: Towards a hypothesis

Teece's concept of appropriability, complementary assets, as well as his notion of a dominant design paradigm (sections 3.1-3.2) help to describe some, but not all of the challenges which designer-entrepreneurs typically face at the outset. Teece's framework does not recognise the designer-entrepreneur's potential need for seed-funding for example, and by his own admission it does not acknowledge the option of targeting niche markets (Teece, 1986, p.288). Yet, many inventions are aimed at niche markets or emerging markets. The potential value related to product-languages is mentioned, but not explored in relation to appropriability regimes and dominant designs. Investigating the degree to which product languages that are secured through registered design rights can strengthen the appropriability regime surrounding a start-up, is of significance because design rights can be secured faster and more cheaply than patents.

Clarysse and Kiefer's distinction between technology-push and demand-pull (section 3.5) is too simple to foster a sufficient understanding of the forces which accompany the early-stage development of a design-led start-up because development incentives are much more complex and subject to dynamic changes. Need-pull and market demand may be closely connected, but they are not identical, because the former can be converted into the latter over time, if need is initially unrecognized by an audience who may learn to appreciate the benefits of an inventive step over time. A differentiation between technology-push and design-push allows for a more refined understanding of how need-pull can be converted to market demand, because it helps to analyse the motivating factors behind market adoption to a greater degree.

The fundamental question to be resolved in conjunction with this thesis is how IP is best managed throughout the design business development process in relation to other business development factors? This raises the following key questions about IP:

1. How effective are patents and registered design rights with respect to the success prospects of a start-up business, be it design-driven or technology-led?
This question highlights the need to verify how design IP is used with respect to its potential to signal innovative capacity and competitiveness to potential imitators, collaborators and investors. Does it help start-ups to gain access to complementary assets, where the integration of assets is prohibitively expensive?

2. What other key development factors determine the commercial success prospects of a design-led start-up business?
Answering this question will shed light into how finance strategies correspond to IP strategies, and how the chosen route-to-market impact the designer-entrepreneur's approach to IP management and financing.

3. In what way do IP protection methods and other key business development factors depend on each other over time?
Through answering this question, the thesis will generate awareness for the interdependencies between business development attributes.

The enhanced contextualised knowledge of IP options will allow designer-entrepreneurs to strategise start-up business developments more effectively and more cost-efficiently over a period of time. To verify the literature findings and to analyse problems and challenges in relation to IP that are specific to design-led start-ups, this thesis will conduct a series of qualitative case studies. Based on these case studies, this investigation will develop a model for mapping out development factors over time.

4.4.1. Premise

Design-driven innovation differs from technology-led in that it introduces novel product languages, which lead to a shift in *meaning* that may support the communication and commercialisation of technological innovation (section 3.4). Such new product languages may also be introduced where there is no or little technological innovation (figure 10), in which case they are seen as selling points in their own right. In distinguishing between design-driven innovation as a term that relates to the commodity to be developed, and the term design-led start-up as the business that develops, owns and trades a commodity, a design-led start-up is understood here as a start-up company, whereby at least 50% of the team-members are core designers. This definition is based on the understanding of design-intensive industries as discussed in section 2.2 because these firms are best equipped to develop and appropriate novel product languages. A dominant design paradigm relates to an innovation that dominates a particular market. In the field of technology innovation this is often achieved through the convergence of various innovations. However, in niche markets, dominant design paradigms can be established on an independent basis because of the absence of scale and learning economies mentioned in section 2.2.

Focusing on niche markets provides an opportunity for start-ups that has been neglected in the existing innovation management literature, as has the potential value of product languages.
In relation to the more general question raised above, this study will address how much value a novel product language can add to a design-led startup, and whether or not registered design rights protect such to the same degree as utility patents protect technological inventions. In line with the three key questions listed in 4.4, this thesis argues that product languages and registered design rights may be undervalued, and the preliminary hypothesis is that registered design rights may help to delay patenting and consequently speed up the route-to-market.

4.4.2. Dissociation from existing concepts

As pointed out in chapter 1, the focus of this study rests on the early stage of the design business development period, referred to as fledgling period in this thesis. The significance of this group of industry stakeholders is increasing because the average life span of companies is dropping. In reference to S&P 500 data, the authors of a report published by Innosight, a strategy and innovation consultancy, highlight that the average life span has dropped from 33 years in 1964 to 24 years in 2016, and they forecast that it will be further reduced to about 12 years in 2027 (Anthony et al., 2018, p.2). As reasons the authors cite accelerated business growth, as well as mergers and acquisitions. They also refer to ‘the “unicorn” phenomenon of highly valued disruptive startups’ (Anthony et al., 2018, p.3)

which suggests that start-ups play an increasingly important role in the context of innovation and economic growth, despite the fact that this design business development stage is commonly neglected in the literature[15]. The applicability of existing frameworks developed for established businesses is limited in the context of innovation, which is frequently disrupted through radical innovations developed by new and small firms (Abernathy and Utterback, 1978, p.5). Adding a new framework of references will benefit designer-entrepreneurs as well as scholars in the field of IP and innovation management. It is important to re-iterate that this thesis focuses on the company development rather than the product life cycle. With start-ups, who have few, often no more than one product invention in the pipeline, the company development is closely intertwined with, and dependent on the product development. However, according to Teece's appropriability matrix (section 3.1), the success of a product does not always coincide with the success of the innovating firm. This is why it is important to be able to distinguish between product (commodity) and business (start-up). Discussing how product innovation is linked to the success prospects of small firms adds to the contribution of knowledge generated through this study.

It is also important to dissociate the business development process from the three stages defined by Abernathy and Utterback in relation to the product lifecycle (PLC) (Salter and Alexy, 2014, p.38). The PLC corresponds to the development of the commodity, which may not always concur with the development cycles of the business that aspires to take the commodity to market. Even though the latter may be closely linked to the former, Salter and Alexy's discussion of the PLC, as well as Teece's, do not distinguish between established businesses and start-ups. As opposed to established businesses, for start-ups developing multiple applications of an invention simultaneously may prove difficult to afford. Here focusing on one application may be necessary for economic reasons, unless the preferred application proves nonviable, in which case designer-inventors may find themselves forced to shift their focus towards alternative concepts or applications. To articulate the differences between the design product development and the design business development, this thesis uses the term *period* in relation to businesses developments instead of the word *stage*. It differentiates between the fledgling period, the transition period and the established period of a business.

Murta et al. (2004) describe the pre-paradigmatic phase in reference to Abernathy, Utterback, Dosi and Teece as a competitive phase during which companies rely on 'standardized manufacturing equipment, in order to retain flexibility to adopt an alternative, should their offering fail to establish itself as the dominant design.' (Murta et al., 2004, p.8) During the paradigmatic phase, which follows once a dominant design is established, the degree of environment uncertainty is reduced so that investment in product-specific manufacturing equipment becomes viable. Competition shifts to price, scale and production processes (Teece, 1986, p.288). In line with the three business development periods outlined above one can argue that a start-up is no longer a start-up by the time its first product enters the paradigmatic phase. Instead it will be transforming into an established business. This thesis refers to the time span during which a business establishes a dominant design or a dominant product language in the market as the transition period (figure 18).

[15] When explaining his theories, Teece, for example, refers to Electrical Musical Industries (EMI), RC Cola, Bowman, Hewlett Packard, Xerox, Apple, de Havilland (Teece, 1986, p. 286) who were all established companies with existing income streams.

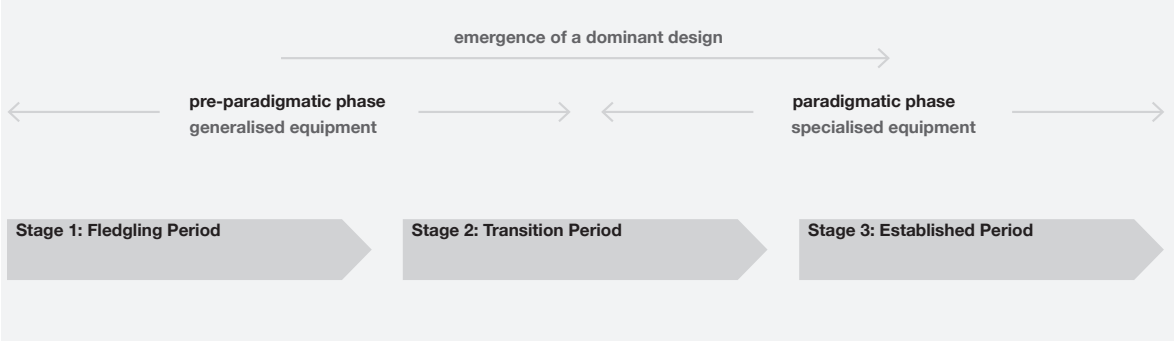

Figure 18: typical business development periods

When aligning the PLC with the pre-paradigmatic phase and the paradigmatic phase, the fluid stage sits within the former, and the specific stage within the latter, provided the emergence of a dominant design. A start-up in pursuit of a radical innovation will inevitably be confronted with a pre-paradigmatic situation at the outset, because the development of a paradigm requires market adoption which follows a period of 'ferment' during which 'alternative designs are largely crowded out of the product class' (Tushman and Anderson, 1986, p.441).

Although the focus of this study rests on the fledgling period, the ambition of filing for patents and of registering designs has long-term implications, which need to be taken into account when comparing the strengths and weaknesses of diverse IP strategies. Furthermore the transition between pre-paradigmatic and paradigmatic phase is likely to be gradual rather than sudden. This is why this study treats the transition as a period rather than a point in time. When aligning the three start-up business development periods with Teece's framework, this thesis assumes the fledgling period to be pre-paradigmatic, and the established period is of a paradigmatic nature. This study will examine the fledgling period, and verify how the transition period unfolds for start-up businesses in order to verify the longer-term impact of IP. In order to assess this, the study will examine the following aspects and how these change over time:

- **Potential changes in the vulnerability of businesses**
- **Changes in the value of patents and registered designs**
- **The significance of other appropriability factors such as complementary assets**

In order to assess the findings, this thesis will discuss how effective alternative IPR protection methods are for start-ups under the present circumstances including current legislation, common fundraising methods, and commonly used design practices. This study is situated between IP studies, business management, and design innovation. In the context of IP studies, both Tushnet (2012), and Collopy et al. (2014) highlight a knowledge gap with respect to design patents (Tushnet) and design rights (Collopy et al.). Knowledge deficiencies in the context of business management are evidenced by Levin et al. (1987) who acknowledge the under-representation of small-scale start-up ventures in relation to the economic valuation of R&D. The potential significance of design-driven innovation is articulated by Verganti and Dell'Era (2014) who, however, fail to establish how commercial gains can be appropriated through design-driven value propositions.

4.4.3. Preliminary hypotheses: IP and route-to-market strategies

To take the right decisions for the benefit of the business development, the designer-entrepreneur in charge of a fledgling business must understand where and how to prioritise various forms of IP protection and alternative means of appropriation, and how to shift emphasis over time in accordance to the business needs on the one hand, and in recognition of funding strategies on the other.

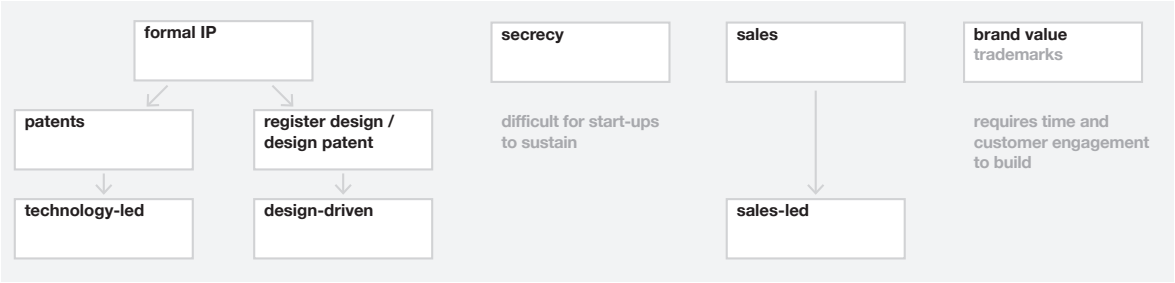

Figure 19: Potential IP development priorities

In line with section 3.7. this thesis distinguishes between formal IP (such as patents and registered designs), secrecy, and sales focus (first-mover advantage) to summarise the available means of appropriation (figure 19). NDAs and confidentiality agreements connect secrecy with formal IP. But due to the difficulty for a micro-scale start-up to enforce such rights, such arrangements are subsumed in secrecy. Secrecy is of limited use for start-ups who need to communicate their ideas and concepts to raise funds and / or to find collaborators and strategic partners. Whilst recognising the need to communicate, temporary secrecy is a requirement to sustain patentability. Although brand values can be protected with IP such as trademarks, they grow over time through discourse with audiences. The term *brand value* is used as a summative term here, and is treated as an asset separate from formal IP. With secrecy and branding put to the side, the focus rests on formal IP such as patents and registered design rights, as well as sales.

Design innovation strategies and IP

Considering formal IP, sales orientation, secrecy, and brand value as the four main corner stones of a fledgling business' appropriability regime, development stages thereof can be envisaged as a model in the shape of a time line. Based on the deployment of these different mechanisms, development priorities can be mapped out. Separating formal IP into that which connects with technological qualities, namely patents, and that which relates to the visual qualities (product language), namely registered design right or design patents, produces five appropriability aspects in total: product language, secrecy, technology IP, sales, and branding.

The three schematic simplifications overleaf (figure 20-22) illustrate ways in which the early-stage development phase may roughly pan out for a start-up. The sales-focused approach (figure 21) is the most straightforward. The technology-focused approach (figure 20) may lead to a small patent portfolio, whereas a focus on product-language may lead to a coherently designed product range. Within the flow charts, IPR-related aspects are highlighted in red, introduction of sales in yellow.

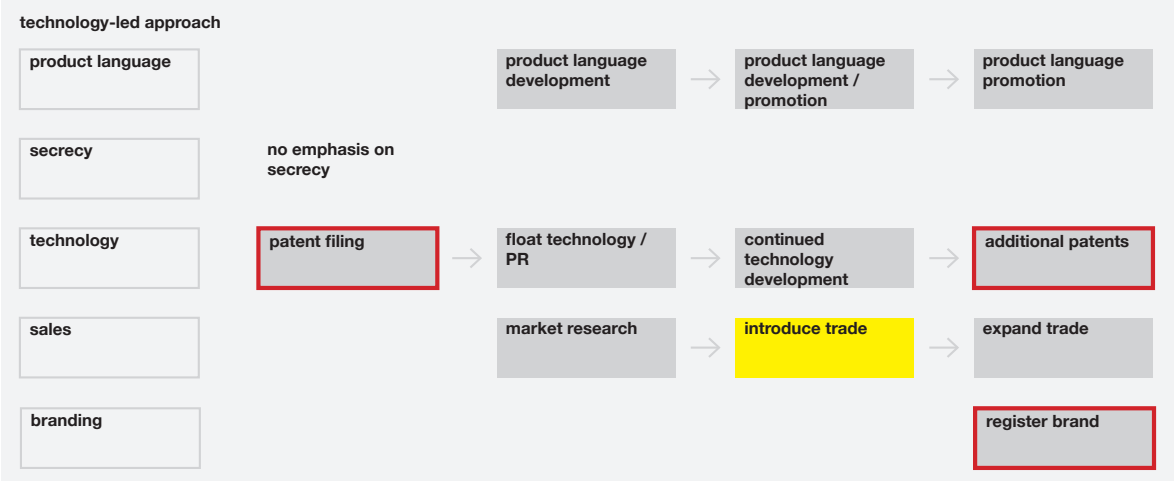

Figure 20: Technology-led venture: patent focus

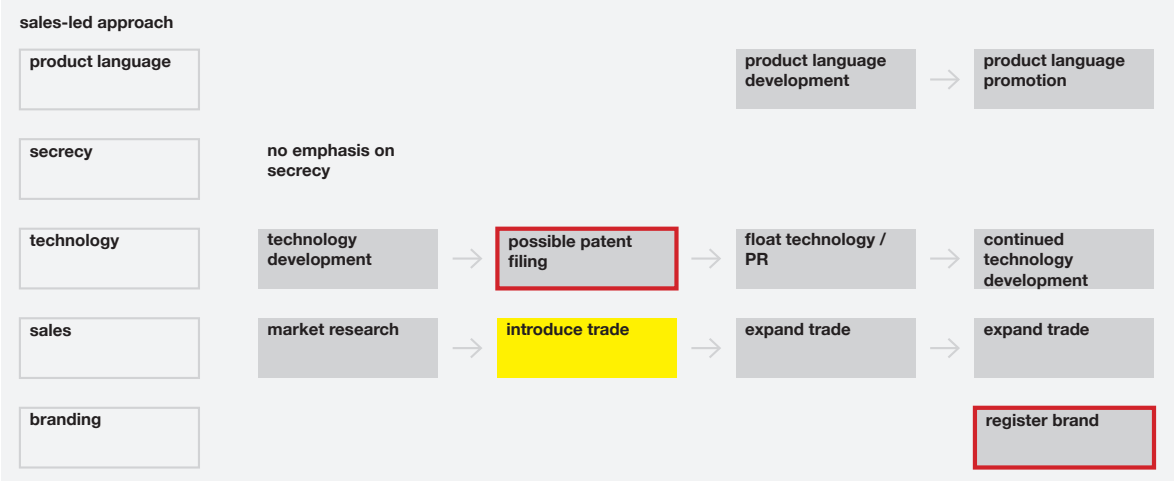

Figure 21: Marketing-led venture: sales focus

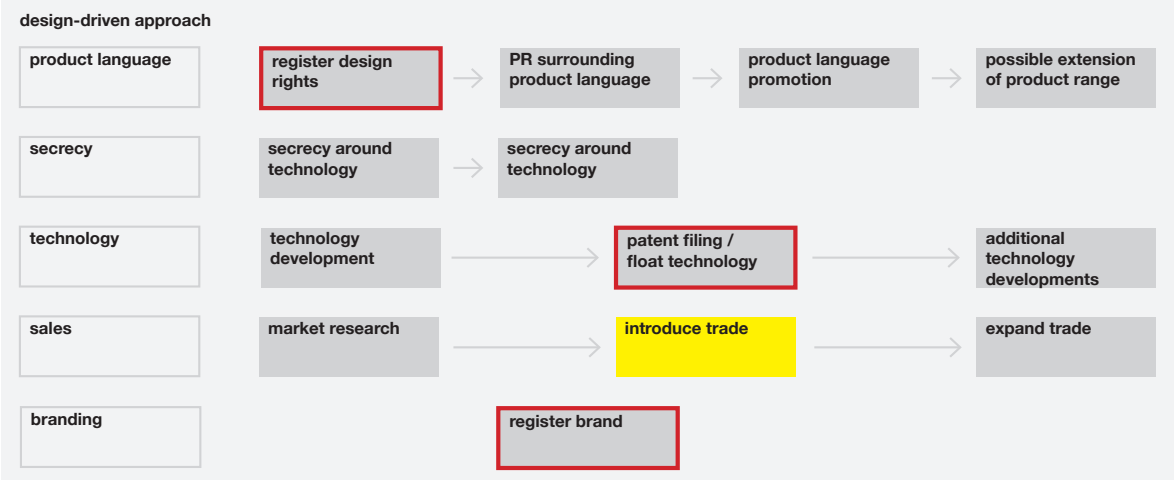

Figure 22: Design-driven venture: focus on product languages

The literature review has shown that securing patents is time-consuming and costly. If time and seed funds need to be set aside for patenting (usually around £4-5K for national patents in the UK, and roughly the same for PCTs or registration in other European countries), then less time and finances can be committed to other business development needs such as prototyping, production development, and market research. Registered designs can be obtained significantly cheaper and faster than patents, suggesting that those designer-entrepreneurs who opt for an early patent enter markets later than those who neglect the patenting option in the beginning in favour of a design-driven or sales-driven strategy. However, the effectiveness of registered design rights requires verification, in particular with respect to its signaling effect and in relation to securing market power. The designer-entrepreneur needs to decide very early, to what extent design developments are worth decelerating to allow for the pursuit of patents. This thesis will examine the potential benefits of investing time and resources in the innovation of product languages, and thus will help designer-inventors assess their innovation development options.

The literature gives rise to the following preliminary hypotheses
The longer the development period, the more funds are needed. This leads to seemingly inescapable conundrum: Tech-led strategies are comparatively costly. Hence there is a strong need for equity investment. IPRs serve as assurances for equity investors. Therefore investment in IPR is required, which in turn reinforces the need for equity funding.

Preliminary hypothesis 1: Sales-led strategies help to speed up the route-to-market, but may limit the business growth potential.

Preliminary hypothesis 2: Tech-led strategies harnessed through patents require more development time, but may lead to greater business growth trajectory in the long run.

Preliminary hypothesis 3: Design-driven strategies allow for faster access to market because IP is easier, cheaper and faster to secure. But is IP related to product languages robust enough to protect novelties against imitators and to pitch them against competing products?

Chapter 5 consists of a range of case studies, the analysis of which uses the discussion points in the literature review. Based on the case studies, the model described above will be verified, corrected where necessary, refined and visualised. The underlying question, as highlighted in chapter 1 is:
How are IP strategies best defined and managed in relation to other business development factors that are to be taken into account in pursuit of design-led start-up businesses?

Final hypothesis: This question can be connected to the hypthesis that IP strategies can enhance the dynamic capabilities of a design-led start-up if managed effectively in relation to other business development factors.

4.4.4. Route map

It is important to note that the final hypothesis was not defined at the outset of this study. In line with Grounded Theory principles, it emerged gradually through several steps of data analysis. The following table shows where and how questions and hypotheses are addressed in this thesis. The timings of inquiries and insights can be reviewed figures 20 and 21 featured in the opening section of this chapter.

Key question 1: How effective are patents and registered design rights with respect to the success prospects of a start-up business, be it design-driven or technology-led?

Where is this addressed?	How is this addressed?	What has been learned?
sections 5.1.4, 5.1.5, 5.1.9 (incubator case studies),	Various comments made in subsections of chapter 5 discuss timings of registered design rights (5.1.4), registered design rights as a complementary form IP in support of a technology innvoation (5.1.5, 5.1.9). All case studies in section 5 address the significance of patents in relation to fund raising and other development needs.	Some of the designer-entrepreneurs interviewed in chapter 5 did not fully understand the scope of registered design rights, e.g. the fact that functional aspects can invalidate registered design rights (5.1.9).
section 5.2.2 (investors and funding)	Conversations with investors during an investment pitch event revealed individual views on the relevance of patents.	Patents are seen as a prerequisit for investment by most angel investors, but not by venture capitalists.
chapter 6, 7, 8	The designer entrepreneurs spoken to in section 6 and 7 address design rights and patents, section 6 focuses more strongly on the latter, section 7 on the former. Section 8 is mainly dedicated to registered design rights, and contains survey findings, which are examined statistically.	Confidence in design rights is limited amongst designer entrepreneurs (chapter 6, 7, and 8) and not sufficiently tested in court in the UK. Product languages can add value to innovations (chapter 6 and 7) and growth businesses can be built around design-driven innovations (chapter 7).
chapter 9	A series of inventive initiatives are discussed with a designer who has become a serial entrepreneur.	Chapter 9 supports the insight that product languages are of value on their own or in support of technology innovations. Multiple inventive steps connected to a design-entrepreneurial initiative may ehance the success prospects of the latter.

Table 1

Key question 2: What other key development factors determine the commercial success prospects of a design-led start-up business?

Where is this addressed?	How is this addressed?	What has been learned?
section 5.1 (incubator case studies)	Section 5.1 identifies the key development concerns of designer-entrepreneurs through interviewing.	Whilst there is a strong inter-dependency between patents and finance, other development factors also matter, such as team, reseources, and market access.
sections 5.1 and 5.3 (incubator case studies)	Section 5.3 analyses the key development factors visually, and maps them diagrammatically in preparation of a reference framework. This involves a series of steps which are derived from Grounded Theory principles.	There is a small number of dominant business development factors, which are referred to as meta variables.
section 6.7	This section connects business development factors to three distinct business development periods which have been defined in dissociation to the product life cycle discussed in section 4.4.1.	Dominant business development factors manifest themselves differently depending on the maturity of the business. Their significance may vary accordingly.
section 9 (introduction)	This section discusses design quality attributes, typical workflows, and development priorities.	The section provides insights into timeframes, and how priorities shift during individual design development steps.
section 10	This section builds on the diagramatic analysis from section 5.3 and further develops the framework based in the insights gained in section 6,7,8, and 9.	IP has short- and long term implications, and affect other business development factors.
section 11	This section discusses the framework in relation to possible IP strategies, and in relation to each of the three business development periods in section 4.4.1.	The framework can be used as a decision making device, or in retrospect to generate an understanding for inter-relationship between existing business development factors.

Table 2

Key question 3: In what way do IP protection methods and other key business development factors depend on each other over time?

Where is this addressed?	How is this addressed?	What has been learned?
sections 5.1-5.3	Explanations provided by designer-entrepreneurs followed by the comparative analysis of statements. Conversations with angel investors and venture capitalists (section 5.2.2) helped to validate the data collected.	A strong inter-dependency between patents and funding was detected. This inter-dependency does not apply to registered design rights. Dependencies were speculatively mapped (section 5.3).
section 6 - 7	The responses received from the designer-entrepreneurs spoken to in section 6 and 7 helped to investigate IP in relation to market-access and market capture.	The litigation of IP infringement can be very costly, but is often perceived as a necessary defence. The defensibility of registered design rights remains questionnaible.
chapter 9	A case study reveals how the triangulation of multiple inventive steps strenghtens an IP portfolio.	The more inventive steps are involved the more diverse forms of formal and informal IP can be combined to build a flexible strategy.

Table 3

Preliminary hypothesis 1: Sales-led strategies help to speed up the route-to-market, but may limit the business growth potential.

Where is this addressed?	How is this addressed?	What has been learned?
sections 5.1.2, 5.1.5, 5.1.7, 5.1.8, 5.2 and 5.4	Designer-entrepreneurs interviewed in these sections have de-emphasised the patent-route at an early point in time. The consequences were discussed during the first set of interviews, and longer term effects could be verified during a series of progress verification interviews in 2018.	Some of the businesses were discontinued by 2018 (5.1.2, 5.1.7), others have developed moderately (5.1.5, 5.1.8). The data collected suggests that the route-to-market can be expedited through sales-led strategies. However, there is not sufficient evidence to clarify whether or not this limits the business growth potential.

Table 4

Preliminary hypothesis 2: Tech-led strategies harnessed through patents require more development time, but may lead to greater business growth trajectory in the long run.

Where is this addressed?	How is this addressed?	What has been learned?
sections 5.1.5, 5.1.6, 5.1.9 chapter 6 and 9	Designer-entrepreneurs interviewed in these sections have built on patents using a variety of strategies in different contexts. These strategies, as well as the business contexts and the implications were discussed during all interviews. Insights with regards to the growth potential is made apparent in the case study featured in section 5.1.9, and in chapter 6 which provides a longitudinal perspective, and insights into IP infringement matters.	It appears that patents can decelerate business development processes, although there is not enough reliable data to fully support this claim. Patents do not necessarily lead to high-growth. Section 5.1.5 features an example of a business that grew to a medium size. Development were more limited in other cases. Section 5.1.6 features a high-growth business, section 5.1.9 a business with high growth potential, which however did not grow to its best potential in during the course of this inquiry. Chapter 6 provides longitudinal overview over the development of another high-growth business, and chapter 9 features a range of initiatives with high-growth potential.

Table 5

Preliminary hypothesis 3: Design-driven strategies allow for faster access to market because IP is easier, cheaper and faster to secure. But is IP related to product languages robust enough to protect novelties against imitators and to pitch them against competing products?

Where is this addressed?	How is this addressed?	What has been learned?
Chapter 5	None of the start-ups examined in Chapter 5 are strictly design-driven, though some have design-driven elemenst (e.g. 5.1.4, 5.1.5)	Feedback obtained from designer-entrepreneurs confirms the significance of this query.
Chapter 6	Section 6.3 supports this hypothesis, although the product language is not the driving factor here. It is a complementary aspect.	Product languages make a significant difference to the business growth, however, can be difficult to protect. 3D trademarks can also be registered to protect product languages.
Chapter 7	This case study examines design-driven innovation in the absence of patents.	This case study provides evidence of the fact that high-growth is not bound to patented technology elements. However, the initial route-to-market used a licensing model, whcih decelerated progress. Hence the potential speed-to-market advantage could not be examined here. The data suggests that registered design rights are effective internationally, but less so in the UK.
Chapter 8	This part of the study discusses a predominanty quantitative survey that was carried out across the UK in 2016.	The data analysis suggests that registered design rights provide a deterring signalling effect to competitors, but do not guarantee exclusivity in the market. The confidence in this form of IP is limited.
Chapter 9	This section examines the value of product languages in combination with technology innovation.	The findings give rise to the hypothesis that multiple inventive steps increase the number of possible combinations of different forms of IP. As a consequence IP strategies become more flexible and robust.

Table 6

The fundamental research question:

The question how IP strategies are best defined and managed in relation to other business development factors that are to be taken into account in pursuit of design-led start-up businesses, is addressed in all parts of this thesis, first through inquiring the value of patents and registered design rights (sections 5.1, 5.2, 5.4, chapters 6-9), then through linking these to other business development factors (section 5.3). The question is answered through the development of a reference framework (theory component 1) which comprises three distinct business development periods (theory component 2), and allows for the strategic management of multiple inventive steps that are combined in a design-led start-up initiative (theory component 3). The framework is discussed and analysed in chapters 10 and 11, with section 10.4 providing a summative overview over the combined theory that constitutes the main outcome of this study.

5. Qualitative data 1: Early-stage start-ups

The approach to the following series of case studies has been discussed in section 4.1.1. Nine case studies were conducted to examine the significance of IPR for design-led start-ups, and in pursuit of the business development aspects listed in 4.4.3., i.e. to examine potential changes in the vulnerability of businesses, and possible changes in the value of patents and registered designs, and also to search for appropriability factors other than IP.

As pointed out in the previous chapter, the information used in the following section has been obtained through secondary research and interviews. The first nine case studies were conducted with current or former incubatees of Design London / InnovationRCA. It has to be acknowledged that each of the ventures is closely linked to postgraduate studies conducted at the Royal College of Art (RCA). The similarity in the surrounding conditions enhances the comparability. The inventions, target markets and route-to-market vary sufficiently to allow for a critical scope of data. To optimise the credibility of the information obtained about the ventures, the founders were spoken to directly, instead of relying exclusively on information provided by third parties. Incubator managers and business coaches were interviewed to critically verify the views of designer-entrepreneurs, and mitigate subjectivity. Conflicting data such as information on investment or IP for instance, was excluded.

Three key concerns were identified and taken into account in the analysis:

A) The designer-entrepreneurs' views on IP have been nurtured through their education at the RCA and through their mentoring schemes.

B) The incubator underwent different phases, which made the process more difficult for some rather than for others.

C) The designer-entrepreneurs' perceptions of investors' interests were potentially skewed and needed to be treated with caution.

The first concern suggests that there might be an undue coherence in the data. The second concern suggests that the comparability may be limited due to contextual variations. To counteract the first concern, design-led start-ups were examined that did not go through any incubation scheme at all, Haberman (chapter 6), Trunki (chapter 7) and Conran (chapter 9). Incubation managers were asked to comment on their views on IPR, which were subsequently compared, which helped to mitigate the second concern. To shed light into the third concern and identify possible misperceptions, four angel investors and two venture capitalists were spoken to. The views varied here, and have been discusses in section 5.2.

5.1. Design London / InnovationRCA

Design London was a business incubator scheme supported by NESTA (The National Endowment of Science, Technology and the Arts). It became InnovationRCA following changes in the funding structure. This also led to a change in the management of the incubator. It is noteworthy that Concrete Canvas preceded the RCA design business incubators (figure 16). The two designer-inventors involved, both RCA graduates, sustained access to RCA premises, but there was no mentoring or funding support, although some seed funding was sourced through award schemes.

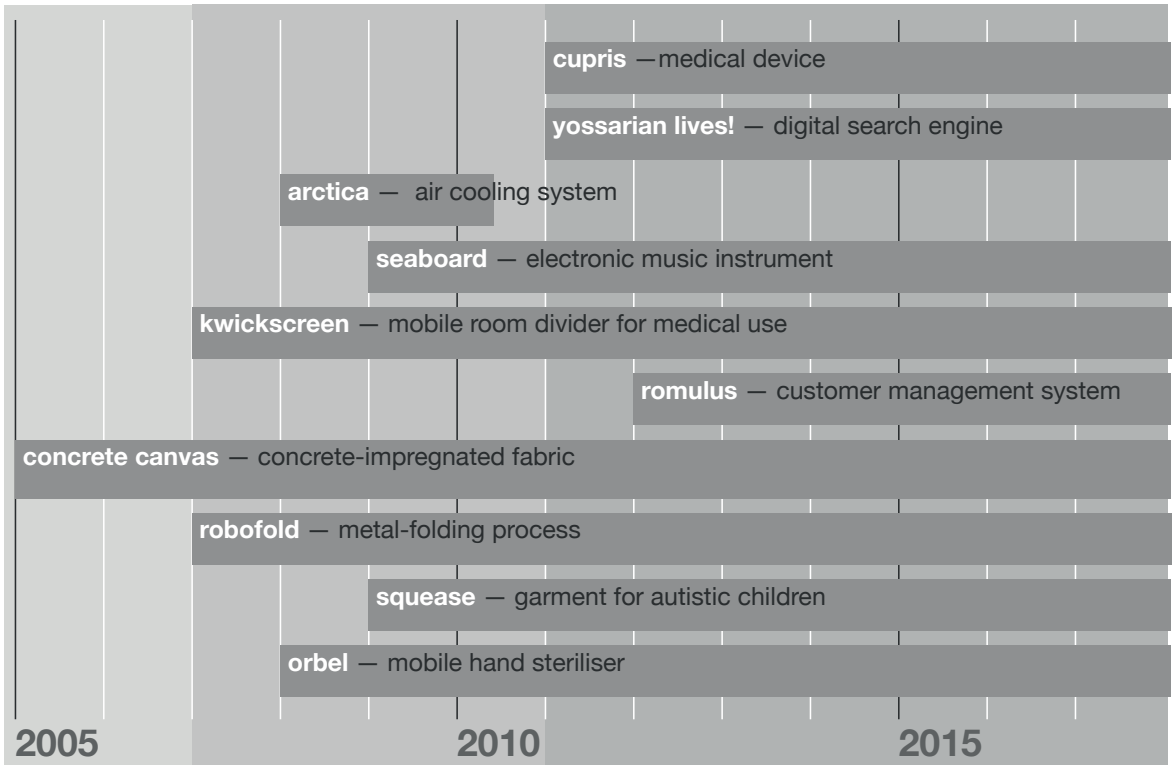

Figure 23: The case studies within the incubator life cycle

The first incubator projects such as RoboFold did not need to apply as an interdisciplinary start-up team. This requirement was introduced in 2008. The project outlined in the introduction of this study was pitched in 2009. It made it into the second round of the competitive selection process, but failed to enter the boot camp, which constituted the final stage of the selection process. Having failed to enter the Design London incubator, the project was continued on an independent basis for two years, but then abandoned. A comment made by one of the Design London Competition judges suggested that the market surrounding the anticipated technology was too tight to allow for realistic success prospects.

The case studies in this chapter were guided by the underlying question what concerns designer-entrepreneurs entertain at the outset of their start-up business development. The order in which the cases below are presented reflects the chronology of interviews.

5.1.1. Cupris

Nature of invention Founders Inception date	**Mobile diagnostic equipment, telemedical concept** **Paul Thomas, Julian Hamann** **2011**
No of patents No of registered designs No of registered trade marks	**2** **0** **0**
Problem Strategy	**Complex target market environment, potential competitors** **National patent application to secure freedom to operate, possible challenge against competitor, complementary service design solution**
Development stage	**Under development, 2 FT staff plus 1 intern, 2 years in**

Figure 24: summary information for Cupris

Figure 25: Otoscope by Cupris

Business proposition and history

Cupris was founded in 2011. This initiative began as a multi-disciplinary collaboration between Paul Thomas, who has a degree in Engineering and Product Design, and his business partner Julian Hamann, who is an ENT (Ear Nose and Throat) surgeon. The initial idea came from Hamann, who detected deficiencies in the way in which ENT cases were handled in the UK. This means that there was a need-pull at the outset.

The aim behind Cupris is to develop mobile diagnostic equipment, software and services to involve the patient in the diagnostic process. This is hoped to streamline the delivery of health care at a reduced cost in the UK. The company's launch product was a smartphone-enabled endoscope that allows for general practitioners to conduct the diagnosis and to consult with the ENT specialist remotely. GPs and patients can take images on their smartphone and upload them to a database. They are then given questionnaires, which help the ENT specialist to analyse the patient's problems remotely. Transfers to hospitals and specialist doctors are thus made unnecessary.

Cupris entered the InnovationRCA incubator in 2012. In the same year, an investment offer was considered, but rejected due to the fact that the investor requested a majority stake. Despite the investor's experience in medical innovations, the founders decided against the investment and support, relying instead on the funds and support obtained upon entry to the incubator. In 2014 two new members joined the team, a business development manager and a programmer. The latter was added to the team to pursue of the development of a platform which was to connect patients to medical advisors. In 2014 the team had begun to run free trials in university hospitals. The purpose of this was two-fold: to obtain useful insights through customer-feedback; and to build a customer-base for future sales. This shows how open innovation practices as discussed in section 3.6 can be aligned with market-development opportunities and with the objective of converting market-need into market-demand. It can also help to align the innovation development with the expectations and preferences of the target audience, in this case future medical practitioners.

IP held, problems and benefits

The founders filed the first patent in 2011, almost a year prior to entering the incubator. At the time, little consideration was given to the brand name and the logo. The trade mark was initially unregistered. It was later changed, and the new version was registered in June 2016 as an image. The name Cupris was registered in May 2016. Registering the design of the product was not an option because it remained subject to development throughout the first few years. The form of the product focus was seen as secondary, since the focus was on the overall concept as well as the function and implementation of the technology. A competing innovation was detected in the US in 2012. Instead of filing for PCT, the founders filed their first patent only in the UK, and a second one in 2014.

Conclusions / predictions:

The first patent was filed pre-maturely. But patent searches led to insights related to overseas competition, and allowed for an informed strategic response. Paul Thomas is a serial entrepreneur. Despite his experience with earlier ventures, risks and anxieties persisted. £10K were set aside for defending IPRs in court if needed.

Having a patent application on file, helped to secure a place on the incubator scheme and enhanced bargaining power. As the twelve-month post-filing period had not elapsed when the team entered the InnovationRCA Incubator, Cupris could make use of the incubator's consultancy service in order to decide whether or not to take their first patent global, or to extend its scope through withdrawing and re-filing the patent.

The team behind Cupris chose to limit the scope of their first patent to the UK thereby saving costs, and to file a second patent two years after the first, also within the UK only. Cupris was a need-pull initiative involving technology-development, platform development and concept design. Trials conducted within academia helped to build a potential customer-base and to further develop the product through participatory design, an open innovation method. This was aimed at generating demand within the future target market (demand-push). The initiative combined service design aspects with the product development. The focus on patenting was comparatively strong, although the designer-entrepreneurs' confidence in the IP was limited. Design registrations remained ignored, partly due to the lack in suitability. Informal IP was given little significance, although secrecy was used where possible.

This case suggested that it is quite common for start-up ventures to file a patent twice. What can be learned was that an early patent application can help to secure seed funding and a place on a business incubation scheme, as it provides the venture with a priority date. Any patent application can be withdrawn and re-filed within the first twelve months. This sets back the priority date to the second filing date, thus extending the patent's maximum lifespan by up to a year and it allows for the inclusion of additional details and patent claims. The costs involved in withdrawing and re-filing a patent were described as small, with the main risk lying in the fact that another party may file a competing patent prior to the re-filing date, thus securing priority. Knowledge of a potentially competing innovation discouraged Cupris from pursuing the process of withdrawal and re-filing.

5.1.2. Yossarian Lives!

Nature of invention Founders Inception date	**Digital search engine** **J. Paul Neeley, Dan Foster-Smith, Katia Shutova** **2011**
No of patents No of registered designs No of registered trade marks	**0** **0** **0**
Problem Strategy	**Complex target market environment, potential competitors** **Secrecy, Complementary Assets (Getty Images)**
Development stage	**Under Development, 3PT staff**

Figure 26: summary information for Yossarian Lives!

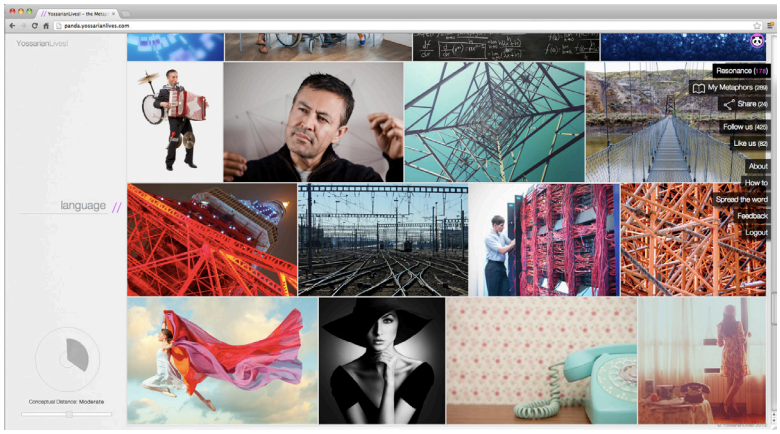

Figure 27: The Yossarian Lives! user interface generated in response to the search term "language"

Business proposition and history

Dan Foster-Smith and J. Paul Neeley developed the idea for Yossarian Lives! during a conversation in February 2011 whilst studying at the Royal College of Art. Yossarian Lives! is a metaphorical search engine that uses algorithms to generate results, which are not literally but rather metaphorically linked to the search terms. Thus Yossarian Lives! is a creative tool capable of generating unexpected results that are meant to trigger new thought processes within people's minds. Dr. Katia Shutova from Cambridge Computer Lab joined the team in March 2011. As Yossarian Lives! is a software product, it does not qualify for a patent in Europe. Instead the inventors rely on their copyright and on secrecy to sustain exclusivity on the market, with key elements in the programming code not

shared. YossarianLives! won the Deutsche Bank Award worth £10,000 in June 2011, and entered the InnovationRCA incubator in November 2011. In 2013, the search engine was undergoing its first testing phase.

IP held and problems and benefits

Despite the lack in formal IP and the need for secrecy, the team behind Yossarian Lives! managed to secure a product development agreement with Getty Images. Through on-going developments, the team produced a highly personalised search engine that breaks with the stereotypical functions of conventional search engines. Yossarian Lives! obtained the right to access Getty Images' API[18] for access to their databases. This strategic partnership allowed Yossarian Lives! to return every content from Getty Images' collections, with every image sold through Yossarian Lives! searches generating royalties. Not only did the team manage to enter a setting within which their technology can be put to the test, and re-designed in response to customers' needs, they also succeeded in initiating a first income stream. This is a technology-push initiative, where demand is generated through customer involvement in the design.

Conclusions / predictions

Patents are not applicable in this case, with secrecy being the only alternative. Complementary assets in the form of a working relationship with a major incumbent compensates for the lack of IPR provided that secrecy can be used effectively to prevent strategic partners from becoming competitors. In chapter 3, IP has been highlighted as a means to strengthen a start-up's appropriability regime. Complementary assets constitute a similarly significant element within this equation. The ultimate goal is access to and lasting control over value chains. In this respect IPRs are simply a means to an end. Given the distance to market, which most designer-inventors are faced with at the outset, it is easy to focus too much on IP and too little on the route to market.

Yossarian Lives! started with no equity investment. Smart funding in the form of an award has helped the founders during the very early stages, after which the team relied on bootstrapping[19] to keep costs low. Not being able to secure a patent may seem a disadvantage, but it saved time and effort. On the other hand, J. Paul Neeley acknowledged the fact that investment would have allowed for an expansion of the team to accelerate the development process (Neeley, 2013). Software innovations benefit from the fact that they do not require much development resources. Not having to rely on investors can be liberating. Although investors can contribute with experience and industry relations, some designer-inventors perceive the interference of investors as problematic. Particularly well-connected investors are referred to as super-angels in the software industry (Expert 2, 2013). However, managing without equity investment not only secures the freedom of choices, it also helps avoiding the dilution of equity, and reduced equity dilution can be beneficial during second and third investment rounds.

[18] application programming interface

[19] an approach to starting a company without external input and investment (Investopedia, nd)

5.1.3. Arctica

Nature of invention Founders Inception date	**Cooling system for interior use** **Karina Torlei, William Penfold, Daniel BecEra, Mathew Holloway, Matthew Judkins** **2008**
No of patents No of registered designs No of registered trade marks	**3** **0** **0**
Problem Strategy	**Bottleneck in the upstream value chain** **Focus on niche market to enhance access to complementary assets**
Development stage	**Sold in 2010**

Figure 28: summary information for Arctica

Figure 29: Arctica cooling system

Business proposition and history

Arctica was a second-wave venture at Design London. The inventors and original team members, Karina Torlei, William Penfold, Daniel BecEra and Mathew Holloway, met when studying Industrial Design Engineering at the Royal College of Art and Imperial College in 2006. During a networking event in October 2008 they joined forces with Matthew Judkins, a MBA graduate from the Imperial College Business School in London. Artica, an environment friendly cooling system that does not use any toxic gases, 'requires less than 10% of the energy of a conventional air conditioning system, and can easily be installed in new or existing buildings' (Royal College of Art, nd). In the course of the night

a thermal battery stores low temperature through freezing a phase-change material, which absorbs the warmth of the air indoors during the following day. This reduces temperatures to about 20-25 degrees Celsius. Running costs are very low, as are the costs involved in product servicing and maintenance. In October 2008 Arctica entered the Design London Business Incubator, exiting in May 2010. Later that year it was sold to Monodraught Limited, and the system is now being traded under the name Cool-Phase®. The start-up team filed their first patent in February 2008, and their PCT a year later. All members parted with the venture following its sale, except Matthew Holloway and William Penfold, who worked for the acquiring company for a period of time.

IP held and problems and benefits

Arctica strengthened their appropriability regime through filing three patents, which they extended through PCT applications. However, the inventors found themselves confronted with a bottleneck in their downstream value chain. In the UK air conditioning systems are commonly fitted by so-called HVAC (heating, ventilation, and air conditioning) fitters and distributors. Selling Arctica directly to property developers was not possible. As the market was too tightly controlled by incumbents, a distribution channel could not be established. The team consequently focused on a niche market and marketed their product to the owners of listed and period properties, where the installation of conventional air conditioning systems is legally prohibited and technically difficult. Following some initial successful trials to prove the viability of the product, Arctica were approached by Monodraught Ltd.

Despite their successful exit, Mathew Holloway remains critical of patenting regulations. He stated that, "If you are a small organisation and you try to develop something in a clever and innovative way, and you actually want to do something with it, it can be very difficult. … It is not really about how good your invention is, it is about how much money you have." (Holloway, 2013) He referred to multi-national companies who accumulate extensive patent portfolios, which they trade on without ever generating a true interest in exploiting any of their patents themselves, and explains that "A patent is … only actually valid, once it is tested in court by another company. … It works as a patent, but only to the point where someone challenges it. And then you have to spend the award money on legal fees." (Holloway, 2013) This suggests that the chances for a patent to succeed on the market depends on the financial resources available to the IPR holder, highlighting the question at what point in time a patent ought to be filed, given that start-ups are financially restricted.

> Mathew Holloway admits that "Without filing a patent we would not have received any funding. Unfortunately it is expected by investors on the whole. Some incubators insist that you spend a certain proportion of your funding on IPR. There is a culture that a patent gives you credibility. It is worth for an early stage company having one as a marketing tool, if nothing else. […] It is also your only 100% way of protecting your invention if you need to disclose it in some way, as NDAs are worthless."
> Holloway, 2013

Conclusions / predictions

IPR was vital for overcoming bottlenecks in the value chain. The trade sale may seem premature. However, the investors seemed satisfied with the outcome. "Design London recovered its costs. The founders got a little bit of money out of it" said Expert 3, the incubator manager at Design London the time. He acknowledged the fact that they "could have always held out for a better offer", but also stated that "there have been numerous examples of companies holding out and going bust" (Expert 3, 2013). Finding the right point in time for a trade sale can be difficult. What seems clear with respect to Arctica, is that a dominant design paradigm had not been established prior to exit.

In line with Teece's point that the Abernathy-Utterback framework is of limited reliability with regards to niche-markets, the Arctica case shows how a micro-business can edge its way into the market, even if complementary assets are tightly controlled by incumbents. It also highlights the benefit of IP to keep potential competitors and imitators at bay. What Arctica did, was to gain control over a larger section of the value chain through focusing on a niche market. This case makes it clear that market strategies are just as important as IP protection. Although Arctica did not prevail for long, it would not have been able to secure a trade sale without patent protection. This raises the question how commercial success is to be rated in relation to design-led start-ups.

5.1.4. Seaboard

Nature of invention Founders Inception date	**Digital music instrument using a 3D sensory system** **Roland Lamb** **2009**
No of patents No of registered designs No of registered trade marks	**2** **1** **1 (registered a word rather than an image)**
Problem Strategy	**Complex target market** **Integration of manufacturing, and sales, integration of software platform**
Development stage	**Under development, trading since early 2013, with 20 FTE staff**

Figure 30: summary information for Roli (trading Seaboard)

Figure 31: The Seaboard designed by Roli (launched in March 2013)

Business proposition and history

Roland Lamb invented the SEA interface (Sensory, Elastic and Adaptive), a touch sensory system that can be moulded into various shapes, and enables the seamless transition between discrete and continuous input. It is capable of capturing three-dimensional gestures and gives the user a tactile feedback. Lamb entered the Design London Incubator in early 2011 with his first product, the Seaboard, a new musical instrument based on the design of a piano keyboard. The Seaboard's patent-pending concept enables performers, composers and producers to exert real-time control of all the major characteristics of sound. Rather than simply hitting a key with the finger, the pressure can be

altered in terms of location and intensity. The pitch can thus shift seamlessly between notes. Volume and timbre can also be varied. Lamb spearheaded the product development from the start as CEO of Roli Labs with around 20 employees. Roli's newsletters in 2013 and 2014 made it clear that the first product, the Seaboard GRAND Limited First Edition, had not sold out within the first year or two of trading. It became available for pre-order in 2013, and the edition of 88 had not sold out by 2015. Considering the price of US$8,888.88 and the fact that less than 88 products were sold, one can deduct that a turnover of US$1m had not been reached by the end of 2015.

A document published on line on 30 August 2012 (acquired by The National Archive on 02/01/2013) reveals that Lamb sought to raise £300K worth of equity funding whilst predicting rapid growth and promising 'strong returns either through a major refinancing in 18-24 months or at exit through a flotation or sale to a major music industry leader in four-to-six years' (The National Archives, 2013)

An US-based online publisher of news related to technology reported that Roli had 'acquired JUCE, a long-time C++ framework which has, over the last few years, come to be used by most of the leading audio companies' (TechCrunch, 2014). Julian Storer, who founded the firm that developed Juce, joined Roli. The acquisition followed a $12.8m (£8.8 million) investment, which Roli had secured earlier that year (Business Insider UK, 2016).

In May 2016 TechCrunch reported that Roli had raised an additional $27m (£18.6m) of in VC investment in a second funding round (TechCrunch, 2016). By then the company had expanded in to the US. By then, the Seaboard had been introduced to 15 countries.

In October 2017, TechCrunch reported that rap musician Pharrell Williams had invested in Roli and taken on a role as Chief Creative Officer (TechCrunch, 2017). The cumulative investment is stated as $50m, which suggests that a total of $10m was secured in addition to the series A and series B investments mentioned above. In the process of the series B investment round, the company was estimated at a value of £60 million ($80 million) (TechCrunch, 2017).

IP held and problems and benefits

Lamb confirmed that he "found it very difficult to bear the costs of early patents" (Lamb, 2013). Nonetheless he managed to file his first patent within about six months of conceiving the idea. For Lamb a patent was not only a way to secure exclusive access to the technology, it was also a way to underline the fact that he is fully committed to the project and willing to sustain his commitment long-term. This is thought to have helped to attract the interest of investors and collaborators. Lamb admitted that a patent was "not always enforceable but this statement of commitment is relevant" (Lamb, 2013).

Unlike other designer-entrepreneurs, Lamb managed to keep all the equity during the inception period. The seed funds obtained in conjunction with the Design London incubator scheme allowed him to pay his start-up team instead of shredding equity at the outset. Business partners were carefully chosen, and shares in equity have been reserved for investors.

Other technology applications have been taken into consideration in the medical field, and a second patent was filed in 2014. The SEA interface is thought to lend itself for the improvement of prosthetics, which is a complex market that is difficult to enter. Credentials earned in the music industry might help convince representatives in the medical industry. The way in which different inventions connect may be important to this study. We can distinguish between a situation, where one patent lends itself to numerous product applications, and another where several patents enhance one product. 'Patent fences occur when a firm patents a number of close (product) substitutes, perhaps different versions of a product that are invented over time, preventing other firms from entering the particular technology area.' (Hall et al., 2012, p.17) However, the number of patents maintained by a start-up will always be small due to the costs involved in filing multiple patents.

The shape of the Seaboard surface has been registered as a design with OHIM. The design registration dates two years after the filing of the patent. Thus Lamb made sure that the registration would be filed no more than one year after the patent was published. This meant that the one-year grace period was made used to its best potential. Through delaying the design registration to the maximum degree possible, Lamb maximised the IP lifespan.

The word 'Seaboard' has been registered as a US trademark. On the other hand the company name has changed numerous time during the PR campaign, from 'Lambde' to 'Sea Labs' to 'Roli Labs' to 'We are Roli' to 'Roli Ltd'. Until the venture is known within the target market, name changes seem unimportant provided that the product name differs from the company name. With start-ups the focus of attention is directed to the product, not to the inventing firm. The word Seaboard has not changed.

Conclusions / predictions

A patent helps the designer-inventor build confidence, which is beneficial when pitching for funds, or when negotiating equity shares, even if the patent on its own does not convince an investor. For Lamb the patent was vital to secure exclusivity on the market. He rejected offers from the industry to license the invention, instead he chose to market directly to customers and distributors. The US constitutes one of the largest markets. Therefore Lamb filed a patent for the US in addition to the European patent. In addition to sales, production was also integrated to secure independence and to increase the profitability. Lamb claimed that 'The Seaboard has cost parity with other keyboard devices but can be priced above them, meaning healthy margins.' (The National Archives, 2013) To test the market, a limited edition of 88 products was launched, in reference to the 88 keys of a grand piano, along with standard smaller, cheaper versions of the Seaboard. However, this did not sell out within the first year of trading.

In reference to the incubation period, Lamb explained that "…through the process [he] learned a lot about IP, and about product design and about the relationship between IP, product design and entrepreneurship. So those things have all come together" (Lamb, 2013). This point echoes a comment by IP expert Thomas Hoehn from Imperial College Business School, who also highlighted the value of know-how (Hoehn, 2013). With the Seaboard, investments in IPR were limited to the most necessary, and the focus of its attention was shifted towards complementary assets. Subsequently its focus moved to the integration of assets including production. In 2013, the Seaboard was said to be manufactured mostly in-house (Lamb, 2013).

5.1.5. KwickScreen / Romulus

Nature of invention Founders Inception date	**Retractable room divider** **Michael Korn, Denis Anscomb** **2006**
No of patents No of registered designs No of registered trade marks	**1** **1** **1 (registered a word rather than an image)**
Problem Strategy	**New market, complex market** **Bootstrapping, Integration of sales, exclusive license of material innovation, customer relations management system**
Development stage	**Established, 6-7 FT staff, profit-generating**

Figure 32: summary information for KwickScreen / Romulus

Figure 33: KwickScreen dividers

Business proposition and history

KwickScreen, a portable retractable room divider, was invented by Michael Korn, who graduated at the RCA in 2007 and filed a patent for his invention the year after. KwickScreen launched its product in 2010 and joined the Design London incubator in January 2011. In 2007 Korn was joined by Denis Anscomb, who holds a degree in Mathematics, and had worked as a finance director prior to joining KwickScreen.

KwickScreen grew without the need for equity funding. In 2012 the two founders had four people working for them. The technology development was initially part-funded by the NHS who had 'a pot of money that was for products that were looking at infection isolation.' (Anscomb, 2013) Instead of concentrating on equity investment, KwickScreen focused on manufacturing and sales. Steady business growth indicates the success of the business. Having received revenues of around £100K in their first year of trading (2010), KwickScreen reached a turnover of just under £1million in 2013.

IP held and problems and benefits

Korn stated that "Having a patent has been crucial. Where we needed to engage manufacturers, and get them to invest their time and effort in making a product, they needed to know that this was not a product that somebody else could then make and copy." (Korn, 2011).

Anscomb has a different position on the value of the patent than his business partner — although Korn's public praise of the patent value may also be a defensive PR step rather than a genuine reflection of his opinion. According to Denis Anscomb, "It is not only the cost of the patent, it is the cost of defending the patent, that makes it ridiculous to think, it would ever stop anyone from copying". (Anscomb, 2013) Like Concrete Canvas, KwickScreen benefit from the strategic relations with a larger company, securing the exclusive use of the material needed to build the product. Although KwickScreen registered a design and a trade mark in addition to their patent, Anscomb highlights the fact that "All the other intellectual property that we would put around KwickScreen is kind of insignificant compared to the fact that we have an exclusive worldwide license to use this [material] for screens…" (Anscomb, 2013) Like Roli, the team behind KwickScreen secured their trademark only for the product, not for the company. A company name does not seem to exist here, as none is used in the public domain.

Conclusions / predictions

As in the previous cases, the confidence in the patent is low here. As no equity investment was sought[20], the need for a patent seemed less strong than in the other cases. Corporate relation, trade channels, access to materials and manufacturing is the focus of attention here. Anscomb admitted that "It is very difficult to know the best route at an early stage. Most investors would probably not touch something that is so early stage that it hasn't got a patent." (Anscomb, 2013) Working without equity investment eases the pressure of pursuing a patent. Exclusive access to third party IP can be equally beneficial as a patent. The benefit here is that the IP policing and defence can be covered by a third party. The dependency on a different company's stability can be disadvantageous. In KwickScreen's case the licensor was larger, and perceived as more stable than KwickScreen (Anscomb, 2013). Hence, the exclusive license constituted a strong asset at the outset.

Whilst critical of patents, Anscomb seemed positive about having one. In April 2013, the UK Government introduced The Patent Box, a tax savings scheme which reduces corporation tax to 10% for those businesses who generate profit from patented inventions (UK Government, 2007). However, pre-trading ventures do not benefit from the Patent Box, because they are not liable for corporation

[20] The team borrowed only five thousand pounds from the incubator initially, but soon repaid the debt (Anscomb, 2013).

tax until they generate taxable income. Due to the costs involved, KwickScreen did not invest in international patents. However, when interviewed in 2013, Anscomb admitted that "now, if I had the option, I would have an American patent, and I would have a European patent. But, at the time, it was just too expensive, and very few products ever become successful, and the likelihood is that you are wasting your money". (Anscomb, 2013)

Here the dilemma can be clearly felt. Filing for patent is costly, and possible benefits are hard to assess at the outset. Once a company starts trading, the patent maintenance costs can be offset against sales. Until then, the decision whether or not to patent appears a gamble. What the KwickScreen case highlights, not dissimilar to Yossarian Lives!, is that the need for a patent partly depends on the degree to which a designer-entrepreneur needs to source equity investment. Identifying the need for investment is important for taking the right decision with regards to IPR, as is the prediction of future export interests. The timing of the patenting process depends on the development pace, and the distance from market. These factors are even more difficult to predict than the funding needs. The interviews suggest that most designer-entrepreneurs underestimate the time that is needed to render a start-up profitable.

5.1.6. Concrete Canvas

Nature of invention Founders Inception date	**Material innovation for construction** **William Crawford, Peter Brewin** **2004**
No of patents No of registered designs No of registered trade marks	**4 (40 including international filings)** **0** **1 (registered in the UK as an image), plus** **1 (registered as a word in Europe, Korea, Mexico, US and worldwide)**
Problem Strategy	**Initial downstream value chain bottleneck** **Collaborative arrangements, pre- and after sales support, international licensing agreements**
Development stage	**Established, around 20 staff, profit-generating**

Figure 34: summary information for Concrete Canvas

Figure 35: The Concrete Canvas

Business proposition and history

Concrete Canvas is a material invention that can be deployed for multiple purposes. It is a flexible cement impregnated fabric invented in 2006 by Peter Brewin and Will Crawford, who met at the Royal College of Art. In 2004 the team had patented a concrete shelter designed for disaster zones. However, unable to successfully market this concept to the military and to NGOs, the inventors extended the application of their material to ditch lining, slope protection, roofing. Concrete Canvas

spun out of the Royal College of Art in 2004. It preceded the incubation schemes mentioned above. Following graduation the two founders retained access to RCA premises for a six month-period, during which they were supported by InnovationRCA, which at the time functioned as a support unit to strengthen the strive towards design innovation and entrepreneurship at the college. Following the filing of a second patent for impregnated fabric in 2006, Concrete Canvas secured around £200K through grants, competition awards and angel investments. According to Brewin, having a patent "is absolutely vital. If people invest in a start-up, they want to see that there is the capability to protect the technology" (Brewin, 2013). However, having been commissioned to build a demonstrator of their military shelter, but not being able to market it, Concrete Canvas re-oriented towards trading the material per se. For this reason, the company has relied on third parties to generate new ideas for using the material. Through patenting the material, Concrete Canvas has set clear boundaries between internal and external knowledge which facilitated open innovation as discussed in section 3.6.

Figure 36: Concrete Canvas Shelter

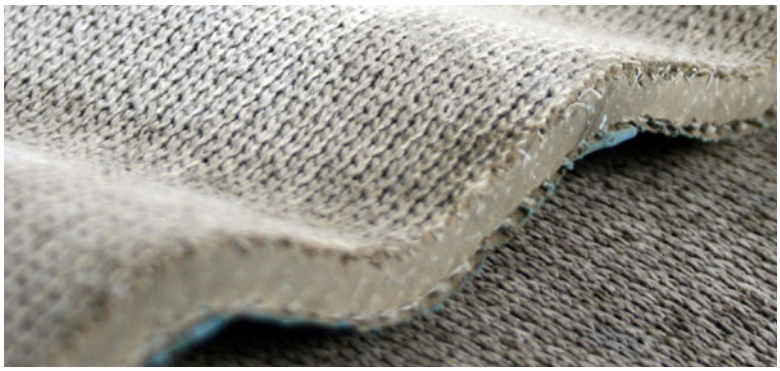

Figure 37: Concrete Canvas Fabric

Figure 38: Concrete Canvas used for lining a slope

IP held and problems and benefits

By 2013 Concrete Canvas held four different patents in total, and over 40 including international filings. This helped the entrepreneurs to tighten the appropriability regime which was further enhanced through the contractual arrangements which Concrete Canvas entered with third parties. Peter Brewin stated that patents are important when talking to potential customers and the press because "… there is a limit to what you can do under non-disclosure agreement … and also, it is important to generate a lot of press, and we were entering a lot of design competitions" (Brewin, 2013). The first significant sales were secured in 2008, and the company broke even the following year, which marks the beginning of the company's established business development period (section 4.4.2) Whilst trading independently in the UK, Concrete Canvas relied on licensees in the US and Canada, where they also have R&D arrangements. Although it may be difficult to 'generate substantive revenues through licensing' as claimed by Clarysse and Kiefer (section 3.7.7), this confirms that licensing can help to expand the business into territories, to which the designer-entrepreneur has no direct access (section 3.7.7). With respect to market power (section 3.7.7) Brewin explains that "… there is a certain amount of weight having some large multi-nationals standing behind you, as well, in terms of being able to protect our IP." (Brewin, 2013)

Brewin addressed a fundamental aspect related to the significance of IPR at the outset:

> "As a start-up you have no real value, you have to convince people. And, in order to do that, you have to build up lots of evidence such as winning competitions, and generating press attention, things like that, to build up credibility through different sources, and it is very difficult to do that if you don't have protection of the idea, because the patent [idea], once disclosed, you are then unable to get a patent."
> Brewin, 2013

This statement related to PR and competitions highlights that Brewin and Crawford benefitted from the signaling effect which was mentioned in section 3.7.7. The paragraph above confirms that the strive for market power and the possibility of licensing out novelties can also become significant to design-led ventures. By 2013 Concrete Canvas had become an established firm.

Conclusions / predictions

Knowledge and experience, and the way this is shared and exchanged with customers can be an important development aspect. Brewin explained that the development of new applications for Concrete Canvas are often incentivised by the firm's distributers. The latter are approached by customers with specific challenges that can be addressed through the use of Concrete Canvas. The technical support provided by the team behind Concrete Canvas is combined with a collaborative approach to resolving the difficulties experienced by the distributors' clients. Following initial case analyses, entirely new applications can be developed. Brewin described Concrete Canvas as "a new plan for construction rather than a product in itself." (Brewin, 2013)

Concrete Canvas make use of open innovation principles. Brewin's statement further indicated that Concrete Canvas is a typical technology-push venture, which means that the idea surrounding the technology preceded its application. According to Brewin the technology-push incentive existed from the outset, even during the phase of exploring the idea of a sheltering solution (Brewin, 2013). During this early phase, the company was helped by one of their suppliers, Walkerpack, who provided Concrete Canvas with free use of a disused factory. Accessing complementary assets without incurring costs is of great benefit to a start-up that is strapped for funds.

What the Concrete Canvas case highlights is that collaborative development arrangements including strategic partnerships can lead to access to complementary assets, which are particularly beneficial in conjunction with technology-push ideas, for which the market is usually unclear at the outset. Both aspects, access to complementary assets as well as collaboration, which in this case involves open innovation, benefit from the ownership of exclusive IPR because IPR secures the designer-entrepreneur's position within the collaborative framework.

5.1.7. RoboFold

Nature of invention Founder Inception date	**Metal folding process** **Gregory Ebbs** **2007**
No of patents No of registered designs No of registered trade marks	**4 (40 including international filings)** **1** **6 (registered as images)**
Problem Strategy	**No specific product, complex market environment** **Free software support, service element (workshops), customer support, collaboration**
Development stage	**Established, 1 FT staff, 2-3 intern, trading, pre-break even**

Figure 39: summary information for RoboFold

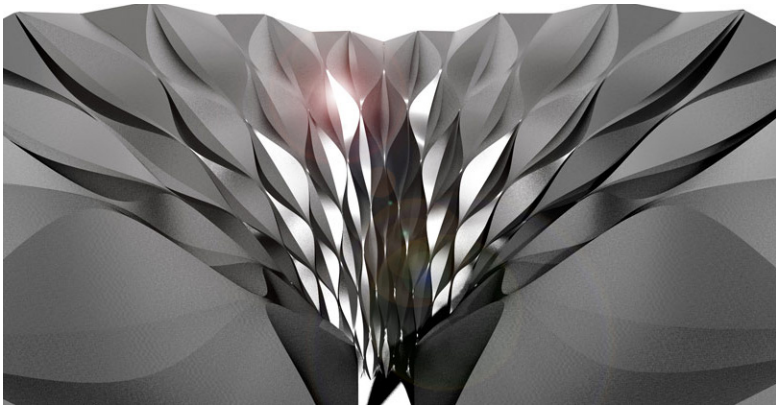

Figure 40: A metal-fold solution created for Zaha Hadid

Business proposition and history

In 2007 Gregory Ebbs, the company founder of RoboFold, invented a process to form metal that does not require mold-tools. Aluminium sheets are first scored using CNC cutting, which allows for them to be bent along curved lines using 6-axis industrial robots. The movements of the robotic arms are controlled through bespoke software components, which are developed in a software application called Grasshopper3D and thus can be used within Rhino3D. Ebbs patented the process in 2007. Thereafter RoboFold has built on approximately £140K of investment obtained from the Design London incubator and family members. A combination of consultancy work, commissions and workshops allowed the company to become self-sufficient. But equity returns were still due in July 2013.

Not being able to patent the software needed to coordinate the metal folding process, appears a big disadvantage for the designer-entrepreneur because it makes it more difficult to secure exclusivity. But it has opened up new possibilities in relation to the business model. RoboFold offers workshops and develops software in collaboration with users. At times RoboFold gives the software components for free. Sometimes they are sold. Where possible, secrecy is used to sustain exclusivity. Attempts to get sponsorship from the company behind Rhino3D have failed. The added value, which the latter would get from supporting RoboFold, appeared too low. Nonetheless Ebbs promotes his invention alongside this established firm at trade fairs and conferences. Similarly to Arctica, this case shows how market power imbalance can pose threats and limit opportunities to form strategic partnerships with existing incumbents. The RoboFold process has been promoted within London colleges and universities to nurture future demand, not unlike Cupris. Despite a high environment uncertainty, which may have compromised RoboFold's commercial progress, there is some competition. Following the grant of the US patent, Ebbs is thinking of approaching overseas competitors to makes sure that IPR is not infringed. The advantage of the market uncertainty is that there is little if any risk to be edged out by incumbents. Environment uncertainty can be a mixed blessing for the design-led start-up.

IP held and problems and benefits

Ebbs filed his process patent in 2007, just prior to his graduation. The software needed for the process cannot be patented within Europe because The European Patent Convention excludes computer programs (The European Patent Office, nd). However, exclusive access to the process itself is hoped to suffice to sustain exclusivity. Ebbs confirmed having extended the process patent to various EU countries as well as to the US. This came at a high cost. In order to avoid shredding too much equity during the very early stages, Ebbs chose to pay for the patent filing and the maintenance, rather than to rely on the financial support of the RCA.

Ebbs considers his process patent as necessary "Because if we ever want to exit we need to have something to sell other than our order book." (Ebbs, 2013) He explained that "If you develop the technology, then you create potential value, and that potential is protected by a patent…". However, one could argue that this potential value is as probabilistic as is the IP, to which it relates. Only sales provide reliable credibility, in particular if an innovation is aimed at an emerging market. On the other hand, without IP the venture's value growth will be limited in proportion to the sales and marketing efforts.

Ebbs has registered a number of trademarks, but had to resort to figurative ones, because the word 'RoboFold' is a descriptive term, and therefore does not qualify for a trade mark. Only its specific figurative representation could be secured. However, none of the trademarks on the register resemble the one used in RoboFold's PR. Changes to the corporate identity seem common in the early stages of a business development, as the proprietor only gradually builds a full understanding of the business characteristics and branding requirements. There seems little benefit in focusing on branding in the very early stage of a design business development.

RoboFold could develop designs, be they finished products or modular components, which could be secured through registered design rights. Identifying useful designs and sizeable markets for these is

far from easy though. Instead income is currently generated through consultancy and one-off projects, and participatory design methods are used to further develop the service provision needed to attract clients.

Conclusions / predictions

Whilst understanding the value of IPR in terms of growth prospects, Ebbs criticises the early-stage version of the Design London Incubator for an exaggerated focus on investors. He argued that sales should have been given greater attention and explained that "if you get sales, you get investment". (Ebbs, 2013) This makes it clear that the incubator management affected the designer-entrepreneurs' decision making, and that views on the relationship between IPR, sales and investment differ amongst designer-entrepreneurs and business coaches.

Ebbs further explained that he "found investors particularly unpleasant at times". (Ebbs, 2013) This point falls in line the views of some but not all other designer-entrepreneurs. Although not at the core of this inquiry, the involvement of investors can be a mixed blessing. Whilst the investors' influence on the decisions can be compromising, their networks may help connect with industries and to secure access to complementary assets. The reason why the role of investors is of interest here is because their potential involvement and the funds available through investors are closely connected to the availability and value of IPR, patents in particular.

Ebbs seeks to build his business around a licensing strategy, which inevitably requires IPR of some sort. But the markets surrounding RoboFold do not seem clear. A wide variety of applications are under consideration, from the automobile industry and boiler covers to furniture and architecture, making the market environment seem very uncertain. Although the diversity of applications of processes and materials can be beneficial to the venture's growth prospects, diversity can lead to a lack in focus, which in turn can slow down the development of complementary assets. But Ebbs argued that there is a need to get into the mainstream for risk-averse companies to develop interest in your goods (Ebbs, 2013).

After five years, RoboFold remained still under development. Ebbs explained that "the majority of the business is focusing on software developments, because that's what tells the robot what to do" (Ebbs, 2013). As patenting the software is not an option, Ebbs focuses instead on building customer relations through participatory design efforts. RoboFold stages workshops to train designers in the use of the technology, where knowledge is shared to develop a loyal customer base. The software required is provided either against a fee or for free. Only the key component, the process per se, is secured. How robust the IP is awaits to be seen. Process patents are often regarded as comparatively weak. 'For new processes… patents were generally rated the least effective of the mechanisms of appropriation' (Levin, et al. 1987, p.794). The question how difficult and expensive it may be to litigate possible infringement here is difficult to answer. Like Yossarian Lives!, RoboFold had to prioritise assets other than IP. Constantly growing know-how and the pro-active development of customer relations dominate the strategies here.

5.1.8. Squease

Nature of invention Founder Inception date	**Medical garment** **Sheraz Arif, Andy Brand, Menno Kroezen, Katrien Ploegmakers** **2009**
No of patents No of registered designs No of registered trade marks	**0** **1** **1 (registered as a word)**
Problem Strategy	**No existing market** **Complexity of design, direct sales, overseas distributors**
Development stage	**Developing, trading at a small scale, 3-4 people**

Figure 41: summary information for Squease

Figure 42: The Squease vest with and without the hooded top

Business proposition and history

Squease was founded in 2009 by a team of four, Sheraz Arif, Andy Brand, Menno Kroezen, Katrien Ploegmakers, who invented an inflatable pressure vest that can be hidden within a trendy hooded top. The product was aimed at people with sensory difficulties such as autistic children, who can use

Squease to reduce anxiety in public environments. The founders tried to file a patent, but encountered difficulties, one of which related to the patentability of the idea. The principle of using pressure to reduce anxiety was already known, which was why there was an initial confusion about what precisely the patent should cover. The main novelty was the layout of the pressure elements. However, there were doubts that this would suffice for succeeding with a patent application. The patent underwent various stages of iteration, but was perceived as weak by the designer-entrepreneurs (Arif, 2013). The costs involved in continuing their patenting strategy as well as the potential risk of failing with their patent application were too high for the founders to sustain their confidence in the patent. In agreement with their investors, the team behind Squease decided to discontinue their patent application.

Instead of patenting, the market ecology was the priority here. To foster this, Squease initiated a rental scheme that allows potential buyers to rent the product for a period of two weeks or more for a small fee, prior to making the purchase. If the product is then bought, the rental costs are taken of the purchase price. Liaising with customers not only helped to educate the market, it also kept the team behind Squease motivated. Squease also developed a supply chain. Without that, and without a distribution network, imitators cannot compete. Instead of relying on exclusive IP, Squease counted on their speed to market, which was introduced as an alternative to formal IP in section 4.4.3, the complexity of their product as well as on their complementary assets, i.e. their suppliers and distributors, in order to secure their market advantage. This is unusual for a design-led start-up, and mainly possible through the discovery of a new niche market. Speed to market is sustained not so much through development pace, but through the market uncertainty, which makes it unattractive for imitators to compete. Squease have been selling their product online, but also secured distributors abroad, including in South Africa and Australia. Despite the limitations in the market size, Squease did not seem to far from break-even in 2013. Avoiding the patent route and bootstrapping helped to reduce development costs, which in turn made it easier to reach profitability.

IP held and problems and benefits

Arif admitted that "it [the patent] was purely a mechanism for getting investment." (Arif, 2013) To the question whether or not one has to have a patent in order to secure investment, Arif responded that it provided a degree of 'comfort' even though it was still in the early stages of the application stage. According to the entrepreneur, investors never asked what exactly the patent protected, within which context it was filed, and how easy it would be to enforce (Arif, 2013).

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[21] According to The European Trademark and Design Network (nd), the Squease design was registered in July 2014, i.e. after the interview took place. The registration document suggests that a legal representative, Strategem IPM Ltd, was used for the filing process. Seven photographic representations were used to identify the design. Seven constitutes the maximum permissible number of visuals that can be submitted. However, the design right can be perceived as weak. There is a chance for competitors to invalidate it on two grounds: A) The product was in the public domain prior more than one year prior to the filing date. B) Many of the visual characteristics serve a functional purpose, and functional aspects cannot be protected through design rights. During the interview, Arif seemed aware of the weakness in the protection. Therefore the focus was shifted towards complimentary assets for the benefit of value chain control.

In line with other interviewees Arif raised questions about the legal value of a patent. He claimed that "if you have the money to invest in a patent as a start-up, you probably do not have enough money to enforce it later." However, the Squease pressure vest would be very difficult to reverse-engineer, due to the complexity in its design[21]. And yet Squease is not without competitors. But there are few in the field, and the market is still evolving. As Squease is aimed at a niche market, chances for imitators to become a threat are very limited, as too much uncertainty surrounds the market.

At the time of the interview, the inventors were already aware of a variety of weighted vests and blankets designed for the same purpose as Squease. The product that seems particularly similar in terms of its concept and functionality, is the T.Jacket, a garment that was developed and taken to market in 2011 by Dr. James Teh, an engineering graduate from the National University of Singapore (Ho, 2015). Although the T.Jacket was invented two years after Squease, the geographic distance makes it likely that this is a case of an inadvertent 'near duplication of R&D effort by [a] rival firm' (Levin et al., 1987), where similar novel concepts emerge independently from each other. The concept behind the T-Jacket is very similar to Squease: a hoody that conceals a technology that exerts adjustable air pressure onto the wearer's torso, and which is aimed at an audience with psychological disorders (T.Ware, nd). As the team behind Squease dropped their patent, meant that T.Ware had freedom to operate. Although Squease is noticeably cheaper with a price of £249 (Squease, nd) as opposed to the T.Jacket which costs between S$549 (£296) and S$799 (£439), the latter benefits from an app that allows the device to be controlled via smart phones (T.Ware, nd). Andy Brand confirmed having been aware of T.Jacket, and that Squease did not take any action, since the competitor seemed largely inactive (Brand, 2018). Other competing products were also identified, including one in the US. Squease grew little, and nine years after inception of the business, some of the founders still do not draw any salary. Brand expressed the team's hope to sell out to a US-American firm (Brand, 2018).

Conclusions / predictions

The Squease case was too underdeveloped an invention to be patented. It started as a need-pull initiative that focused on the needs of children with autism. Whilst it was not clear to the design team, what the patentable element in the design proposition was, its complexity and the focus on a niche market helped to protect the innovation. A patent was said to have a psychological benefit (Arif, 2013), as it helps to build confidence.

Like KwickScreen, the founders shifted their focus very early on from IP to manufacturing and sales. It seems that the availability of complementary assets, or the lack thereof, the nature of the novelty as well as various other development criteria are strongly interlinked. In order to establish under what circumstances a design-led start-up should or should not file for patent will require the identification of these attributes, and an analysis that reveals how these attributes are interconnected.

The Squease case makes it clear that there is a difference between need-pull and demand-pull, because research has revealed a need where there was no market demand. The latter needed to be pushed. In niche markets accessing complementary assets is easier than in mainstream markets. The necessity of exclusive IPR is much reduced.

5.1.9. Orbel

Nature of invention Founders Inception date	**Medical device** **Adam Sutcliffe (inventor), Damian Song** **2006 (first patent)**
No of patents No of registered designs No of registered trade marks	**2 (9 including international filings)** **2 (6 including international filings)** **2 (1 registered as a word, 1 registered as an image)**
Problem Strategy	**Long development period without sales** **Seed funding, followed by investment rounds, partnership with a manufacturer with a distribution network**
Development stage	**Developing, 3 PT staff**

Figure 43: summary information for Orbel

Figure 44: Orbel

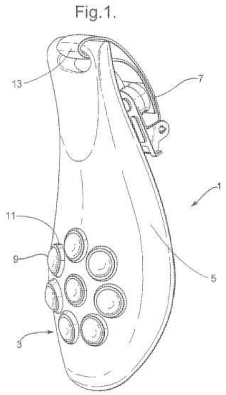

Figure 45: Orbel, 1st patent (no GB2439061), filing date: 19/12/2007

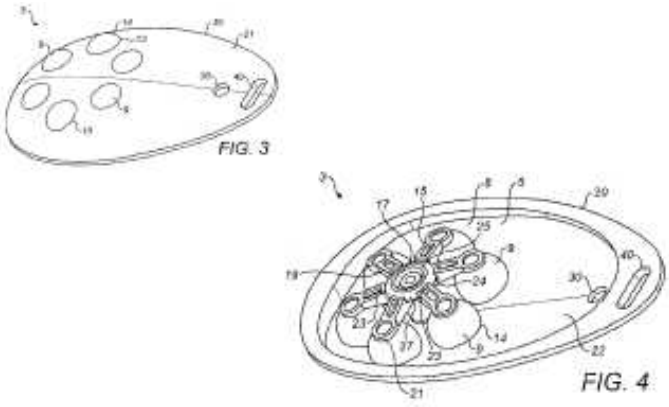

Figure 46: Orbel, 2nd patent (no GB2497097), filing date: 05/06/2013

Business proposition and history

Orbel Health is a hand sanitiser aimed at use in hospitals to reduce the risk of bacterial infections such as MRSA. It dispenses a disinfectant solution from a small palm-sized container that can be clipped on to the clothing of a health care professional. This allows for the disinfectant to be available at any given time with no time required to attend to a stationary wall-mounted dispenser. The fluid dispenses through a number of balls which rotate as the healthcare practitioner's hand slides across. It requires only one hand to get the device to release the disinfectant fluid, leaving the other hand free to perform other actions.

Orbel is one of the oldest RCA incubator businesses examined within this thesis. Having started developing his invention in 2005/2006, Adam Sutcliffe, the inventor, pitched twice for incubation at Design London. In 2007 he applied on his own and failed to get accepted. In the following year he joined forces with Damian Soong, an Imperial College MBA graduate, and succeeded. The venture exited the Design London incubator and completed its first successful trial with the National Health Service in 2010. In 2011 the team of two secured angel investment from the London Business Angel Consortium. Sutcliffe advocated the registration of designs and argued that "You are less likely to get investors to invest without [them] seeing something" (Sutcliffe, 2013). In 2012, Orbel Health re-entered the RCA incubator, which by then had been integrated by InnovationRCA after Design London had come to an end.

IP held and problems and benefits

By the end of 2013 the venture had raised £675K in total: £75K in 2007, £250K in 2011, £350K in 2013. A design flaw meant that redesign became necessary to prevent the device from dispensing an excessive amount of disinfecting gel. The first design did not hold the balls in place, therefore too much fluid was dispensed. The second patent provides a supporting structure that makes sure that the balls can rotate without being pushed deeper into the container. This is why a second patent had been filed in June 2013 to complement the first (figure 46). With two patents in place, about £120K per

year were being spent on patents (Sutcliffe, 2013). The costs built up due to the fact that the patents were filed internationally, covering Europe the US, Australia, Hong Kong, Japan, Argentina, Australia, South Africa and China (appendix 5).

Conclusions / predictions

In 2013 the product was due to be manufactured in China by a firm who was also considered to be a potential distributer at the time. Giving away control over both upstream and downstream value chain elements can be risky. However, if Orbel Health can rely on their appropriability regime, which is strengthened through their extensive IP portfolio (appendix 4), they have a strong set of complementary assets, as their business partner was said to own two filling lines, one in China and one in the USA (Sutcliffe, 2013). Sutcliffe expressed hopes that the distributor's investment in a minority share of the Orbel Health Limited, would mitigate the risk of by-passing the start-up. This suggests that strategic partnerships can help mitigate the risk of IP infringement through third parties.

Sutcliffe speculated that infringement in China was "going to be an issue" (Sutcliffe, 2013), and went on to argue that in China design patents are more common, and that these are easier to enforce than ultility patents (Sutcliffe, 2013). Given the IPR comparison discussed earlier (section 3.7), this is a questionable point of view. Sutcliffe referred to the InnovationRCA incubatees as "an intricate group where they believe that one would need to have a patent. Patents [were thought to be] the only commodity which A) are going to protect, and B) has a value in its own right, which is not true. Every form of IP has value in its own right" (Sutcliffe, 2013). Therefore Sutcliffe proposed that a combination of various forms of IP should be at the focus of attention, for example to file for a patent in the early stages in order to secure investment, and then to neglect the patent in favour of registered design rights (Sutcliffe, 2013). However, the IPR comparison in section 3.7 makes it clear that patents and design registrations are not interchangeable. They do not constitute alternative options. Aesthetic qualities are excluded from patent protection, unless 'the feature relates to a genuine technical effect' (UK Government, 2016, paragraph 219), and the functionality from registered design rights (UK Government, nd b). This beckons the question how shifts in emphasis between from technology and product language are best strategised.

5.2. Qualitative data 1: Analysis

Most of the designer-inventors who were interviewed perceived patents as a prerequisite to initiate a proprietary venture. All interviewees testified that there is a dependency between the acquisition of seed investment and the ownership of patents. However, some decided to abandon a patent-route early-on.

There is a noticeable difference between the businesses who use few or no patents — either because their novelty does not qualify for a patent-route, or because they perceive their patent as flawed — and minimal funding: Yossarian Lives!, KwickScreen, Squease, and those who opt for patenting strategies, which significantly increases the funding needs: Concrete Canvas, Seaboard, Orbel. Those who opt out of patent protection, work without or with limited equity investment and reduce their funding needs through a bootstrapping approach. Income obtained through freelance work or teaching helps some of these designer-entrepreneurs to cover living expenses and other financial needs are limited to the best degree possible. All three ventures with minimal funding, Yossarian Lives!, KwickScreen, Squease, secured revenues through early sales. This is confirmative of the first preliminary hypothesis (section 4.4.3), which suggests that focusing on sales and marketing generates revenues faster, but may limit the business growth potential. The level of revenues of Yossarian Lives! and Squease were low when the first interviews took place (2013), and have been confirmed as low in 2017 for Yossarian Lives! (Neeley, 2017), and in 2018 for Squease (Brand, 2018). On the other hand, KwickScreen had reported significant revenues in 2013 (Anscomb, 2013), and the business has grown noticeably in the following years (Anscomb, 2018)

Designer-entrepreneurs who pursue a patent route, spend much time on developing and implementing patent strategies which limits the time available for analysing and engaging their target markets. They also focus on raising equity investment with a view on filing for patents in a variety of countries, such as Concrete Canvas and Orbel. Self-funded non-patent ventures seem to focus on sales earlier, perhaps because they need to in order to avoid the need for equity investments. Designer-entrepreneurs in pursuit of a patent route need to invest a lot of time and resources in managing the IP and forging strategic partnerships. This can delay PR and sales efforts, none-the-least because secrecy with respect to the technical novelty is required in the run-up to a patent application (section 3.7.3).

None of the interviewees, not even those who invested in patents, expressed much confidence in the patenting process. This is generally perceived as time consuming and cost-intensive. There is a shared understanding that patents cannot be defended by an early stage start-up if infringed by a third party.

5.2.1. Comparative examination of case studies

This first subsection examines case-study-related observations by comparison. Arctica is excluded from this part of the analysis because it was sold to an incumbent during its early development.

With the exception of Concrete Canvas, all ventures benefitted from a degree of seed funding which was capped at £75K during the Design London Incubator phase. However, three of the ventures —

Yossarian Lives!, KwickScreen (and Romulus), Squease — soon converted to a bootstrapping approach which meant that they limited their costs to the best degree possible in order to avoid the need for equity investment or debt. Roli, Concrete Canvas and Orbel used an equity-intensive strategy. Robofold and Cupris sit between both categories with some investment used, but not to the level at which Roli and Concrete Canvas have. The ventures' funding approaches were first assessed in 2013/2014 with a view on the development stage of each respective venture. This observation indicated a dichotomy between funding-intensive start-ups and those who sought to limit their funding needs as much as possible. This dichotomy is a known in the context of business management. Deshpande, a scholar from Temple University in Philadelphia US refers to aspirational businesses if they deploy a 'more aggressive [approach] with higher initial expenditures' that is aimed at 'much higher revenues and profits and the ability to better compete' than businesses who deploy a lean boostrap approach (Deshpande, 2018, p.382f).

The IP reliance is assessed in relation to the range of formal IP obtained by individual start-ups. Concrete Canvas, Roli and Concrete Canvas own multiple patents in a variety of territories, multiple registered design rights, and registered trade marks. This shows a high reliance on IP. Yossarian Lives! Robofold and Squease de-emphasised their formal IP, whereas Cupris and KwickScreen make use of formal IP to some extent.

	IPR focus	funding needs
Seaboard	high	high
Concrete Canvas	high	high
Orbel	high	high
Cupris	medium	medium
KwickScreen	low	medium
Yossarian Lives!	low	low
RoboFold	medium	low
Squease	low	low

Figure 47: Funding strategy versus IP strategy

The table above (figure 47) shows a relationship between IP reliance and funding needs. The assessment of the former is based on the IP portfolio (mainly patents, design rights), as well as on verbal comments. In six out of nine cases, there is a strong coherence between the need for equity investment and the reliance on formal IP as hypothesised in section 4.4.3. This illustrates the conundrum surrounding IP dependency and finance needs, highlighted in section 4.4.3.

5.2.2. Investors and funding

As highlighted above, there is a shared perception amongst designer-entrepreneurs that patents enhance the chances of securing angel investment, even if the patent remains subject to approval. To verify whether or not these perceptions are justified, or if these are erroneous assumptions, investors' views had to be taken into account. During an investment pitch event at the Dyson Centre in London Battersea on 10 December 2013, four angel investors were spoken to. The event was organised by the London Business Angel Association (LBA) in collaboration with the RCA. Three of the angel investors, whose names will be treated confidentially, stated outright that patents mattered. Two of those three labelled them as "pretty important" (appendix 6). One of these two further explained that a patent helps making sure that the innovation does not infringe the rights of third parties. This too may be a misjudgment, because a pending and even and approved patent is only perfectly reliable following a successful defense in court (section 3.7.6). Other criteria came to mention, such as the proximity to market, not because of the urgency to generate returns quickly, but to limit the number of investment rounds, which lead to a dilution in equity. The fourth angel spoken to stated that the relevance of patents depended on *the sphere* (appendix 6), which means that the entire situation needs taking into account. The sphere can be related to Teece's appropriability regime (section 3.1), to his concept of the dominant design paradigm (section 3.2) and to Clarysse and Kiefer's IP entrepreneurial strategy matrix (section 3.3) which maps ventures in relation to environment uncertainty and environment complexity. Although the data used in support of the points discussed in this section is limited with only eight case studies and four conversations with angel investors to draw from, the information obtained suggests that patents provide an effective signaling effect that enhances the designer-entrepreneur's prospect of securing equity investment. Market proximity, which can be measured based on sales, orders, or expressions of interest, increases a ventures credibility. A conversation with John Hutton who joined Cupris as Business Development Manager in 2013, suggests that early patenting may delay market entry (Hutton, 2013). Whilst market proximity and patent ownership both matter, both attributes may stand in conflict with each other during the early stages of a business development.

Angel investment differs from venture capital in that the latter is a usually higher budget covered by a range of investors who are represented by a venture capitalist. One such venture capitalist, referred to in this thesis as Expert 6, confirms that "Angel investors do want to see patents, and they get very nervous when they do not see patents. And that is much due to the lack in sophistication of investors, and especially of those angel investors." (, 2014) He further explains that "… when you hear investors or incubators say: Patents are the most important thing, it is because it is the only tangible thing that they can actually articulate." (Expert 6, 2014) Expert 6 highlights the value of secrecy, while Expert 1, another venture capitalist, points out: "I have 14 start-ups in my portfolio. None of them have filed patent. None of them …" (Expert 1, 2013) The designer-entrepreneurs' wide-spread fear of having ideas and concepts adopted by third parties when conveying details to investors is not justified according to Expert 1 who explains that "Companies need to have the strategic intent to want to do something in this area …" (Expert 1, 2014). Angel investors and venture capitalists do not develop ventures themselves, which is why they are not in the position to adopt and exploit the IP of others. "The goal [of investors] is to invest, it is not to start their own companies, and they are not going to take your idea" (Expert 1, 2011).

Investibility

Expert 1 highlights three key criteria for judging the investibility of a venture:

- Team (Backgrounds, experience, interpersonal relations)
- Target market (Scalability of business)
- Technology

These three areas in combination with finance and IP help to later organise business development attributes, when analysing the qualitative data in greater detail.

Some of the ventures discussed above sought equity investment, others chose to limit costs to avoid shredding equity. Expert 1 confirms that "Not everybody needs capital… many ideas are not capital consuming, so you don't need them… there are other sources of capital, which are called *smart money*, and that are more valuable than venture capital" (Expert 1, 2013) So focusing on bootstrapping and deploying a sales-approach can be advisable. In relation to sales, Expert 1 explains: "You are not an entrepreneur because you raise money, but because you make money. … none of them sold their company. They say: In my first run I raised 1.7m. How much money have you made already? … and this is something that puts me off a lot." She further points out that "Venture capitalists track entrepreneurs and companies" which is why direct sales experience is of importance (Expert 1, 2013).

In light of the above we may assume that the costs and time required to pursue a patent route can only be justified if the long-term business development trajectory is significantly greater than that which a venture would be experiencing without patent protection. The relationship between business success, i.e. business growth, and patenting, or IPR in general, requires further examination. Judging by the responses of the interviewees, there is little middle ground, which would allow designer-entrepreneurs to mitigate the funding requirements and the associated risks without outright abandoning patent protection. Expert 1 explains: "Patents are there to defend your business. But there are other ways to defend your business." (Expert 1, 2014) So what are the alternative routes to defend your business? The above analysis suggests that the designer-entrepreneur has the choice whether to opt for a sales-oriented business development strategy and opt for a bootstrapping approach, or for a patent-based business development strategy, and pursue an equity investment route. Whilst sales-driven strategies appear speed up the route-to-market as hypothesised in section 4.4.3 (preliminary hypothesis 1), it is not clear whether or not this limits the business growth potential as suggested within the same hypothesis.

5.2.3. Qualitative data 1: Summary

As illustrated in figure 45, the strong inter-dependency between IPR investments and funding needs articulated in section 4.4.3 is evident in the responses of the interviewees. However, whilst their perception that patents are a prerequisite to secure investment is shared by angel investors, it is not shared by venture capitalists. Designer-entrepreneurs who de-emphasise or abandon patents seem to reach markets earlier, which confirms that tech-led strategies harnessed through patents require more development time by comparison (preliminary hypothesis 2 in section 4.4.3). Complementary

assets such as exclusive access to materials (e.g. KwickScreen) and facilities (e.g. Concrete Canvas), and access to distribution networks (e.g. Squease, Orbel) can be equally, if not more significant than IPR. This relates back to the *sphere* mentioned above. However, patents can facilitate the access to complementary assets. In the least they may enhance the designer-entrepreneur's bargaining position, be it just due to the confidence which they help generate amongst the patent owners.

The investors' expectations towards IP as articulated above have an influence on the perceptions of the designer entrepreneurs and their mentors. However, this does not prove that patents are actually beneficial to the venture's success prospects. Many of the designer-entrepreneurs interviewed above express doubts about the real benefit of patents. The interviewees also concur in claiming that patents are expensive and time consuming to obtain. Furthermore, patent infringement is perceived as difficult for micro-scale start-ups to litigate due to the lack of capital, and some of the angel investors highlighted this, thus confirming the designer-entrepreneurs' assumptions.

In light of the points made by the venture capitalists, we may argue that avoiding the sacrifice of equity when sourcing seed-funding through bootstrapping or smart funding strategies, does not rule out the possibility of securing venture capital funding at a later stage, in particular since venture capitalists do not rate IP quite as high as angel investors do. This means that bypassing IP at an early stage does not automatically limit the potential business growth trajectory.

Patenting can slow down the development of start-ups. Those inventors who de-emphasise the patent route, seem to be more sales-oriented and they generate revenue at an earlier point in time which confirms the preliminary hypothesis 1 in section 4.4.3. This suggests that there could be alternative start-up business development routes. The benefit of patenting beyond the need to secure equity investment requires further investigation.

5.3. Theory component 1: towards a reference framework

One of the three key questions in section 4.4 asked what other key development factors determine the commercial success prospects of a design-led start-up business? Sections 5.1 and 5.2 discussed the data obtained through semi-structured interviews in the context of some of the insights obtained through literature reviews. To allow for a more objective approach towards dissecting the diverse key concerns expressed by the designer-entrepreneurs, the interview transcripts were scanned for concept references irrespective of existing theories in a second-stage analysis to highlight the ideas and perceptions that were shared amongst the designer-inventors. As explained in section 4.1.3, the process deployed here was defined in line with Grounded Theory coding principles.

Step 1: Concept labelling — identification of significant data

This step was referred to as *open coding* in the methodology (section 4.1.3). Notable concerns, i.e. concepts that came to mention during the interviews, were highlighted in the transcripts. Significant keywords and sentences were extracted, and listed in chronological order in a spreadsheet under the heading ***concepts***, keeping in mind the context within which the keywords were used (appendix 7.1). It mattered, for example, whether words such as 'insights' or 'learning' were used in conjunction with 'market' or 'technology' or in general. Responses to directed questions were not included to reduce the risk of confirmation bias.

A ***value*** such as 'timing' was sometimes affixed to the concept term (e.g. patent) to ensure that the context within which the concept was articulated, was retained. The *value* was specified in consideration of the possibility that the emerging reference framework could be used for evaluative purposes. Where a *concept* was mentioned repeatedly in consecutive order, it was listed only once, and note was taken of the number of iterations. Repetitions due to speech patterns were not counted.

Following this process, ***labels*** were assigned to the concepts in a separate column considering the context within which the respective *concept* was mentioned. The labelling was done in preparation of the alignment of concepts. Terms like 'insights' or 'learning' would be labelled as 'knowledge', for example. Whilst the *concepts* were literal interview extracts, the *labels* used synonymous or semantically closely related terms to reflect the meaning of the corresponding *concepts*. Where possible the exact wording was retained. Changes were made only for the benefit of aligning similar concepts.

Step 2: Variable definition — categorisation of concepts

This step was referred to as *axial coding* in the methodology (section 4.1.3) Following the labelling of concepts, a process of transcription was undertaken to further enhance the alignment of *concepts* that were articulated by different interviewees. In a process of abstraction, the *concept labels* were divided into ***meta variables*** and ***sub variables*** (appendix 7.2). For instance, the *concept* 'We started in 2007, and we traded it in 2008' was labelled as 'business life-cycle'. The latter was subsequently

translated into ‘business’ (meta variable) and ‘development stage’ (sub variable). To prevent an over-generalisation, an ***extension*** such as ‘early stage’ or ‘established’ was also added in some cases.

Step 3: Organisation of variables

This step was referred to as *selective coding* in the methodology (section 4.1.3). After the meta- and sub-variables were specified and copied into new spread sheets (appendix 7.3), one for each venture, with extensions assigned where appropriate, the labels, concepts and values were deleted, and the lists were arranged in order of the meta-variables. It emerged that all sub variables could be listed under a very limited number of meta-variables: assets, business, finance, IP, market, proposition, and team.

Step 4: Frequency analysis

After the meta- and sub-variables were clearly identified with respect to each individual venture in separate spreadsheets, the sub-variables from all interviews were transferred into one single spreadsheet, where they were listed vertically in a number of columns, each of which represented one of the ventures. Vertically the sub variables were divided into seven groups representing the meta-variables (appendix 7.4). If a sub-variable was mentioned more than once during the interview, a term was entered that was representative of all relevant concepts, and the number of iterations was entered in the spreadsheet. Where a sub-variable (concept) was mentioned in different interviews through the same or similar terminology, the sub-variables were arranged in one row horizontally (appendix 7.4). In light of the sub-variables listed within each row, a summative keyword, a summative sub-variable so to speak, was entered into a separate column to better represent the variety of corresponding keywords found across all interview transcripts. This was done to enhance alignment of concepts. For examples, references to ‘competencies’ were listed under ‘knowledge / expertise’, as were all references to either of the latter two concepts. In line with Strauss and Corbin (1990, p.68f) ‘in-vivo codes’ were used where appropriate. Although it has to be acknowledged that this may introduce a degree in bias, it facilitated the discussion of the interview insights in relation to other research findings and to discuss the research outcomes in the wider context of innovation studies. The aim behind this process of concept labelling was to lay the foundations for the development of a hypothetical framework of key concepts.

Step 5: Summative analysis

During this final step, the meta-variables — team, proposition, IP, finance, assets, market — were aligned horizontally at the top of a new single spreadsheet. The sub-variables were listed beneath irrespective of the venture, in relation to which they came to mention (appendix 7.5). Formulas were used to calculate how frequently these sub-variables came to mention during all of the interviews combined, and the listings were arranged such that the most frequent sub-variables were located at the top of the list, and the least frequent ones at the bottom. The meta-variable ‘business’, as well as their respective sub-variables were merged with ‘team’, since the corresponding sub-variables

suggested that there was little conceptual difference between the issues that were addressed in both categories. It is important to acknowledge that this comparative case study was not meant to be a statistically representative analysis. The number of cases would not suffice. It was merely aimed at developing a framework of references that are grounded in original data.

Step 6: Categorisation of variables

One could argue that all concepts are somewhat correlated. However, some may be more closely interlinked than others. To develop an overview over how the variables are related to one another, the meta variables developed in steps 1-5 were mapped in a diagram.

Expert 1 listed three key investibility criteria (see section 5.2.2): *team, target market, technology*. Some of the transcribed summative sub variables fall neatly into these three categories:

- *Knowledge / expertise / competencies* as well as *commitment, credentials* etc. connect with the variable *team*
- *Public relations, target audience, competitors* etc. were concepts found under the variable *target market.* The prefix *target* was dropped since a lot of the concerns aired during the interviews preceded the selection of a target market / audience.
- *Development pace / incentive, product development*, as well as *ideas / concept / novelty* can be allocated to *technology*. The concept technology was replaced with the term *proposition*, so that its coverage could be extended to include *design*. The ambition behind including design (in the sense of product language) was to not limit the inventive aspect to technology alone.

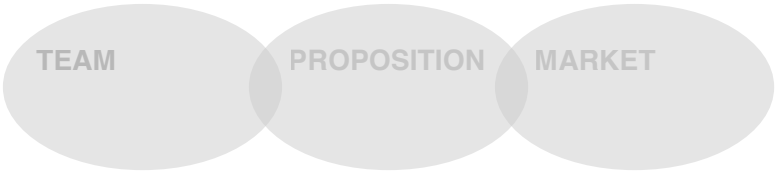

Figure 48: The identification of variables within this venn diagram was based on the most simple premise: a design team (or lone inventor) incepts a design proposition, which they (or he or she) take(s) to market.

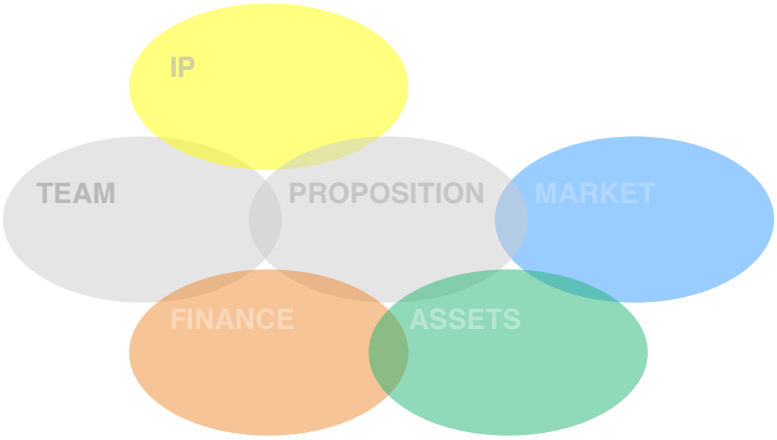

Figure 49: Here three variables were added: IP, finance and assets, the variables in relation to which Expert 1 had discussed the significance of team, proposition and market.

Step 7: Mapping of variables

As explained above, keywords have been gathered and organised as part of the concept coding prescribed by Strauss and Corbin. Instead of using the term concept, this thesis refers to *variables* from here-on. The reason for this is two-fold:

- These concepts specify uncertainties which the designer-entrepreneur needs to manage over time. A variable, as opposed to a concept, is by default changeable, and the anticipated framework is to be designed to manage this change, and to develop the design business attributes in such a way that the established phase can be reached, and a foundation for stability and long-term growth be built.

- The second reason for using the word *variable* instead of *concept* is to be able to connect the framework development process with John Creswell's idea of theory positioning (Creswell, 2014, pp.51ff). Creswell discusses the correlations between *independent variables*, *intervening variables*, and *dependent variables* (Creswell, 2014, p.56), as explained in section 4.1.3. Creswell discusses this process in conjunction with quantitative studies. The amount of data collected within this study does not allow for a statistically representative analysis. However, the objective of this thesis is the development of a theoretical framework of business development attributes rather than the validation of an existing theory, which justifies a degree of speculative quality.

Most of the key concerns unveiled during the interviews with the nine designer-entrepreneurs can be mapped against the three criteria mentioned by Expert 1: *team*, *proposition* and *market*. However, some rather prominent issues cannot be allocated to any of the three areas. The majority of the latter relate to *IP* on the one hand and *financial matters* on the other. Expert 1's articulated the three criteria in response to what investors are looking for, i.e. she discussed them in relation to finances. After adding finances as a fourth meta variable, the vast majority of summative key terms gathered can be accommodated (figure 48). One area that was less frequently discussed during the interviews was that of assets. Although some designer-entrepreneurs, such as the teams behind Concrete Canvas and Yossarian Lives!, entered strategic partnerships in order to access complementary assets — Concrete Canvas found use in a disused factory, Yossarian Lives! managed to access Getty Images, an established image databank — this area did not come to mention as often as any of the others (figure 50). However, *assets* are important aspects in relation to appropriability regimes and dominant designs, and were added as a sixth meta variable in consideration of the possibility that they were overlooked by the designer-entrepreneurs interviewed in section 5.1.

TEAM

knowledge / expertice / competencies
development / strategy / progress / prospects
partners / management
ownership / equity
incubator / mentoring
size / value
commitment
credentials
support / networking / partnerships
development strategy / growth
confidence
exit strategy
creative capacities
operations
significance
stability (shareholder agreement etc.)
competencies (investors)

IP

patents (general reference)
IP timing / strategy
costs / affordability
purpose
application process / patentability
open innovation
trade secret / NDA
design patents / registered design rights
strength
territory / jurisdiction
legal support
strategic partnerships
scope
priority
formal / informal IP
signalling effect
environment complexity

FINANCE

investments
IP timing / strategy
sales / revenues
finance strategy
investors
loans / depth
available funds
required funds
fund raising
salaries
bootstrapping
financial risks
self funding

MARKET

access strategy / barriers
market relations (sales management)
target audience
market focus (sector / niche / mainstream)
market position
public relations
competitors
marketing
accessibility / complexity / control
market proximity / proof of market
market impact
branding
territory
size

PROPOSITION

development stage
development standard / strategy
technology development
service element
product development
ideas / concept / novelty
development pace / incentive
software / database
product
applications

ASSETS

supply chain
manufacturing
distribution
work space
materials / resources
sales channels

Figure 50: Overview of business development attributes (variables)

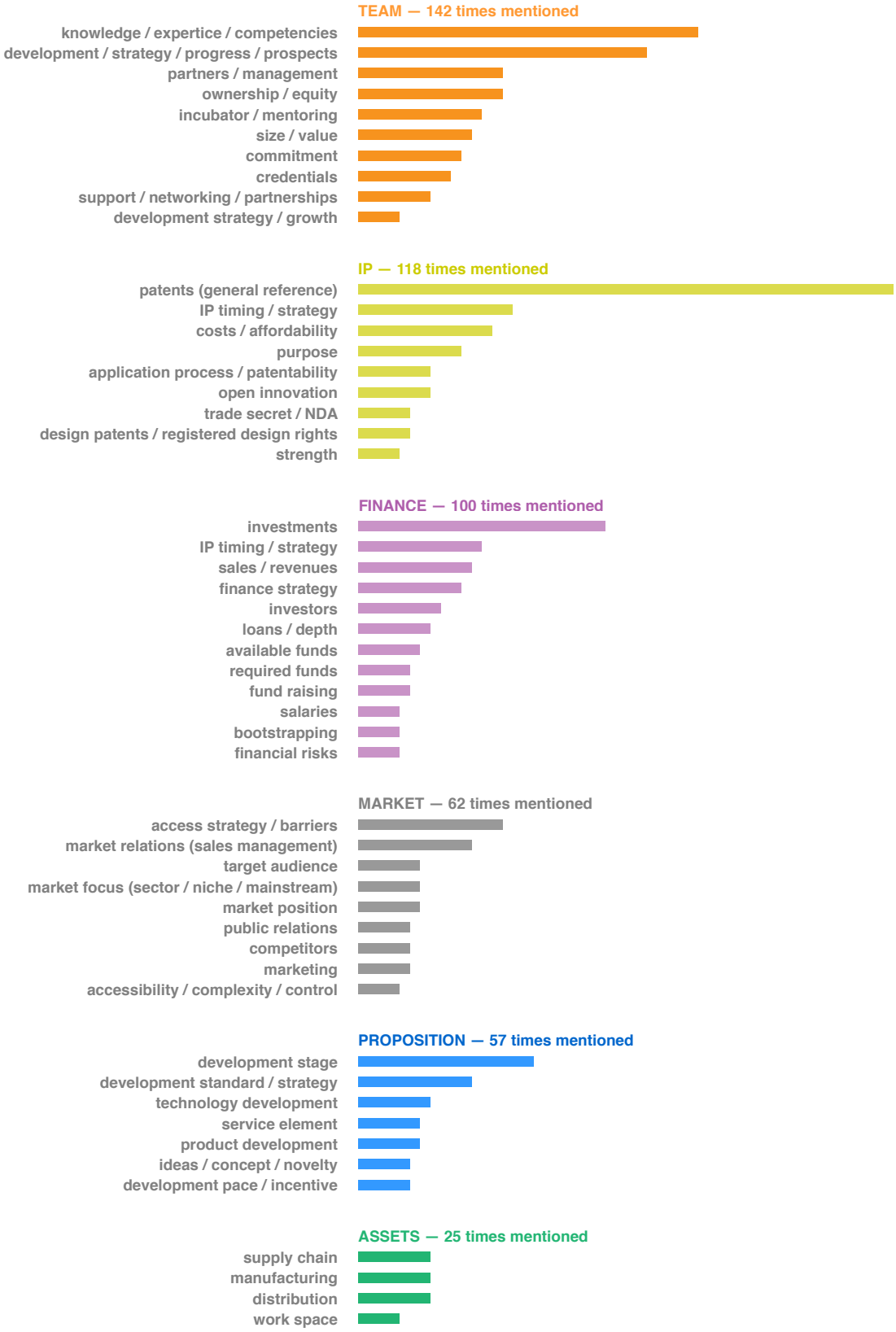

Figure 51: Results of the frequency analysis

The bar charts in figure 51 reveal how frequently individual variables (concepts) were addressed by interviewees. Variables that came to mention only one to three times were eliminated, since these may not be representative of the group of interviewees as a whole. Responses to directed questions were not taken into account to avoid response bias.

It is important to acknowledge that the interviews with the designer-entrepreneurs were semi-structured, because there were some guiding thoughts and questions. However, the majority of questions were open so that interviewees were free to speak at length about issues of concern without being interrupted, meaning that the data collected is representative of their key concerns at the time. As all designer-entrepreneurs were at some point connected with the same design-business development incubator, attitudes and priorities may have been nurtured and exchanged between them. For those two reasons, an above-average coherence could be expected. However, there was a particularly strong coherence related to the concerns surrounding finances, equity investment and IP, although not all interviewees were equally positive about the latter.

If the five meta variables *team*, *proposition*, *market*, *finance* and *assets* are seen as areas that need constant development and that they are permanently interdependent, a circular diagram as shown on the right-hand side of figure 52 could be more appropriate. However, the interviews conducted in section 5.1 revealed that during the fledgling business development period designer-entrepreneurs had little knowledge and understanding of market characteristics and penetrability, and limited access to assets. In most cases discussed in 5.1, the proposition and the invention-specific knowledge constituted the only selling point at the outset. Therefore the team and the IP constitute the determining independent variables, which Creswell refers to as 'predictors' (Creswell, 2014, p.52). The situation related spin-outs grown within medium or large corporations, may be very different and much more in line with the diagram on the right-hand side of figure 52 because these ventures have access to the corporation's assets, and teams can be configured more freely in relation to the development needs surrounding a proposition, because candidates can be selected from a comparatively large pool of employees. The elongated model will be given preference within this study, because this thesis focuses on small independent start-ups as opposed to spin-outs. At the same time, it must be acknowledged that businesses will function in much less linear fashion once established. The circular interlinking of meta variables becomes gradually more appropriate, as a business goes through the transition period (section 4.4.2).

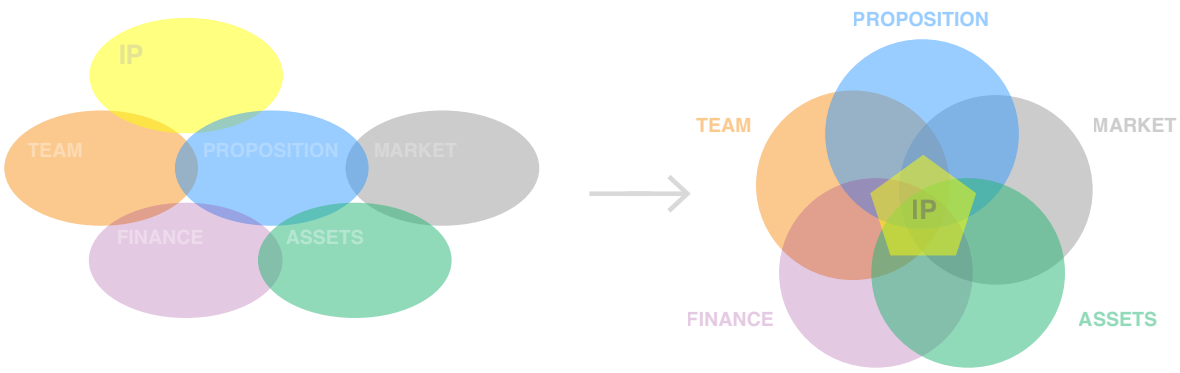

Figure 52: Interdependencies and time factor

Mapping the key concepts (or variables) found through literature review on the one hand (figure 53), and those that came to mention during the interviews with designer-entrepreneurs on the other (figures 54 and figure 55), produces a different picture. Despite the fact that the literature was not subject to selection bias — sources were selected in relation to innovation management and IP — references to market are noticeably more frequent here, and the significance of the team (labelled as *business* in figure 53) was much less pronounced. This discrepancy may be due the fact that most existing literature sources discuss businesses in general rather than start-ups specifically, which in turn suggests that the development-needs of start-ups differ from those of established businesses. Within the framework of references, development priorities will be articulated through the independent variables, which take precedence over intervening and dependent variables. This will produce a causal network of business development attributes, which serves as a foundation for a predictive business development model.

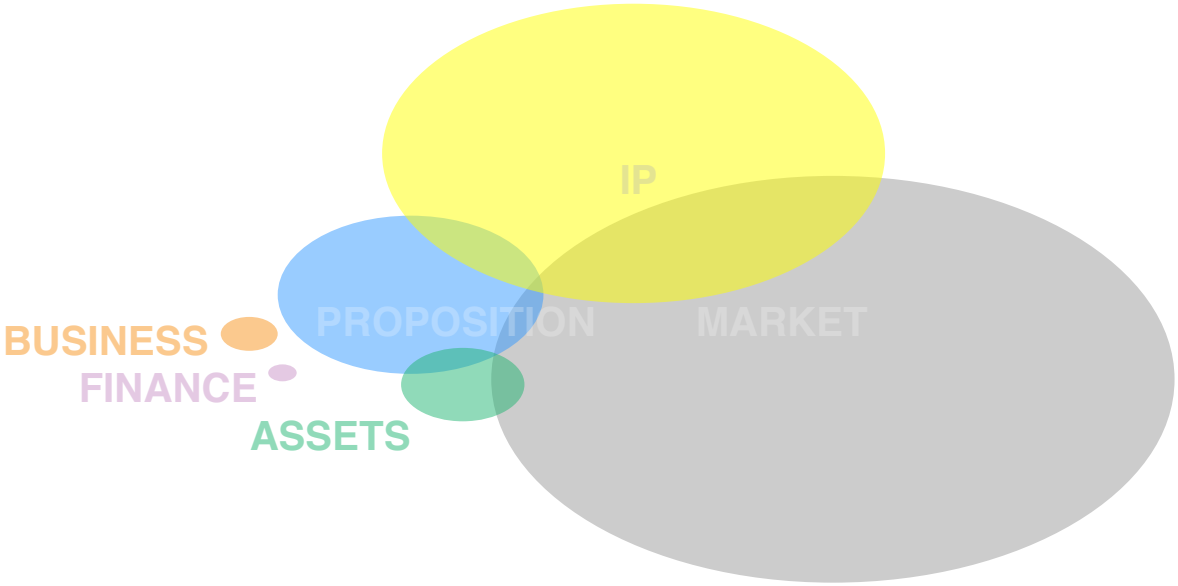

Figure 53: variable frequency analysis using the literature review (chapter 3) as data source (see appendix 7.6 for reference)

Case studies used in theory discussions, such as those used by David Teece, are often connected to multinational corporations (footnote 14). Here teams can be larger, and, as pointed out above, they can be configured perhaps more flexibly in relation to the proposition requirements. Whilst an independent start-up team or the lone inventors determine the proposition, it is more likely to be the reverse in an established corporation. In other words: the dependencies are reversed. This difference extends to other meta variables: Whilst the team factor is often the most stable variable for independent fledgling businesses, the prospective market position is usually unclear. Established firms can position innovations more accurately due to their market knowledge and their existing market power, meaning that demand-pull may be more significant to established businesses than to start-ups.

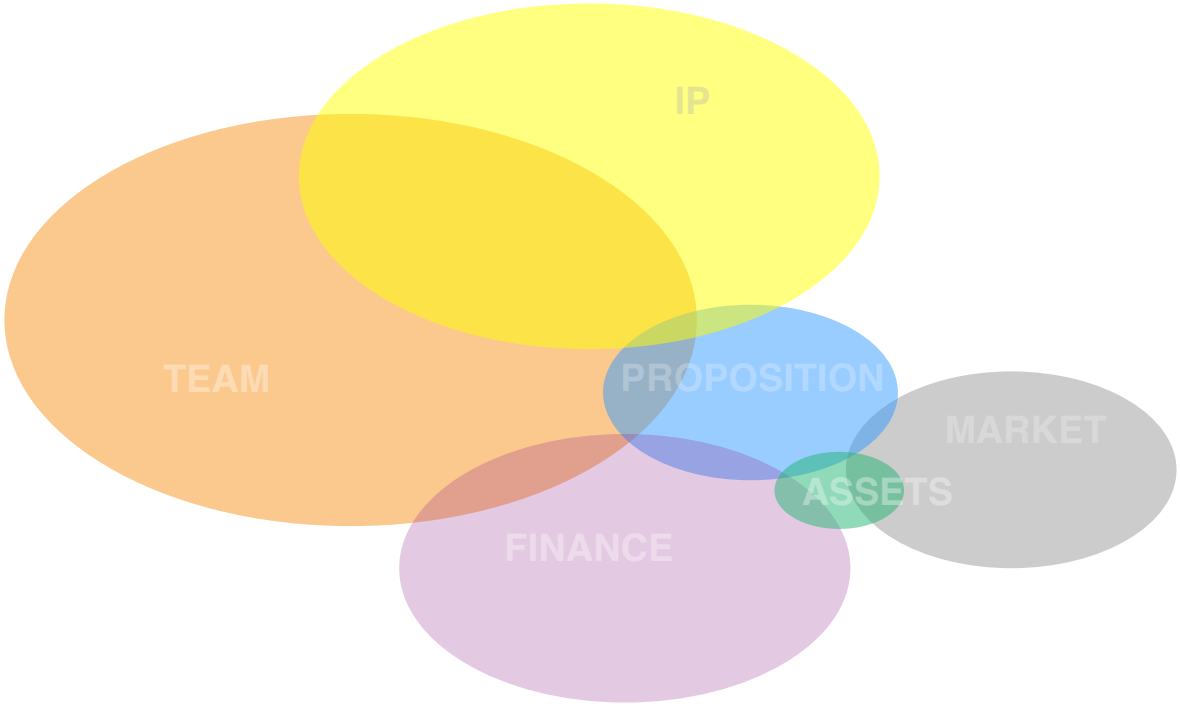

Figure 54: This diagram reflects the number of times which individual meta variables were addressed during the interviews conducted in support of section five (data used for diagram 49). The width of shapes are proportionate to the number of times a meta variable came to be mentioned.

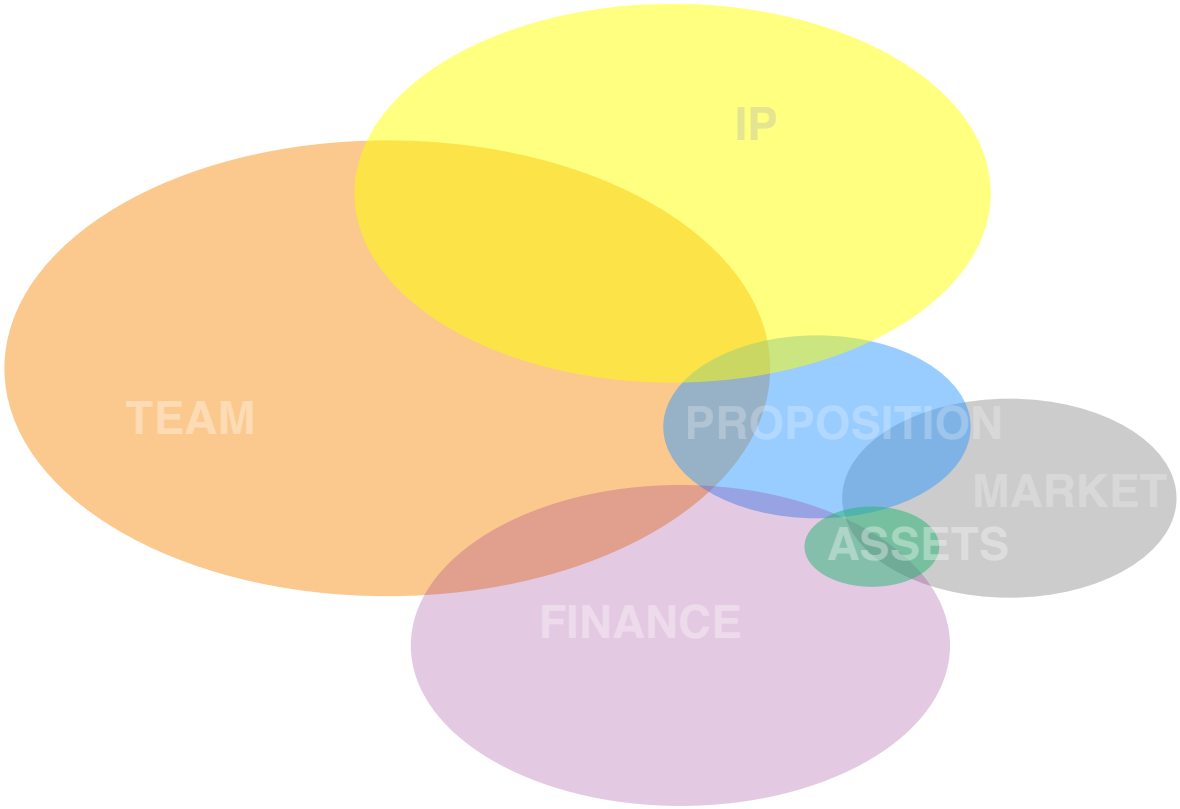

Figure 55: In an attempt to eliminate possible chance results, variables that were mentioned three times or less were eliminated prior to calculating the sizes of these shapes. The result is coherent with figure 54, which suggests that the priorities of the designer entrepreneurs seem quite clear.

Step 8: Identifying properties and dimensions

For further clarifying the interdependencies between variables, the time factor needs to be brought back into equation. Creswell specifies the temporal order of variables as one of the two distinguishing characteristics (Creswell, 2014, p.52). The other characteristic is the measurement or observation that relates to an individual variable. As expressed earlier, the significance of individual variables is highly likely to change over time, meaning that the dependencies also change as the venture develops. This in combination with the fact that more than one independent variable determine individual dependent variables, means that the framework to describe the design business start-up development needs to be multilinear. Inspired by Myers and Marquis' multi-dimensional model (section 3.5.1), which articulates technology-push and market pull incentives in the context of innovation, it is possible to speculatively map out the way in which the meta-variables correlate over time (figure 56): The six meta variables identified in steps 1-7 can be subdivided into primary and secondary variables. The team, the knowledge held in relation to the proposition, and the proposition itself constitute primary variables which are strongly interdependent. Finance needs, the market and the non-financial assets constitute secondary variables, which may be largely unknown to the team in the beginning. The ultimate goal is business growth. In a technology-push or design push scenario, the secondary variables are dependent on the primary variables. Allocated sub-variables to the secondary variables, facilitates a more differentiated understanding of the latter (figure 56).

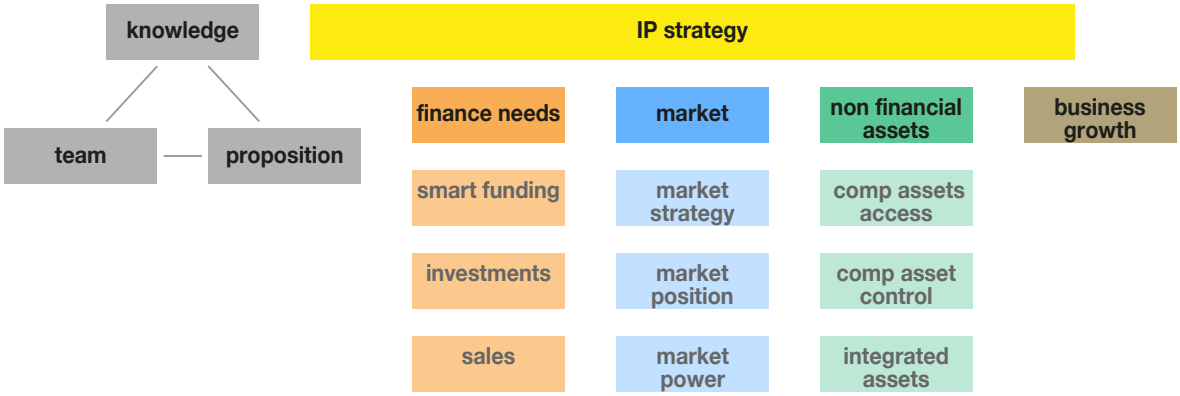

Figure 56: This diagram shows three primary variables on the left and three secondary variables on the right, with subvariables listed beneath the secondary variables. Business growth constitutes the development objective.

This thesis investigates start-up business development attributes, which determine the way in which capabilities are developed and acquired over time. This means that the variables need to be mapped out on a timeline. The dependencies between secondary and primary variables mentioned above suggest a temporal order from left to right. At the outset, independent start-ups have little to rely on other than the team, as well as the design proposition that is nourished through the team's existing knowledge. Team roles and responsibilities depend on the requirements of the proposition and on the knowledge held by individual team members. The selection of team members may depend on their knowledge and expertise. The triangular interrelationship between team, knowledge and proposition

is the driving factor at the outset of an independent design-led start-up. An understanding of suitable markets and market niches evolves gradually over time, and assets are often far from reach in the beginning. Finances are needed to facilitate asset accessibility, and, considering that most ventures are technology-push, design-driven or demand-push initiatives, propositions determine which markets or market niches are of interest.

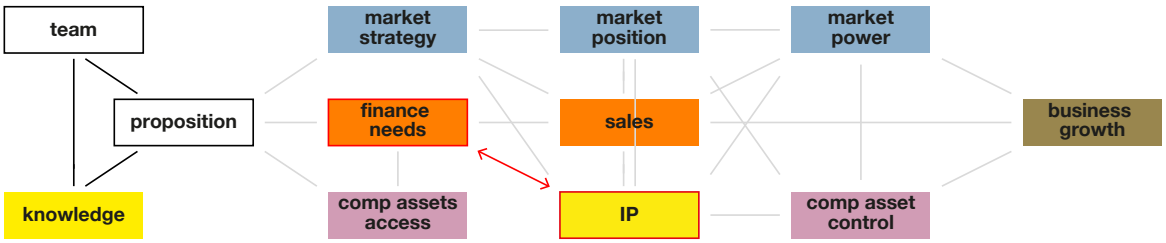

Figure 57: Speculative dependency sketch.

As highlighted in figure 54 and 55, the interdependencies between finance and IP dominate within the list of concerns amongst the designer-entrepreneurs interviewed in section 5. The findings obtained suggest a strong interrelationship between those two variables as highlighted in figure 57 through the red double arrow. The designer-entrepreneurs perceive patents as a prerequisite for securing angel investment, and conversely angel investment is required to fund this comparatively expensive form of IP. On the other hand, venture capitalists seem more focused on market access and assets by comparison. This means that there is a misalignment of perceptions with respect to what shapes the credentials of a design-led startup.

The financial needs depend first and foremost on the proposition, but relate to the complementary assets required to get the proposition market-ready, production etc. (figure 57). The more access to complementary assets already exists, the less financial resources are required. This means that finances and access to complementary asset are interdependent variables. Importantly the IP strategy determines the financial needs. Conversely the availability of financial assets determines what formal IP can be afforded, and in which territories it can be secured. The market, its complexity, and potential uncertainty — Clarysse and Kiefer refer to environment complexity and uncertainty, but here focusing on the market specifically is more useful — determines both the sales strategy and possible market positions. In the long run, the sum of these business development factors determines the market power, which also derives from the control over complementary assets. The latter may be increasingly integrated, as shown in the example of the Seaboard, who acquired Juce, a software platform, in 2014. Business growth depends on the sales strategy, the control over assets, and it results from the level of market power. The purpose of this thesis is to determine the way in which IP interacts with the other factors mentioned above.

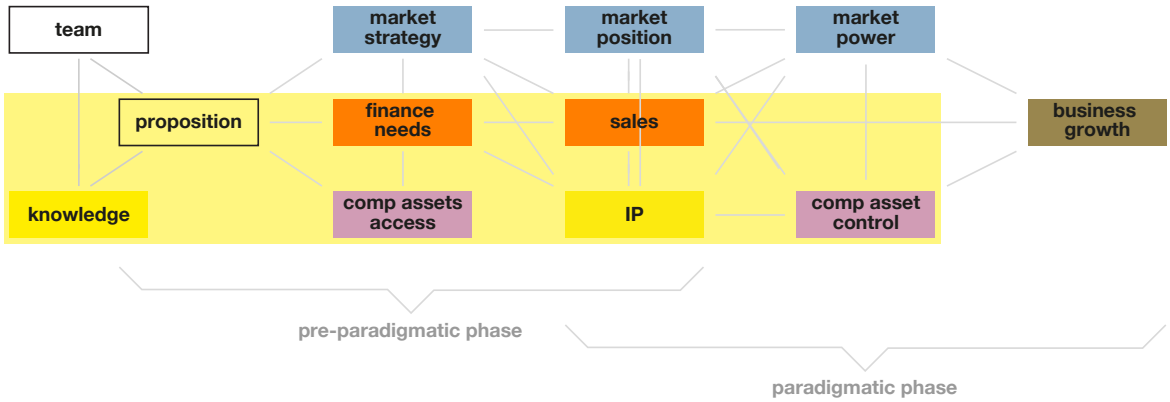

Figure 58: Market Power is dependent on the market position, the sales strategy, and on the IP strategy.

Although this framework shown in figure 58 is subject to further development, it can be mapped against Teece's pre-paradigmatic phase and paradigmatic phase. All three variables, market position, sales, and IP strategies are determining the level of market power that a firm can obtain over time. Once market positioning results in market power and control over complementary assets, be it through contractual arrangements or through integration, a business will have established.

What is worth noting is that the relevance of IP exists from the outset in the form of proposition-related knowledge held within the team, whereas IP strategies are developed and IPR acquired in the course of the pre-paradigmatic phase (figure 58). IP is a variable that underpins and informs most other variables as highlighted in figure 58, and the objective of this thesis is to clarify how the management of knowledge is best pursued in support of the development of the other variables within the business development framework.

5.4. Qualitative data 1: Insights

All of the examples discussed in section 5.1 were aimed at radical innovations which means that they were hoped to have a disruptive impact on the business environment. As explained by Teece (section 3.2), the ambition behind radical innovations is to establish a dominant design paradigm. The data gathered in conjunction with the case studies in this section suggests that:

- Most designer-entrepreneurs perceive patents as a prerequisite to initiate a proprietary growth business.
- Angel investors share this point of view, whereas venture capitalists highlighted other criteria such as market size, market proximity and market accessibility as more important.
- Patents are confirmed to be expensive and time consuming to obtain.
- Patent infringement was thought to be difficult to litigate for micro-scale start-ups due to the lack of available capital.
- The patenting process was believed to slow down the development of start-ups which concurs with the preliminary hypothesis 3 in section 4.4.3.
- As highlighted in 5.2, those inventors who de-emphasised the patent route, seemed to be more sales-oriented and they generated revenue at an earlier point in time. This confirms the presumption that sales-led approaches speed up the route-to-market as articulated as part of preliminary hypothesis 1 in section 4.4.3.
- Some of the case studies revealed that equity investment could be by-passed through boot-strapping. Focusing on first-mover advantages and / or secrecy provided alternative means of enhancing their appropriability regime.

The preliminary hypothesis 2 as articulated in section 4.4.3 could be proven neither right nor wrong. Whether a design-driven approach as discussed in section 3.4 can help to by-pass the difficulties that are commonly associated with patents, namely affordance of time and funding, remains to be clarified. Registered design rights and also design patents are easier and faster to obtain than (utility) patents as explained in section 3.7.4. But are they robust enough to provide alternative avenue to designer-entrepreneurs? If they are, they could speed up the route-to-market and to reduce initial funding needs. Registered design rights and design patents protect different characteristics of a design proposition, namely the visual rather than the functional. However, if they are sufficiently robust, they could help to delay the need for patent filing, until a working prototype is developed. They could prevent premature patent filing, and thus mitigate the risk of having to file follow-up patents, as required for Orbel and the Seaboard for example.

[22] These businesses are situated in the top right quadrant of Clarysse and Kiefer's entrepreneurial strategy matrix (section 3.3).

6. Qualitative data 2: The journey of a serial-entrepreneur

The case studies examined in section 5.1 indicate patterns, such as the refiling (Cupris, Seaboard, Concrete Canvas, Orbel) or the withdrawal of patents (Squease), the longterm impact of which could not be fully established within the timeframe of this study, and so section 6 examines the journey of a serial-entrepreneur, Mandy Haberman, who went through a number of steps until establishing a business. This journey involved a range of legal battles surrounding IPRs which were secured in conjunction with various inventions. As the development cycles behind Haberman's inventions are much greater than those of the inventions discussed in section 5.1, this section reveals how early-stage decisions impact the longer-term prospects of design innovations.

6.1. Invention 1: The Haberman Feeder

Mandy Haberman graduated in graphic design, but became a product inventor following the birth of her third child, who was diagnosed with Stickler Syndrome. The illness prevented Haberman's daughter from feeding. Her daughter's need drove Haberman's innovative thinking. In 1984, after four years of development, she patented the so-called Haberman Feeder, a baby bottle for children with feeding difficulties. The bottle comprised a long teat (figure 59) that enabled babies to suckle by stripping milk along its length. Haberman is said to have approached 'hundreds of organisations' for support in order to raise £20K for prototyping her invention (Pitts, 2012). Having failed to commercialise her invention on a bigger scale through business-to-business marketing, she set up her 'business on a shoestring from the kitchen table' (Pitts, 2012) and sold her first product directly to parents and to hospitals at a unit price of £18.50 via mail order. Haberman failed to commercialise her invention on a large scale, and therefore took distribution into her own hands. She pointed out that limiting the patent to the UK, compromised the commercial success of the product. Although Haberman had secured a patent only for the UK and a European trade mark, she also registered a trade mark in the US. "With very limited investment, that was good use of the IP." (Haberman, 2014) On here website, she states that 'The companies that [she] approached to commercialise [her] invention weren't interested.' (Haberman, nd.) According to the inventor this was due to the fact that the product was limited to a niche market. The benefit of targeting niche markets is that there is limited competition, if indeed any at all. However, a dominant design is of limited value in a niche market, unless the market can be grown through pushing demand, or through establishing the product in other territories, or in mainstream markets.

Figure 59: Haberman Feeder

The Haberman Feeder did not become a break-through success. Unable to secure investment, Habermen applied a bootstrapping approach whilst marketing her niche-market product. Although there was a market need, the market was very small. Market demand was pushed through communications with key industry stakeholders, such as hospitals and the NHS. The lack of market demand at the outset combined with the small market size, made it difficult for Haberman to commercialise her first invention. Although viable, the business could grow only within limits. No imitator entered the scene. This example suggests that the risk of being imitated is proportionate to the scalability of the business and the market value. Despite the limited commercial success with her first invention, Haberman managed to establish credentials with respect to her inventive and entrepreneurial capabilities, which benefitted her following product invention.

6.2. Invention 2: AnywayUp Cup

In 1990, Haberman developed a concept for a non-spill baby cup. The AnywayUp Cup[23] uses a slit valve to prevent liquid from escaping. In 1992 the first of numerous patents was filed successfully to secure exclusive use of the IP. The year after, 18 companies were presented with prototypes using NDAs as a protective measure. In an interview Haberman explains that she failed to secure a license contract, because 'Everyone thought it was great but it was a new, unproven[24] product and they were all risk-adverse.' (Pitts, 2012)

Strategic partnership

In 1995 Haberman enters a partnership with V&A Marketing Ltd, a small Cardiff-based innovations marketing firm. The product was launched at two trade fairs, securing advance orders worth £10,000. This order helped to obtain a bank loan needed to put the AnywayUp Cup into production. The year

[23] AnywayUp Cup® is a registered trade mark

[24] Unproven here means lack of proof of market, not lack of proof of concept.

Figure 60: AnywayUp cups

after, sales reach 60,000 per week, and the product was stocked by Tesco and Safeway, two major UK supermarket chains. This was the result of an unusual marketing campaign: V&A Marketing Ltd had sent AnywayUp Cups filled with concentrated Ribena and packaged loosely in a white cardboard box to distributors with a note asking the recipient to call if it had not spilt. By 1997, the company had grown to 70 employees facilitating the AnywayUp Cup production, and Sebastian Conran Associates, a reputable UK design consultancy, were commissioned to redesign the AnywayUp Cup.

Infringement 1: In 1997 Jackel International Limited, one of the 18 companies, to whom the AnywayUp Cup prototypes had been shown, introduced a product branded as 'Tommee tippee' non-drip cup, which resembled the original AnywayUp Cup prototype (Roskell, 2011). Haberman issued legal proceedings against Jackel International Limited, after her sales had dropped by about two thirds (Roskell, 2011). The British newspaper The Guardian reported that Jackel lost the case despite arrguing that Haperman's valve design was 'obvious', and not fundamentally novel. However, the claim was rejected by the judge and 'Jackel was forced to withdraw its patent-infringing product' (Insley, 2012).

An injunction prevented further infringement of her patent through Jackel International Limited, who first appealed against the verdict, but abandoned their appeal in 2000 when an out-of-court settlement was reached. Haberman and V&A Marketing Ltd were compensated for their costs and awarded damages (Haberman, 2013). The fact that three years had passed from infringement until the case was resolved, shows how long difficulties can prevail in relation to the legal enforcement of patents.

Infringement 2: In 1999 Haberman issued proceedings against Icoma Babyworld, a Dutch distribution firm, who had traded a product similar to Haberman's AnywayUp cup. Following a court hearing in January 2000, the judge ruled that the Icoma's product infringes Haberman's European patent. The parties reach an outer court settlement, following which Icoma ceased infringement across Europe and paid a contribution towards Haberman's legal costs (Haberman, nd)

Infringement 3: During a trade fair in Holland in May 2000, yet another infringement was spotted. This led to action brought successfully against Difrax and Kruidvat, two Dutch companies who had

traded products supplied by Royal King Infant Products Ltd, a company in Thailand. 18,000 Royal King products are seized and given to Haberman who donated them to charities (Haberman, nd).

Infringement 4: Haberman's legal pursuit in the USA proved even more challenging than the case against Jackel International. Having tolerated infringement in the US for several years whilst hoping that her US licensee would take action on her behalf, Haberman issues proceedings against three companies in the US in 2005: Playtex Products, Gerber Products, and Walmart, who was distributing Playtex and Gerber products. Walmart was only included to the case in order to prevent the other two production firms from 'legislation hopping' (Haberman, 2008), i.e. to prevent the case from being taken to a state in which the legislation would favour the defendant. Playtex settled out of court. However, the case against Gerber went to court. The final outcome of this 'roller coaster ride of stress and excitement' (Haberman, 2008) confirmed the validity of Haberman's patent, but it also states that the patent was not infringed. Gerber requests Haberman to pay several million dollars towards their legal costs. Following negotiations, Haberman 'paid a small amount towards their costs (made sweeter by a favourable exchange rate) and gave them the right to manufacture in China but only for sales in the US' (Haberman, 2008). Haberman reported 'a great sense of achievement from having stood up for [her] rights, particularly against such powerful opponents. As a result of [her] US patents being declared valid in court, other companies have since requested licenses. So financially, overall, enforcing [her] rights has turned out to be well worthwhile for [her], but perhaps not for [her] lawyers.' (Haberman, 2014) Haberman had negotiated a contingent which meant that her legal costs would be capped if the case spiraled out of control. Having a contingent in place had strengthened Haberman's confidence so she decided to pursue the litigation route.

6.3. Invention 3: The Smiley Cup

For this product, a derivative of the AnywayUp cup, a design patent was filed in the US in 2012. The Smiley Cup comes in a range of options using different kinds of surface decorations such as the Bird Cup (figure 40), and the Cow Cup. However, the design patent itself is devoid of any surface patterns and focuses on the physical shape of the artefact (figure 62). It uses outline drawings to protects the overall product shape, whilst Haberman's AnywayUp cup (utility) patents protect the functionality, i.e. the way in which the product performance is enhanced through the slit valve mentioned in the previous section.

Figure 61: Smiley Cup (Bird Cup example)

The preliminary hypothesis which remains to be examined relates to the robustness of registered design rights (section 4.4.3) With respect to this, it is interesting that in Europe Haberman chose not to protect the product language of her Smiley Cup through a registered design right. She opted for a 3D trademark instead instead (figure 63). When comparing the registered design right to the patent, Haberman describes design registrations as 'much narrower'. Whilst effective in relation counterfeighted products, small modifications suffice to bypass a registered design (Haberman, 2014).

Haberman (2014) claimed to have filed a US Design Patent as a strategic measure "to obtain a granted right faster than could be achieved by our patent application". The intention was to secure formal IP prior to the product launch, and considering that "The US patenting process [related to utility patents] can take many years."

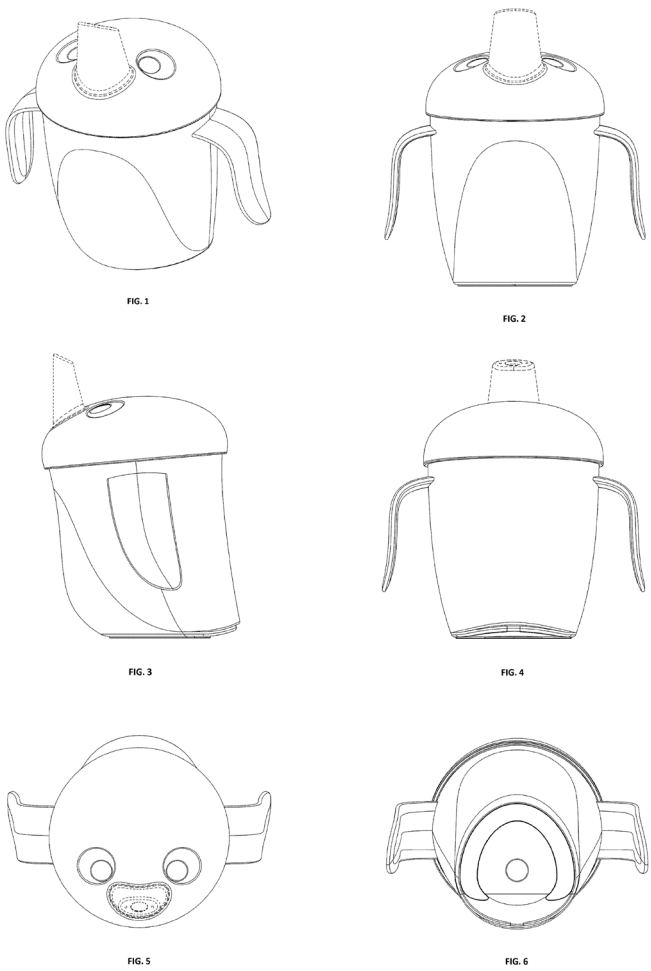

Figure 62: Representations of the Smiley Cup in the US patent (US D684,426)

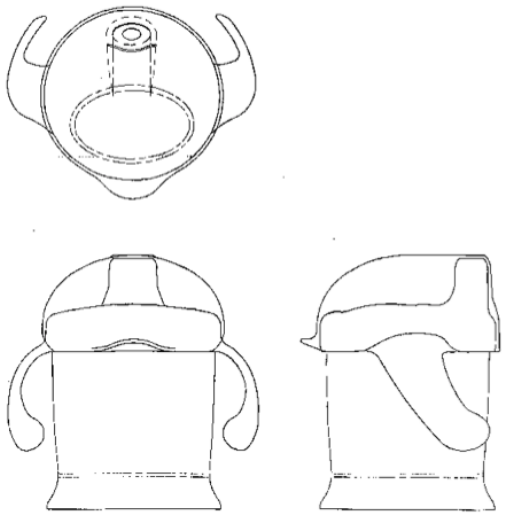

Figure 63: Graphic representation of the Smiley Cup, 3D community (i.e. EU) trademark by Haberman

With respect to registered design rights Haberman's legal consultant, Expert 5, explained:

> "The value of registered designs and their robustness really depends on the prior art. So, if it is a very novel product, it has broader protection. If it is very similar to things that had been put on the market before, it has much narrower protection." (Expert 5, 2014)

This point implies that registered design rights are more effective for protecting radically new product languages than incremental novelties. The fact that these are fundementally different from existing designs, broadens the scope of protection. However, Haberman's concerns related to competing re-designs that use slight alterations to secure freedom to operate, suggests that the registered design right's robustness remains within limits. This juxtaposition of views means that the second preliminary hypothesis remains unresolved and raises the question whether or not 3D trade marks constitute an alternative to registered design rights in the UK and Europe. Expert 5 (2014) argued that: "The 3D trade marks are very difficult to get. […] They are incredibly difficult to secure. […] You need a lot of evidence of the recognition of the shape, exclusively to you on the market. Certainly for the community one you need surveys and witness evidence."

As fledgling start-ups are pre-trade or trade only at a very small scale, the market recognition necessary for securing a 3D trade mark is far from reach. The Community Trademark that protects the visual shape of the Smiley Cup took almost 18 months until approval — 19/06/2001 to 13/01/2003. Trademarking the names Haberman (18 months: 03/06/2004 - 05/12/2005) and Mandy Haberman (14 months: 03/06/2004 – 31/10/2005) took similarly long. The name ANYWAYUP took a much longer time to protect, almost 2.5 years: 24/07/1996 – 01/02/1999. But this may relate to how the filing process had been managed. The latter was the first trade mark to be filed in the course of Haberman's journey, and when it comes to branding the first step tends to be the most difficult. An oppositions verification period is always part of the process. The fact that trade marks take a long time to secure by comparison to registered design rights alongside the fact that they are effective only if supported through market recognition, confirms that brand values are not effective means for design-led start-ups to by-pass the lengthy and costly patenting route as claimed in sections 4.4.3 and 5.1.7.

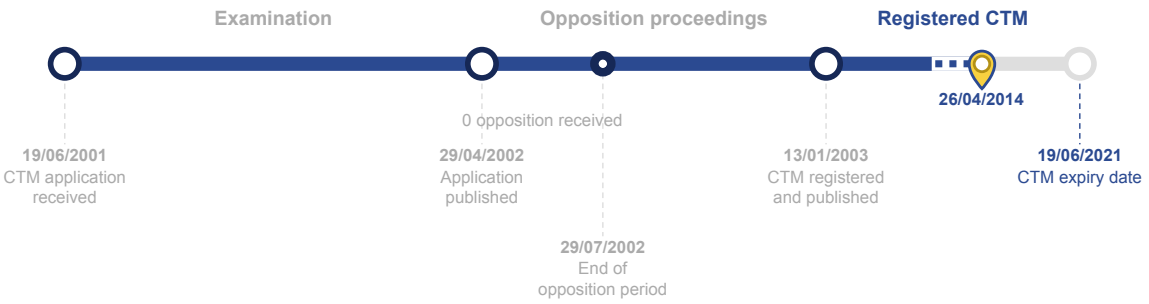

Figure 64: Timeline related to the Smiley Cup 3D community trademark registration

When interviewed, Haberman (2014) pointed out that during a trade show she had seen a competing product that was visually almost identical to the Smiley Cup, but "that there was not enough there for us to […] stop them from infringing our design". Haberman took no action to contest the competing design. In addition to the time required to secure 3D trade marks, her concerns related to its robustness, make it clear that this form of IP is not a suitable alternative to registered design rights for fledgling start-up businesses.

6.4. Genuine competition: The Belanger Patent

As explained in section 5.1.8., the term duplication of research and development (R&D) relates to scenario where two or more inventors or inventing firms develop simultaneously the same or similar concepts. Haberman's concept of the AnywayUp Cup coincided with another innovation that originated in the USA: The Dripless liquid feeding / training container invented by Richard Belanger (Patent reference: US005079013A) that was used by Playtex (see infringement 4)

With respect to the AnywayUp Cup, Haberman explained, that she has withdrawn her patent within less than a year after filing in 1991 as she could not afford international filing. Through the re-filing process she lost a year's priority. During the interview she stated:

> "I cannot believe how much I lost as a result of it. […] If I had not pulled the first one that I started again, my priority would have been a year earlier, so therefore it would not have needed to be amended in order to cover a little bit of prior art that came out in that year. So I could have had a patent on a cup with any type of valve, rather than a slit-valve or a double slit valve."
> Haberman, 2014

The Belanger patent was filed 7 January 1992, and produced prior art, which reduced the scope of Haberman's AnywayUp Cup patent. With respect to the potential duplication of R&D, Haberman stated:

> "If it is not completely obscure, if it is a device for the general market, that the general market is going to want, you can bet on the fact that someone else is going to have the same idea at the same time. So you have got to get the priority. I would go insane if I thought about what I had actually lost. I did extraordinarily well from the cup, well better than I ever thought I would. But you could have added several millions on the end of the order."
> Haberman, 2014

The concern that another competing invention may enter on the market, perhaps one that is protected through a patent that affects one's freedom to operate, was common amongst the RCA inventors interviewed. Whilst secrecy can be an effective mechanism to protect against copying, it perpetuates the risk of another inventor filing for a patent for a similar design concept, unless the product is already on the market (trading phase) or through a defence publication that articulates the technical particulars of the invention in the public domain.

Due to the risk of competing inventions, Expert 5 recommended using the help of patent attorneys when filing for patents:

> "… patents […] are very technical beasts. There is nothing to prevent an inventor from applying for something for themselves. But the prospect of them ending with anything that is worth anything and can be enforced is very slim. It really needs an expert draftsman to look at the invention, look at what is out there already, decide what elements of that invention are worth capturing, and to draft it broadly enough that slight changes by someone else do not defeat it, but not so broad that it is not patentable because it is not inventive."
> Expert 5, 2014

Cases like Haberman and Cupris are not unusual. Expert 5 pointed out several "clients who put their filing in, haven't achieved their investment, and then pull the patent and re-file it. The only problem is, then you will have lost your priority date." (Expert 5, 2014) This again underlines the interdependence between patenting and finance needs highlighted in section 5.3.

6.5. IP and litigation costs

In the aforementioned Guardian article, Haberman explains that 'The cost of litigation in the UK High Court is massive in both time and money. Even a simple case can cost the loser around £1 million.' (Pitts, 2012) In an interview, Sebastian Conran, who designed the new version of the AnywayUp Cup stated that £300K were invested by Haberman / V&A Marketing in pursuit of legal action surrounding the AnywayUp Cup. However, Haberman pointed out that the £300K was a cost that was already reduced thanks to an IP insurance she had taken out. Without the latter the costs would have been even higher. The fee paid for Conran's re-design of Haberman's non-spill baby cups was in the region of £8-10K (Conran, 2014). These contrasting figures highlight the degree to which IP strategies and marketing efforts outweigh the actual design process in conjunction with design-led start-ups. The fact that investment in the design process is limited, may reflect an undervaluation of the value of product languages as promoted by Verganti and Dell'Era (Section 3.4). Haberman's Smiley Cup is also an example that shows that the combination of design-driven and technology-driven innovation as discussed by Verganti and Dell'Era can accelerate business growth. However, if there is a prioritisation of technical aspects in design-led innovation (innovation fostered by design-led teams) then this will inevitably affect the entrepreneurs' attitudes towards design IP and their IP strategies. In a conversation, Haberman rated the registered design right as "not very strong" (Haberman, 2014). If Haberman was mistaken here and registered design rights prove to be robust means of protection through court action, the designer-entrepreneurs' confidence in design IP and in the value of product languages may increase. What is of low value, is not worth protecting. Conversely, what cannot be effectively protected, may be perceived as of low value. Value here can be seen as a soft asset (ideological, design quality, accreditation, reputation, prestige) or as a material asset (monetary value, design-business development potential). This indicates that not only the business development potential and the market-potential of the product influence the innovators decision whether or not to formalise IP, the perceived value of the product languages also does.

Although Haberman (2008) described US litigation as 'fearfully expensive, around 4x the UK litigation costs', she perceives the US patent litigation system as effective and efficient. Haberman entered legal proceedings with her second venture. She became a serial entrepreneur and she had an ally in V&A Marketing Ltd, whom with she had entered a strategic partnership. Haberman's risk was increased by the fact that her patents were in her name rather than in her company's name. Therefore her personal belongings were at stake. Working with V&A Marketing helped to mitigate the risk and to limit the financial burden. Haberman held the view that large companies do not respect the IP of SME's and lone inventors. 'If they reckon you haven't got the resources to protect your copyright, they'll have a pop at you.' (Insley, 2012)

Nonetheless Haberman is an advocate of patenting. Standing up for one's rights is crucial in her opinion. She argued that, 'if we had not taken action, every other competitor would have copied us too and we wouldn't have a business left.' (Pitts, 2012) It follows that an IP strategy should also comprise a method of responding to perceived infringements. Haberman suggested that 'You need to be prepared to enforce your rights.' (Pitts, 2012) Despite her positivity about patents, Haberman promoted the idea that the patent system needs changing to make it more effective for small firms. She perceived the litigation process in Europe as slow and expensive (Haberman, 2014).

6.6. Qualitative data 2: Insights

In relation to the litigation of the infringement through Jackel International, Haberman's claimed: 'I had to risk my house to do it and it used up a vast amount of man hours from the business – time which could have been put to better use.' (Pitts, 2012) This confirms that *facing a competitor during the early-stage development* can be very compromising as pointed out in section 3.7.3. With respect to timings, it is also worth noting that the infringement took place five years after the first filing, because this shows that the competitor had waited with launching a competing product until the AnywayUp Cup had obtained market adoption, which confirms the claim that *competitors refrain from copying technologies that that lack proof of market* (section 3.7.7). Competitors entered the market only after the AnywayUp Cup had become a dominant design. To secure her monopoly in Europe and the in the US, Haberman extended her patents which involved additional IP investment. To increase her market penetration she invested in a redesign by Conran Associates which helped establish a dominant product language. In summary, the following conclusions can be drawn:

- Whilst sharing ideas and concepts with investors is of low risk (section 5), sharing information with prospective strategic partners can be dangerous, even if NDAs are involved[25].
- Imitators are unlikely to invest in competing products and formal IP until an invention is proven to be viable (proof of market).
- A niche market can provide a safer (less complex) environment for designer-entrepreneurs. However, such businesses may be limited in terms of scalability.
- Where infringements occur, there are often multiple incidences involving a range of different industry stakeholders. One case may set a precedent, and encourage other competitors to imitate novelties. None of the infringement cases observed involved investors, but 'companies with strategic intent' as claimed by Expert 1 in Section 5.2.2.
- The case confirms that design languages can increase sales, and that they can be protected through design patents (US), registered design rights (UK/EU) and 3D trade marks. The robustness of registered design rights remains to be assessed.
- Designer inventors often succeed, not with their first invention, but with their second, or they need to re-develop their first invention in pursuit of success[26].
- Haberman filed the AnywayUp Cup patent twice, first herself, then through an attorney. Refiling or delaying patents, can lead to weaknesses in the appropriability regime if competing IP is filed by competitors. It can weaken the scope of patent protection and thus limit market dominance.
- If court proceedings cannot be afforded, these can be pursued at a later stage, when financial means become available. However, lost sales cannot be recovered.

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[25] This confirms the assumption that designer-inventor's may be best advised against strategic partnerships until sufficient credentials are established as bargaining power remains otherwise limited (section 3.6)

[26] This is not only the case with Haberman: Squease abandoned their first patent. Roli, Concrete Canvas, and Orbel filed for a second patent (section 5.1).

This thesis focuses on the fledgling business development period. Although the Haberman case makes it clear that the struggle continues after a product is established in the market, the business is most vulnerable during this initial phase. The Haberman case also shows that decisions made during the fledgling period have a longitudinal impact, for example on the scope of IP, and the market position. This case suggests that the risk of imitation is low during the fledgling period. However, potential collaborators and strategic partners may challenge the inventor through imitations, during the transition period when the proof of market is established. Haberman became an established designer-entrepreneur. Her case illustrates the three development periods introduced in section 4.4.2: She started out independently with a new idea, then entered strategic partnerships to build complementary assets, and finally, secured a growing degree of independence.

The Haberman case confirms that brand assets become significant only during the second stage, after a novelty has been adopted in the markets. It also shows that it is easier to build credentials, brand assets included, in a niche market. Although the business growth may be limited here, it is less likely for competitors and imitators to challenge the start-up. Haberman's case shows that Teece's appropriability matrix (section 3.1) applies not just to established businesses but also to start-ups. 'A patent doesn't automatically give you a monopoly in the market place' (Pitts, 2012). Complementary assets, a collaborative relationship with a marketing firm, manufacturing sources, and later distribution facilities helped to strengthen Haberman's business over time.

The Haberman case study provides no clarity with respect to the preliminary hypotheses in section 4.4.3. which contrast technology-led approaches with sales-driven and design-driven strategies. Haberman built on the exclusive use of technology innovations, but subsequently invested also in product languages. Despite the need for patents, she relied on bootstrapping as a funding strategy at the outset, making use of a modest bank loan. Complementary assets such as manufacturing, sales and marketing, were initially secured through strategic partnerships. The investment capacity needed for integration and IP litigation was developed gradually through sales.

6.7. Theory component 2: The foundations for a business development model

As highlighted in section 3.2, the product-life-cycle (PLC) consists of three stages: The initial *fluid* stage, when generic resources are used to manufacture and market a product, the *transitional* stage, when a dominant design emerges and competition shifts to price and away from design, the *specific* stage, when an established product dominates the market environment.

The development process of a single-product business can be strongly dependent on the PLC so that ups and downs coincide. Conran's redesign of the AnywayUp Cup in 1997 marks the emergence of a dominant product language. One could argue that competition in the design-led product areas may not necessarily shift from design (as in technology) to price, but also from technology to product language, although it can also be the reverse. The visual appearance of a product can be a distinguishing factor as much as its pricing. Although low-tech, the technical aspect clearly came first in Haberman's initial products, the Haberman Feeder and the AnywayUp cup.

1997 was Haberman's transitional PLC stage with respect to the AnywayUp Cup. 1995 was part of the *fluid* stage, because Haberman was still trying to market her product invention with the help of V&A Marketing Ltd. It can very difficult to pin point where exactly PLC stages start and where they end. The series of court proceedings begins around 1999/2000. As this is three-to-four years after, the product was launched nation-wide in major supermarkets, and two-to-three years after sales were boosted through Conran's redesign, the legal actions fall within the specific stage of the AnywayUp Cup / Smiley Cup. To build a foundation for a framework of business development attributes, the business development periods will be sketched out in relation to the Haberman case study.

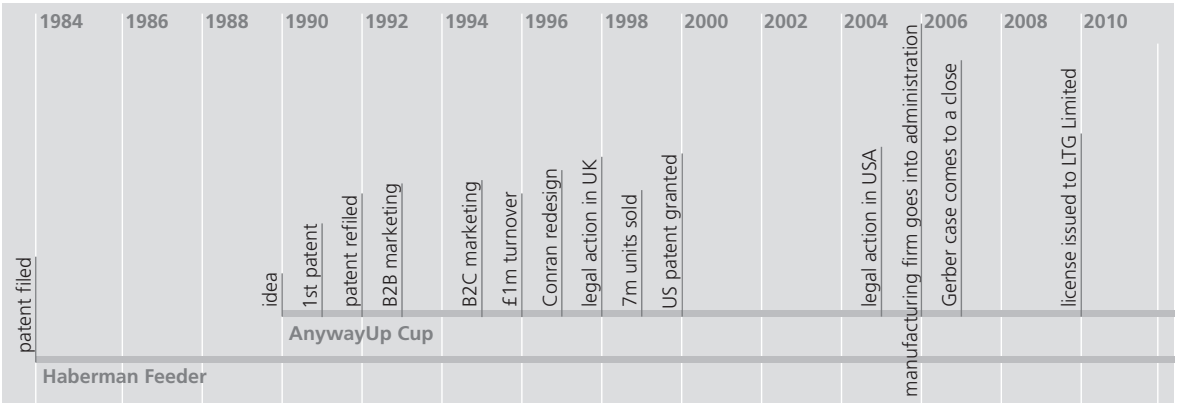

Figure 65: Haberman — pivotal moments in the business development

To map the developments out with more precision, key moments (figure 65) are listed in the following:

- 1984 - 1992: Haberman Feeder — invention, development and marketing
- 1990: AnywayUp Cup — idea inception
- 1991 / 1992: AnywayUp Cup — patent filing
- 1992 - 1999: AnywayUp Cup — strategic partnership, marketing and sales growth
- 1999 - 2008: AnywayUp Cup — legal disputes and battles over market share
- 2008 - now:
    - o The manufacturing firm in charge of the AnywayUp Cup went into administration
    - o Haberman tried to integrate the production using angel investment.
    - o By 2011, after 3 years of persistent effort, Haberman had sourced enough angel investment to set up her own manufacturing and distribution facilities in North Wales.
    - o The product returned to the supermarket shelves in 2012.

Considering an established business as one that is profitable and recognised in the industry by customers and competitors, and a fledgling business as one that is pre-trade, confirms that there is a transformative period between. This was referred to as the transition period in section 4.4.2. These three hypothetical business development periods[27] will serve as a foundation for the development of a business development framework.

The following diagram (figure 66) articulates some presumed key characteristics for each business development period, and it maps these timeframes against Teece's paradigmatic / pre-paradigmatic phases:

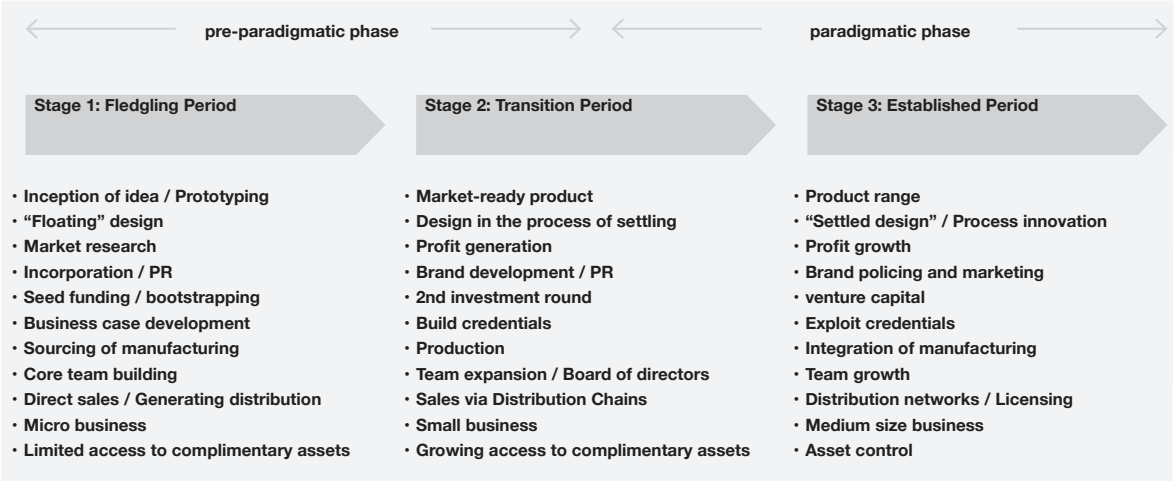

Figure 66: Characteristics of business development periods

Haberman's business development activities provide insight into the typical business development periods introduced in section 4.4.2: The fledgling period begins with the inception of the idea. Teece refers to the design as 'floating' during what he calls the fluid product development stage (section 3.5). During this initial period, the team may be very small. Information is gathered to generate an understanding of the viability and feasibility. Funding may be scarce or non-existent. So is access to complementary assets. Official surveys often bypass fledgling businesses since they are somewhat invisible to the authorities at the outset. During the transition period the team grows, business relations are developed, and advisors may join the board. Complementary assets are established, the product becomes market-ready, and trade is initiated. Angel investment may be sought. During the established period, the business is profitable. Investments or loans are needed only to further grow the business. Expansion is the driving factor. Additional products may be added to the portfolio, sales are grown through strategic alliances and / or expansion of sales into other territories. During the established period, investors can be bought out, or a trade sale can be pursued.

[27] Teece uses the terms *phase* to distinguish between pre-paradigmatic and paradigmatic timeframes, and he speaks of *stages* in relation to the PLC. In dissociation to Teece's timeframes, the model to be developed as part of this thesis refers to development *periods*.

How Haberman's business development process compares against this matrix:

1984 – 1992: The Fledgling Period appears long because it involved two inventions with the viability of the first limited. With her acquired business acumen and entrepreneurial credentials, Haberman took her second invention, the AnywayUp Cup, to market comparatively fast. Here only three years passed from the point of ideas inception to the first pre-order of 10,000 units.

1992 – 1999: The Transition Period: Sales growth, product was redesigned and relaunched, sales reached millions, Haberman became a brand: The first trademarks were registered: ANYWAYUP (1996), ZIPA (1997), SPILL-CHECK (1997), ANYWARE (1997), competitors began to imitate the product.

2000 – 2014: Established Period: Competitive market performance, further sales growth, distribution was expanded within Europe and in overseas markets, imitators were challenged in court, angel investment was sought. Although Haberman had keenly pursued the option of integrating manufacturing, she ended up outsourcing it, because some of her investors had demanded this to allow for a greater focus on sales. (Haberman, 2014)

The division into only three development periods helps to narrow the focus of attention of this study, and to assess the longitudinal impact of early-stage decision making, such as delayed filing or non-filing of patents. The segmentation of the process into business development periods will help to assess the significance of IP in light of changing circumstances. Although in section 5 and 6 some designer-entrepreneurs rated IPR as more important than others, there is a certain significance that cannot be ignored. This significance depends on the circumstances surrounding the venture and the commodity, which the venture seeks to take to market. The above breakdown makes it clear that these circumstances change as the business develops. It may be precisely this instability of circumstances paired with the fact that the commodity itself remains under development, which made it difficult for the designer-entrepreneurs spoken to in section 5, to clearly determine the value of IPR. The Haberman case has shown that a one-year delay in patent filing can compromise market power and business growth in the long run. Haberman's fear of follow-up imitators (section 6.5) suggests that the vulnerability of a start-up increases, if owners of IPR do not litigate infringement, because it entices other industry stakeholders to follow suit and also consider producing imitations.

The Haberman case also confirmed that product languages matter with respect to sales, even to a venture that is initially tech-led. However, the case does not suffice to clarify whether or not product languages and registered design rights can be deployed instead of tech-led approaches and patents (preliminary hypothesis 3, section 4.4.3). To verify if a design-driven approach is a viable alternative the legal framework needs further investigation. The following two questions will guide the inquiry in the next two sections:

- **Do design rights provide a basis for an alternative IP strategy in conjunction with start-up business developments?**
- **Is the UK design right robust enough to effectively harness design-driven start-up incentives?**

7. Qualitative data 3: Design IP — a historic verdict

In 1997, whilst a design student at Northumbria University in the UK, Rob Law incepted a design of a ride-on suitcase called 'Rodeo' that was aimed at children. An updated version of the design was registered as a design with UK IPO in 2002, and with the Office for Harmonization in the Internal Market (OHIM, now: EU IPO) in 2003. Six grey scale CAD renderings were used for the latter design registration (figure 67).

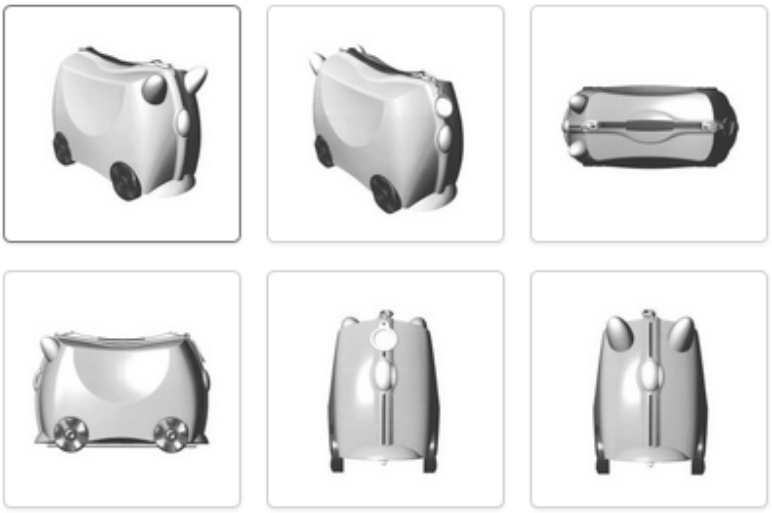

Figure 67: Visuals used by Magmatic Ltd to obtain European Community Registered Design (No. 43427-0001) (image source: http://www.beckgreener.com)

Figure 67 shows an almost perfect depiction of a symmetric 3D object. Expert 5 highlighted that registered designs are best filed using outline drawings (Expert 5, 2014). However, the Supreme Court verdict, that was announced in 2016 suggests that there are many more criteria that determine the strength of a design right.

In 2003 Law licensed the design to a Chinese toy company, and in 2006 he started taking Trunki to market himself having obtained ownership over the production tools through trading in his royalties (Law, 2015). After the Chinese toy company, who had struggled to produce a marketable product for Law, went into liquidation in 2005, the inventor transferred the production between four or five different factories in China, until he moved it to the UK for better quality control in 2012.

Law initially started his company Magmatic Ltd in 2002 with just a £4,000 loan from the Prince's Trust, a charity who supports young talent in the UK. When he licensed the design to the company mentioned above, he invested the entire £4,000 loan in solicitor fees in order to draw up the licensing contract (Coates, 2013). Law explained that he did "a lot of the work by roping in family members and friends, paying them as little as possible" (Law, 2015). Like some of the RCA incubator businesses, he applied a boot-strap approach. Although he "borrowed as much money as possible" (Law, 2015) he refrained from equity investment after his famous BBC Dragons' Den pitch had failed in 2006. During the TV program Law had pitched for £100K in exchange for a 10% equity share (BBC, 2009).

In addition to a production flaw, investor Peter Jones pointed out that 'This product is not patentable.' (BBC, 2009) Rob Law confessed that it was not, and on those grounds Peter Jones subsequently declared the company as 'worthless'. However, in 2009 Law raised £200,000 in exchange for 10%, and, during a second investment round in 2013, when Magmatic Ltd was valued at £12m, Law raised a further £4m worth of equity investment. In 2015 Magmatic employed 35 people in their head office in Bristol and 44 people in their factory in Plymouth (Law, 2015). This confirms that high-growth businesses can be built around product languages.

According to the Telegraph (Burn-Callander, Anderson, 2014) profits had diminished dramatically following the appearance of a competing design that bore close similarities with Trunki: The Kiddee case, which was introduced to the UK by PMS International in November 2012. Some of the figures circulated in the popular press are thought to be inaccurate (Law, 2016). Therefore it is difficult to precisely quantify the damage that Magmatic Ltd encountered. Reportedly the company dropped from a six-digit profit in 2012 to a heavy loss in 2013 (Burn-Callander, Anderson, 2014). In February 2013 Magmatic Ltd issued proceedings against PMS International, and successfully challenged the competitor in the UK High Court. However, Magmatic Ltd subsequently lost against PMS International in the Court of Appeal. Magmatic then took the case to the UK Supreme Court. Whilst awaiting the hearing, Mr. Law revealed in an interview in 2015 that "... if we lose, then it raises questions about everyone's registered designs being valuable" (Law, 2015). They lost.

7.1 The case in the eyes of the law

The UK High Court found that the PMS International's Kiddee Case had infringed Rob Law's / Magmatic's Community Registered Design (CRD — European Registered Designs, the terms Community Registered Design, Registered Community Design and EU Registered Design Right are often used as synonyms). PMS International appealed, which was allowed by The Court of Appeal. Magmatic subsequently turned to the Supreme Court to file an appeal against the verdict of The Court of Appeal. However, the Supreme Court unanimously dismissed Magmatic's appeal.

The reasons

The judgment states:

> 'a design shall be protected to the extent that it is new and has individual character [7]. What matters is the overall impression created by it, and that potential customers will appreciate it on the basis of its distinctiveness ...'
> The Supreme Court of the United Kingdom, 2016

This statement connects with Expert 5's statement that a product's degree of novelty has broader protection (section 6.3) in that the more iconic a design is, the more recognisable it will be to the customer. However, Trunki has been on the market for about six years when Kiddee was introduced. Therefore customers may have acquired the capacity to distinguish design features to a greater degree than in 2006 when Trunki first appeared.

Figure 68: The Trunki design that was registered with OHIM in 2003 (on the left) versus Kiddee (on the right)

The following arguments were brought forward in support of Kiddee:

- Ears / Antennae instead of horns
- Leopard design
- Animal-like appearance
- Rounded 'more cuddly' body shape
- Wheel caps

In March 2016, the Supreme Court confirms the judgment of the Appeal Court, who claimed that High Court judge, Arnold J, 'failed to give proper weight to the overall impression of the CRD [...]'. Whilst expressing 'sympathy for Magmatic and Mr Law, as the idea of the Trunki case was a clever one, but Design Right is intended to protect designs not ideas', the Supreme Court listed three key reasons for confirming the Appeal Court's rejection of the initial verdict:

> 'The first criticism was that the judge failed to give proper weight to the overall impression of the CRD as an animal with horns, which was significantly different from the impression made by the Kiddee Case, which were either an insect with antennae or an animal with ears [21]. The overall impression given by the CRD is indeed that of a horned animal; and the judge did not specifically refer to this when comparing the CRD with the Kiddee Case [37]. A trial judge cannot be expected in every case to refer to all the points which influenced his decision, but when a judge has given a full and careful judgment, conscientiously identifying a significant number of points which weigh with him, an appellate court can properly conclude that his failure to mention an important point means that he has overlooked it. This was the case here [39].'
>
> 'The second criticism was that the judge failed to take into account the effect of the lack of ornamentation to the surface of the CRD [21], i.e. that the absence of decoration reinforced the horned animal impression [40]. This has limited force; unless it simply consisted of items such as eyes and a mouth, any decoration could well detract from the animal impression and even such items could be said to distract

attention from the horns [41]. The Court of Appeal's second criticism was correct, although it is only a relatively minor point which mildly reinforces the first criticism [49].'

'The third criticism was that the judge ignored the colour contrast in the CRD between the body of the suitcase and its wheels [21]. He described the CRD as constituting a claim "evidently for the shape of the suitcase" and decorations on the Kiddee Case were therefore to be ignored [51]. The CRD consisted of CADs of an item whose main body appears as a uniform grey but which had black strips, a black strap and black wheels. The natural inference to be drawn is that the components shown in black are intended to be in a contrasting colour to that of the main body. Accordingly, the Court of Appeal was correct: the CRD claimed not merely a shape, but a shape in two contrasting colours [53] and the judge was wrong in holding that the CRD was simply a claim for shape [53].'

The Supreme Court of the United Kingdom, 2016

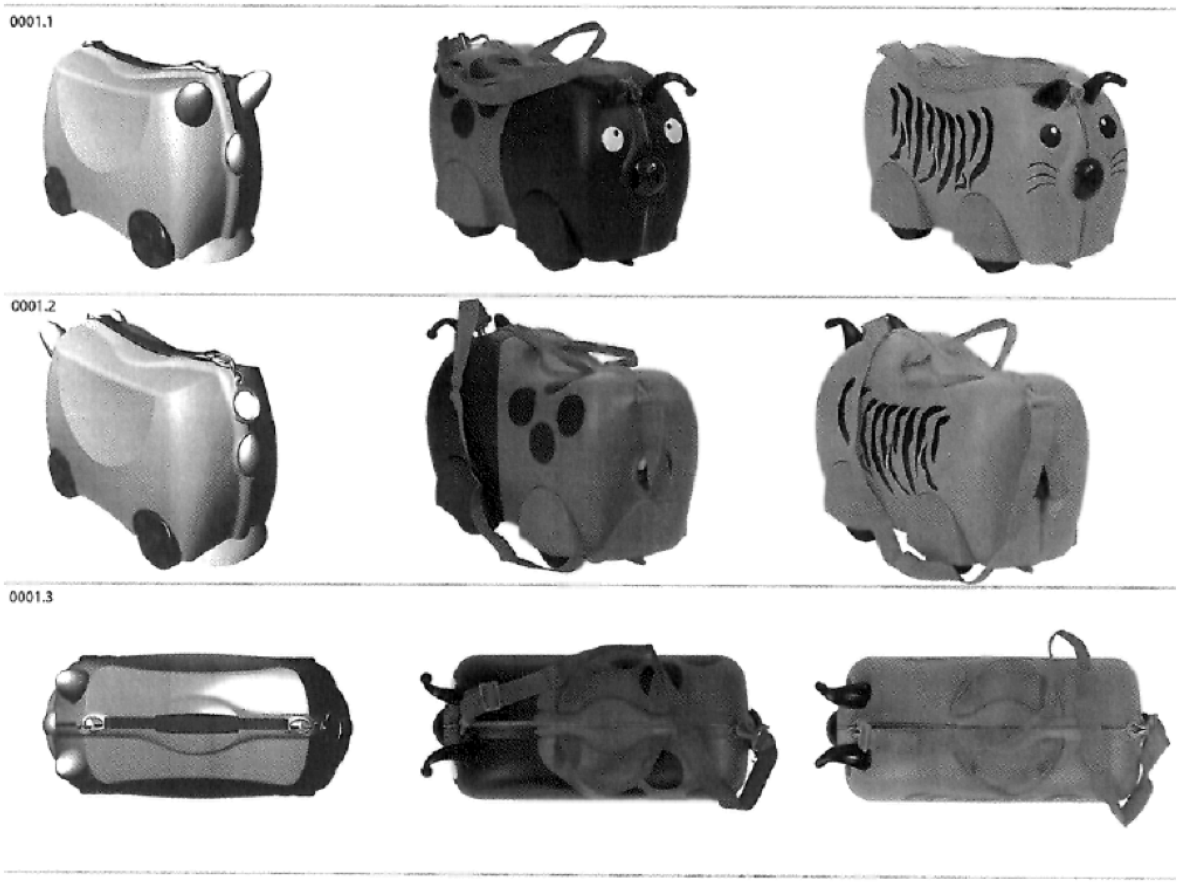

Figure 69: The visual analysis used by the UK courts with Trunki on the left and Kiddee in the centre and on the right

Summary: The Supreme Court confirms the judgment of the Court of Appeal due to:

1. The difference in the overall impression which either of the two designs have on 'the informed user' (At para 55, [Arnold Judge] identified "the informed user" primarily as the parent, carer or relative of a three to six-year-old child)
2. The absence of surface decoration in the registered design
3. The colour difference between individual product components of the registered design

We can conclude from the above that Tushnet's explanation about the confidence loss in design patents and design rights is correct: 'the ordinary observer test makes design patent (and Design Right) infringement findings harder to review and analyze; as gestalts, they are difficult to dissect' (section 3.7.4). The UK counterpart of the *ordinary observer* in the US law, is the *informed user.* Interestingly High Court judge Arnold J defined the informed user in the Trunki-versus-Kiddee case not as the child, but 'primarily as the parent, carer or relative of a three to six-year-old child' (Lord Neuberger et al., 2016). Nonetheless the overall impression is highly subjective, and the reversal of the Arnold J's verdict through the Appeal Court which was confirmed by the Supreme Court of Appeal, makes it clear that even judges struggle to agree on a shared perspective. This means the reliability of design rights is indeed limited, and it explains why confidence in design rights as expressed by respondents through the quantitative inquiry is limited. Hence the Trunki case raises questions whether or not start-ups can be harnessed effectively through design rights rather than patents. Even if *design-driven strategies allow for faster access to market* as articulated in the third preliminary hypothesis (section 4.4.3), they are of limited benefit, if they are not sufficiently robust to fend of imitators.

Inspiration versus imitation

Haberman's patent for a valve was reduced in scope due to prior art produced by the Belanger patent (section 6.4). Prior art also impacts the validity of registered design rights. The squeeze argument relates to prior art which may reduce the scope of protection of a registered design right due to the prior art created by Unregistered Designs:

> In the Trunki-versus-Kiddee case, it meant that if 'the CRD covered the Kiddee Case then it also must extend to the Rodeo, and therefore it [the CRD] was invalid as it did not have "individual character" because it did not produce a "different overall impression" from the existing "design corpus" [i.e. the Rodeo]'
> Supreme Court, 2016, p.6

This means that in principle a UK unregistered design, if in the public domain for longer than the twelve-month grace period, can invalidate a registered design that looks similar. The squeeze argument had little weight in the Trunki-versus-Kiddee case: 'Having compared the CRD with the Rodeo, Arnold J said that "PMS was right not to challenge the validity of the CRD except as part of its squeeze argument" (para 64).' (The Supreme Court of the United Kingdom, 2016) However, Arnold J. stated 'the Rodeo was a prior disclosure but that the relative obscurity of the Rodeo ensured that it did not form part of the design corpus of which the informed user would be aware' (Hogarth Chambers, 2013). What Arnold J meant with relative obscurity was the way in which the Rodeo was depicted. A blurry low-resolution image (figure 68) provided limited detail with respect to specific design features.

However, in principle the premature publication of designs can have a counter-productive impact on the strength of subsequently registered design rights. Roland Lamb, the inventor of the Seaboard, timed the design registration to perfection making maximum use of the 12-month grace period in the UK. He filed his registration precisely a year after his product was exhibited at the RCA degree show.

Figure 70: Image of Rodeo — design details are not clear. (image source: http://ipkitten.blogspot.sg/)

In conjunction with Trunki-versus-Kiddee, Arnold J, the first judge to rule over Trunki-versus-Kiddee, argued that, 'as the Trunki was the first product of its type, the CRD is entitled to a broad scope of protection compared to a design in a more crowded design field.' (Hogarth Chambers, 2013) However, the Court of Appeal as well as The Supreme Court did not uphold this last point, and ruled that PMS International had not infringed Magmatic's CRD. This means that the novelty even of a radical innovation wears off over time, as a consequence the degree to which users and end-customers can differentiate between variations in product languages increases. Therefore the scope of registered design rights diminishes gradually.

The unregistered design rights involved

Figure 71: Unregistered design: Incremental changes in the design since its registration (image source: courtesy of Magmatic Ltd.)

Arnold J. ruled that 'the Kiddee Case also infringed four UK Unregistered Design Rights (UDR) which dealt with specific parts of the Trunki, namely the lock, tow strap and inside retaining straps.' PMS International did not appeal against the infringement of UDRs involved. Rob Law claimed to have received around £3,000 in damages, whereas the legal case in its entirety has cost the company nearly a million (Law, 2016). This means that unregistered design rights are of limited benefit.

7.2 The impact of litigation on the inventing firm

The Trunki case shows that the threat of imitation of product languages is to be assessed by designer-entrepreneurs. "We have had a lot of copies of ride-on suitcase concepts, many working very similarly to our product." (Law, 2016) The first known imitation appeared in 2008, roughly two years after Law pitched the product on Dragons Den (Laura Breen, 2017). The timing supports the assumption that imitations are unlikely to become a threat until a product has proof-of-market. Imitators may then set a precedence that encourages others to copy an idea or a design. Haberman feared this possible scenario in relation to her AnywayUp Cup (section 6.7). For an imitation to become the market lead or for it to dominate a market niche, it takes more than just a design. Law also explains:

> "Selling a product in the area what we call children's travel is really difficult, because the category does not really exist. So all these copies seem to be failing at the first hurdle. They cannot get the traction, they cannot get the buyers. There is not the marketing behind it that would grow the awareness for the product."
> Law, 2016

The fact that disruptive innovations are difficult to align with existing market segments, makes it clear that taking a radical product innovation to market, requires an appropriability regime within which the novelty can flourish. IP, complementary as well as integrated assets are key components of a tight appropriability regime. The concerns articulated by the designer-entrepreneurs who went through Innovation RCA were mostly connected to the lack of a strong appropriability regime, and to the skills and knowledge required to develop nurture it. Trunki was difficult to position within a department store, because it connected with various product areas, children's toys and travel. The fact that a product is difficult to categorise according to established conventions, can be seen as a sign of a radically innovative product invention, i.e. an innovation that will disrupt existing markets or will motivate the development of new ones.

Whilst potentially costly in monetary terms, law suits can be profile-building. Law explained:

> "the morale of the business was hugely lifted by the press coverage on the day of the announcement [of the Supreme Court judgment], where we have never been in every single national newspaper with colour photos before on the same day. And they all went with our story and not with PMS' story. Everyone was reading about Trunki. ...'
> Law, 2016

He further stated that "We got a lot PR out of it. The equivalent advertising spend is probably about the equivalent of our legal cost. […] To some extent we could pull back on our marketing budget." (Law, 2016) It is noteworthy that Trunki had been on the market since for nine about years by the time it was imitated by PMS International, and Law's business had been growing over a period of over six years. This meant that there was a high level of brand recognition already prior to the litigation process. It is questionable if such PR value would apply to designer-entrepreneurs during the fledgling stage of their business development, because they would have less if media presence. On the other hand, the Haberman case suggests that the risk of imitation is low during the fledgling period of a design-led start up business development (section 6.6)

Kiddee was by far not the only case of imitation. Outsourcing the production to Chinese firms may have been cost-effective but it involved risks. Law highlights that "China is the biggest market and the biggest market for copying." (Law, 2015) Therefore Magmatic Ltd invested in a design patent in China. Law explains:

> "in China, a bit like the Community Registered Design [and indeed with the UK Registered Design], there is no [novelty] check beforehand. So we had copycat factories register design patents, which were identical to our shape, which clearly will be invalidated. But this process takes 18 months. So for 18 months they [the imitators] have got a piece of paper they can wave around, and it stops us from taking them off exhibitions, and it prevents us from removing their products from Alibaba. It is frustrating."
> Law, 2015

To counteract the issue, Magmatic Ltd engaged a brand protection agency in China. He further explains:

> "The frontline is the web [...] and second to that are the trade shows. […] After that you probably have to go directly to retailers and after that to factories themselves. But we have not yet gone after a factory, as this requires a huge amount of time and resource."
> Law, 2016

This again proves that the threat of being copied is real, not only in the field of patents and technology, but also in relation to designs and product languages. However, when exactly this threat arises, and at what point in time it is best to register a design, is not yet clear. If a design is registered too late, prior art is created through the publication of the (unregistered) design, and this can invalidate the registered design right or limit its scope. In the case of Trunki, the unregistered design right created through a blurry low-resolution image, had little impact on the validity of the registered design right. But many designers and designer-entrepreneurs are not aware of the danger, as a review of the UK IPO Tribunal cases revealed (Appendix 2).

Figure 72: Infringement scale — The number of occurrences of one single copy. If a company seeks to establish and defend a dominant product language internationally, a carefully developed IP strategy is essential.

Whilst acknowledging the beneficial PR that resulted from the public discussion of the Trunki-versus-Kiddee case, Law claims that the litigation process "sucks away a lot of time and energy and resources that would have otherwise been spent invested in marketing." After the case came to a closure in the Supreme Court, the highest possible court in the British jurisdiction, Law points out that that the process took almost four years in total (Law, 2016). If Haberman is correct assuming that giving in to imitators will entice others to copy designs, Magmatic Limited did not really have any option other than to fight the case all the way. Once a case is exposed to the wider public and intensively debated, a designer-entrepreneur, who backs down, risks to be perceived as an entrepreneur who does not stand up for its rights. The fact that Magmatic Limited lost, exposes weaknesses surrounding the registered design right as a form of formal IP, and this may encourage others to try to circumvent existing designs in the future.

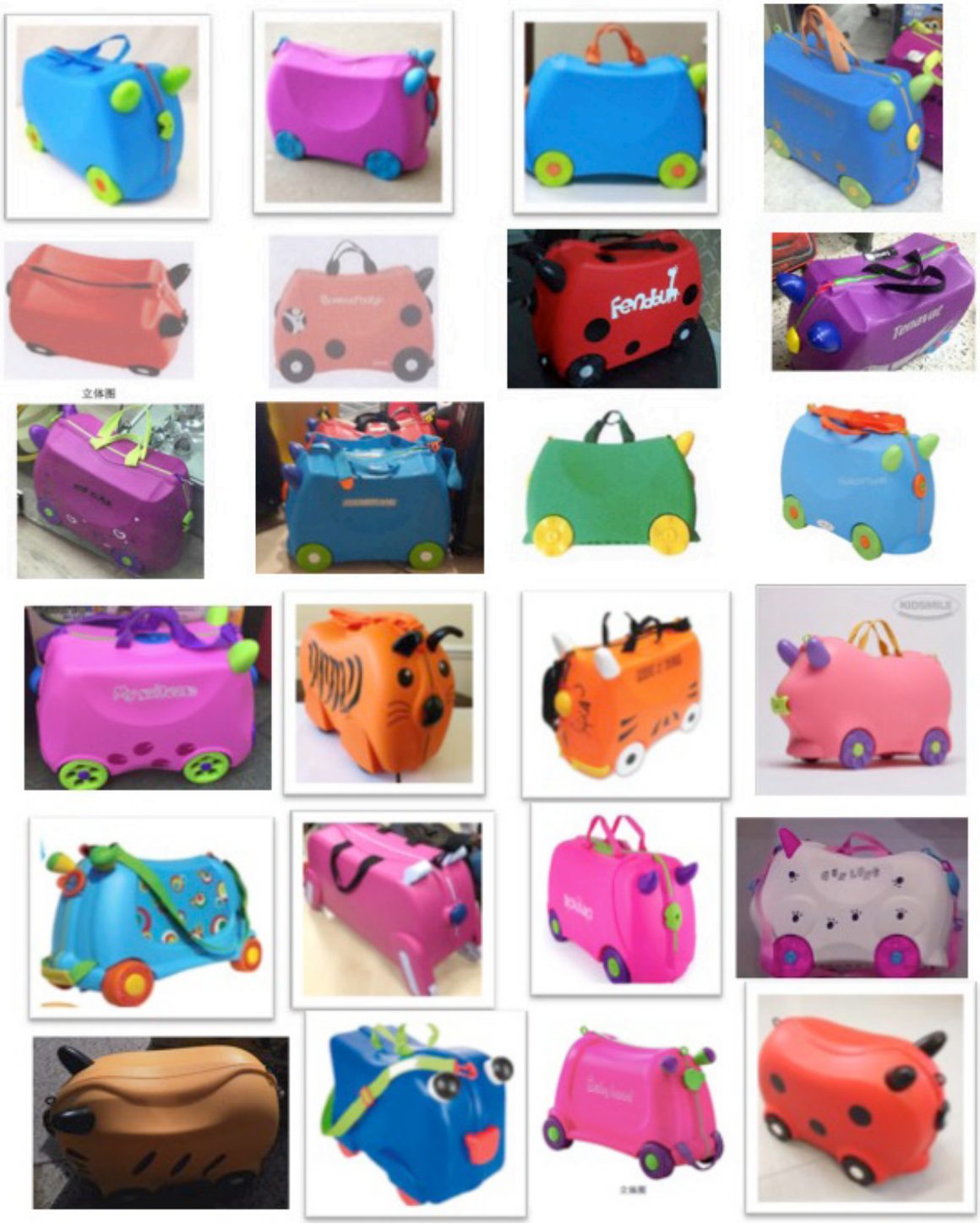

Figure 73: A range of Trunki imitations found by Magmatic Ltd.

On IP and IP strategies

Registering a design in the UK and / or in Europe is cost-effective, although the costs increase gradually if the registrations are renewed every five years. The costs multiply if a design is traded internationally. Registering a design or filing a design patent in multiple countries leads to spiraling costs. However, Rob Law did not see the need for that. "We have used our registered design as a basis for copyrighting in other countries. So our copyright in China is based on our registered UK design and European design." (Law, 2016) This means that Magmatic Ltd use UK and EU registered design rights as a precedence to refer back to, when enforcing their copyright in other countries such as the USA. According to Rob Law, the EU registered design is a more reliable point of reference by comparison to the UK registered design. He explained: "I do not know if the people who sit in China who manage Alibaba or other websites, recognise any UK registered designs. But they do recognize European registered designs." (Law, 2016) When questioned about the robustness of his registered design rights in relation to his lost lawsuit, the inventor explains that "The registered design has been a hugely powerful bar in the UK, and it has been successful in the UK when we sent it to UK retailers. It just has not been successful in court." (Law, 2016) "The registered design that was overturned in the Supreme Court was the same piece of paper that had 4 times listings removed from various global trade websites, and from around 150 odd retailers around the world. [...] Only in or own country it seems to have no value." (Law, 2016) This means that a registered design right provides a strong signaling effect that can be used to discourage retailers from trading imitations. In court, the registered design right may not prove to be an effective means. Sutcliffe was clearly mistaken, when assuming that design rights were easy to enforce (See section 5.1.9).

During both interviews conducted, Rob Law described branding as most important: "In the business-to-consumer industry the brand is more powerful than patents and intellectual property." (Law, 2015). Might branding be a more significant asset than IP in the long term?

When asked how the IP legislation in the UK could be improved Law argues that "We need something very similar to what we have got in Europe which is an 'Unfair Competition' rule. [...] [In the UK] We have 'passing off', which is notoriously difficult to pursue, and we were actually advised by the High Court Judge in the first case to drop our passing off claim, because it is so difficult to prove." (Law, 2016) In a conversation in 2015, Dids Macdonald reported of a focus group discussion with legal experts during which she raised the question whether or not the Trunki-versus-Kiddee case constituted a case of unfair competition (Macdonald, 2015). Most of the delegates were said to have confirmed this. The fact that unfair competition cannot be litigated in the UK, weakens not only registered design rights but also potentially trade marks.

7.3 Qualitative data 3: Insights

Rob Law licensed his design out in the first instance. Although this approach proved nonviable, he succeeded in establishing the product on the market. This supports Clarysse and Kiefer's point that 'the majority of patents don't earn substantial revenue through this passive method [i.e. licensing]' (Clarysse and Kiefer, 2011, p.106) applies not only to patents but also to designs. However, it also means that a product can be tested on the market through a licensing route.

- Viable business can be built through a design-driven approach and without an IP strategy that relies on patents. The Trunki case study does not confirm whether or not equity investors can be attracted to a design-driven start-up because Rob Law did not rely on equity investment during the fledgling period. The Dragon's Den situation suggests that angel investors prefer a technology-led towards a design-driven approach.
- In line with section 6.6, this case study suggests that novel products are unlikely to be infringed until proof of market has been established. The invention was publically disclosed in 2006 through TV broadcast, the first case of infringement dates back to 2008 according to emails exchanged with Laura Breen from Magmatic Ltd (26 October 2017), approximately two years after the product was introduced to the market in the UK.
- Section 4.4.1. raised questions surrounding the value created through novel product languages, and if such can be effectively protected through registered design rights. The Trunki case suggests that design rights are not a robust enough a means of protection in the UK. Here it is relatively easy to circumvent an existing design through adjustments in the product language.
- The fact that different judges arrived at different verdicts makes it clear that there remains confusion about what can and what cannot be protected through design rights. Outside of the UK it thought to be easier to challenge imitators than within the UK. Infringement letters appear to be an effective means to get retailers to take imitations off the shelf.
- Branding can be a more effective appropriation factor than design rights. None of the imitations found carried the Trunki logo. But branding requires a brand recognition within the target sector. It takes time to establish such brand presence.
- Prior art created through Unregistered design right can impair the scope and validity of registered design rights in the UK, if the latter is registered after the twelve-month grace period has lapsed.
- The community registered design right (CRD), now known as EU registered design right, is considered stronger a means of protection than the UK registered design right. The former costs more to register €350 for online filing than the latter which costs £50 for online filing.
- The CRD can support the copyright in territories outside the UK. As it provides documentary evidence of what exactly was designed, by whom and when, the CRD sets a precedent which innovators can refer back to when enforcing their informal IP overseas. Thus it can be used in support of later amended versions of a design, provided that a close resemblance remains between the new and the registered versions.

The third preliminary hypothesis articulated in section 4.4.3 which speculates that registered design rights may help to delay patenting and consequently speed up the route-to-market is in principle correct. However, this can be said with certainty only if equity investment is not required, because it remains unclear whether or not investors can be attracted through design rights. Rob Law used a boot strap approach whilst developing his business. The signaling effect, one of the key IP values mentioned in section 3.7.7 works in relation to competitors and imitators outside the UK, but it does not necessarily convince investors. The robustness of this form of IPR remains at question.

8. First interim analysis: The robustness of UK design rights — results from a survey

Sections 5 - 7 raise the question whether or not the UK design right robust enough to effectively harness design-led start-up incentives. The term *robustness* was explained under section 3.7.6 in relation to an designer-entrepreneur's ability to litigate potential IP infringement (footnote 10). It was mentioned in conjunction with the RoboFold case study (section 5.1.7), and with the Haberman case study (section 6) where it was linked to the designer-entrepreneur's confidence. The latter led to the question how robust the legal framework is surrounding design rights in the UK. To answer this as well as the preceding question, whether or not design rights may provide alternative means for securing USPs in conjunction with design-led start-ups, the following section reviews a paper authored by the PhD applicant in relation to the first survey into the infringement of registered design rights in the UK. The Trunki case makes it clear that investment-worthy businesses can be built around design rights. The outcome of the Trunki case raises questions about the robustness of design rights in the UK. The purpose of discussing this quantitative study is to establish to what degree the insights gained in relation to the Trunki case are transferable. Magmatic Ltd was successful in enforcing their rights through correspondence with retailers, usually with reference to their EU registered design right, rather than their UK registered design right. So, to what extent and how do design right owners in general make use of their IP? Does the Trunki case reflect common industry practices?

The first of three key questions raised in section 4.4. related to the effectiveness of registered design rights. In pursuit of clarity, section 8 examines the views of UK-based designers or design right owners towards registered design rights, and to compare these results to the views expressed in the interviews above. This will help to answer the following questions in relation to registered design right:

- How reliable a form of IP is it in the eyes of the UK design industry?
- How is it commonly used at the present moment within the UK?
- To what extent are registered design rights enforced in UK courts and through pre-court measures such as infringement letters?

The data used for the following analysis has been discussed in a paper presented by the PhD candidate at the Design Management Academy Conference 2017, which was hosted by Hong Kong Polytechnic University.

As explained in the paper (Hillner, 2017a) the data was first obtained through a questionnaire that was designed in such a way that questions could be answered by both infringers and infringed designers/ design companies. In line with legal terminologies, the word *defendant* was used instead of *infringer*, because it was assumed that respondents would be reluctant to identify themselves as *infringers* or *potential infringers*. The majority of survey respondents were *claimants*, i.e. individuals and firms who had perceived their design rights as infringed. However, there were some defendants whose responses allowed some insights into how registered design rights are perceived from the point of view of an imitator or imitating firm.

The paper further explains that two contact databases provided postal addresses, one with owners of designs registered in the UK, and another with owners of designs that were registered with OHIM

in Europe. Owners of design rights that had expired were not included in the survey, nor were those who were not resident in the UK (Hillner, 2017a). According to the author, it was not possible to construct a questionnaire that investigated multiple incidences of design right infringement in great detail with one questionnaire. For the benefit of clarity those questions which were raised to examine the particular details in relation to the infringement of registered design rights, were directed to 'one particular dispute and preferably the dispute which best represents those [the recipient had] been involved with'. (Hillner, 2017a) This was necessary in order to get respondents to reflect on one representative sample case that could be examined in detail without generating ambiguous responses through the conflation of facts related to multiple different cases of infringement.

As highlighted by the author, all the data used in the study was collected prior to the UK Brexit referendum, but after the Trunki case was judged in the Supreme Court of Appeal. This means that the Trunki-versus-Kiddee verdict may have affected the views of some survey respondents.

The first few sets of data discussed in the following map out the context within which registered design rights are used by UK-based design industry stakeholders. This provides an insight into which design sectors utilise registered design rights. The questionnaire helped to generate three sets of data:

- **The use of design IP in general:** Infographics one to six (appendix 3) which are discussed in section 8.1 examine the general use of design IP.
- **The infringement of registered design rights:** Infographics seven to nine (appendix 3) are discussed in section 8.2 to better understand the particulars surrounding the infringement of registered design rights, and how IP owners respond to infringement. The questions raised here were focusing on one particular incident of infringement, whereas the other two sections were referring to all cases of design right infringement experienced by the respondent.
- **Behaviour patterns and views towards design IP:** Infographics ten to fifteen in section 8.3 discuss the views of UK-based owners of registered design rights with respect to their IP.

Terminology: The questionnaire was designed to investigate perceived infringement, alleged infringement as well as actual infringement (Hillner 2017a). This meant that questions needed to be designed to elicit situations where recipients thought to have been infringed with or without taking action, as well as situations where cases were taken to court. Therefore, the term 'dispute' was defined in a liberal way. It was specified as 'any kind of awareness of, or correspondence (pre-court, in court or out-of-court) related to the actual or potential infringement of IP.' (Hillner, 2017a) Infringement in the survey as well as in this PhD thesis can be both intentional or inadvertent. Copying on the other hand is considered to be intentional by default. In an email a Professor of International Design Law at Queen Mary University of London, raised the question 'if inadvertent, how is it a copy?' (Expert 7, 2015) Therefore copying is perceived as a deliberate act of emulating an existing design.

8.1. The use of design IP in general

Whilst the case studies featured in sections 5 - 7 were carried out in depth, their number had to be limited to fit the scope of this thesis. The survey inquiry was carried out across a large number of UK registered design right owners, and is therefore more representative of the UK design industry as a whole. The survey, which was predominantly quantitative, allowed to investigate some very specific questions in great detail, in particular in relation to the robustness of this form of IP.

Relevant design sectors: Infographic 1 (appendix 8) shows that the majority (54.73%) of design right owners belong to the product design and industrial design sector. This somewhat justifies the focus of this thesis which is product innovation, and those areas of design-related practice that are connected to this area of design practice. Conversely one could speculate that the IP legislation surrounding design may not be corresponding to certain areas of contemporary design practice, the origins of which date back centuries: 'Design right dates from the eighteenth century, and registered design right from the nineteenth.' (Hargreaves, 2011, p.64) Where the IP framework has not been updated in good time or to a sufficient degree, various sectors such as service design may not sufficiently benefit from design IP as a consequence. This indicates that in certain areas it is more difficult to protect a proprietary design-led start-up through IP. However, with respect to product innovation, product languages and consequently registered design rights are of great significance.

Firm sizes: The survey results show that the use of registered design rights is more common in small firms than in larger companies (infographic 2, appendix 8). Over two thirds of the respondents, all of whom were owners of registered design rights at the time of the survey, were either individuals (40%) or micro firms of 2-9 employees (29%). Only 6% of respondents claimed to have more than 250 employees. As highlighted in the introduction, smaller firms and sole traders dominate the design industry in the UK. There are only comparatively few medium and large corporations by comparison. Therefore the distribution of registered design rights might be vaguely proportionate to the number of small, respectively large design businesses in the UK. The filing costs which are low by comparison to patents, may attract small businesses, whilst large corporations may be less concerned about IP costs, since they may have larger funds available. What the data set also shows is that this study which focuses on business development and IP strategies for small start-ups and lone inventors, is relevant to a great proportion of the UK design industry.

IP Awareness: The degree of awareness for registered design rights is particularly significant in the context of this study, because it will inevitably affect the designer-entrepreneurs' behaviours. The fact that Rob Law was unaware of an EU unregistered design right (this became apparent in the interview conducted with him in June 2016), for example, is surprising, since its validity is significantly longer — 15 years — than that of the UK unregistered design right, which is 3 years (October 2017 — ACID is trying to urge government to increase the validity of the UK unregistered design right). If inventors are unware of certain forms of IP, these will be underutilised. Infographic 3 (appendix 8) shows not only that amongst the owners of registered design rights over 45% are unaware of UK unregistered design right, and over 54% of the EU (Community) unregistered design right, many of them are also unaware of the existence of a EU (i.e. community) registered design rights. According to Hillner's paper (2017a) over one third of respondents 36.67% claimed to not have heard of EU registered design rights before,

despite the fact that this right covers a far greater territory whilst the costs are insignificantly higher (See section 3.7.5). Since all respondents were at the time of the survey in possession of registered design rights, we can assume that those who are not aware of a EU registered design right, will have owned a UK registered design right. If the latter is less robust than the former, as indicated by Rob Law in the previous section, then we may conclude that the use of registered design rights in the UK is compromised through an underutilisation of EU registered design rights. Indeed the number of owners of UK registered design rights is far greater than that of EU registered design rights, 88.7% versus 39.7%. Clearly some respondents have filed for both rights. But the figures of infographic 3 and 4 combined (appendix 8) suggest that many designers did not secure any EU registered design rights simply because they are not aware that this form of IP exists. It has to be highlighted that the survey was conducted prior to the BREXIT vote, the results of which were released on 23 June 2017. Public announcements made by ACID, as well as emails exchanged with Dids Macdonald, CEO of ACID, indicate that UK-based individuals and firms may lose their EU IP rights, including registered and unregistered design rights (email received from Dids Macdonald, 18 September 2017). If that is the case, then the comparison between UK registered design rights and EU registered design rights will become redundant, and only UK registered design rights will remain of relevance. It is further possible that the UK registered design rights may be redefined in light of UK's exit from the EU.

Acquisition costs: The costs involved in filing a registered design right have been clarified in section 3.7.5. But it has to be noted that to sustain its validity beyond five years, it requires renewal fees which are higher than the initial filing fees. Only 300 respondents could clarify approximately how much they spent annually on obtaining and maintaining design IP. Around 42% of respondents ticked 'Don't know' (Hillner, 2017a). Judging by the other responses, we can say that investment in design rights is modest. Over 70% of respondents claim to spend less than £10K per annum (infographic 5, appendix 8). Over 30% of respondents spend less than £1,000 per annum, and investments of over £100K are exceptionally rare. It follows that design rights are considerably inexpensive, both in terms of acquisition and maintenance. They certainly do not require a budding designer-entrepreneur to raise equity investment.

Design Right Disputes: The paper presented by Hillner (2017) reveals that the number of cases of UK design right infringements 21.4% is significantly larger than those of EU registered design right infringements (12.3%), but the difference is proportionate to the number of owners of either design right (infographic 6, appendix 3). 88.7% of respondents claimed to own one or several UK registered design right, whereas only 39.7% stated that they owned a EU (community) registered design right (infographic 4, appendix 8). We can generally say that only a relatively small percentage of respondents was involved in one or several design right disputes. Based on the figures in infographic 6 (appendix 8) we may assume that no more than 33.7% got involved in disputes surrounding registered design rights, perhaps less if certain disputes involved both UK and EU registered design rights. Note here that dispute is not limited to litigation. Infringement letters, and any kind of 'awareness of, or correspondence […] related to the actual or potential infringement of IP' was considered a dispute here. So only about one third of owners of registered design rights experienced such a situation in relation to their respective IP. Therefore one could speculate that either, infringement is relatively rare, or the owners of registered design rights make little effort in monitoring possible infringement.

8.2. The infringement of Registered Design Rights

With respect to the following six infographics (infographics 7 - 12, appendix 8), those respondents who had been involved in more than one dispute surrounding design right infringement were told to refer to one particular dispute in their answer and preferably the dispute which best represented those they have been involved with. This was to avoid confusion and ambiguous responses (Hillner, 2017a). The paper further explains that a distinction needed making between those who saw their rights as infringed, and those who had been accused of infringing the rights of others: 163 respondents (91.06%) stated that they were claimants with respect to the incidence of design right infringement, 16 respondents (8.94%) were defendants (Hillner, 2017a).

The forms of IP involved in Design Right disputes: IP disputes often involve a range of different forms of IP. This is due to the way they are defined. Hargreaves highlights that 'There are also circumstances in which copyright can protect designs, and ones in which trade mark protection is relevant. Within this patchwork are differences as to what forms of design are covered, how long the rights last, what is required to prove infringement, and what the penalties for infringement may be.' (Hargreaves, 2011, p.64). The infographic 7 in appendix 8, which was discussed by Hillner (2017a), shows the forms of IP that were involved in the particular case of infringement, which the survey respondents referred to in the second section of the questionnaire. What we can see here is that the data is fairly coherent between defendants and claimants, with the only exception of EU (i.e. community) registered design rights which was enforced by few claimants only. That, and unregistered design rights aside, the range of IP involved is fairly similar between claimants and defendants.

Infographic 7 also shows that UK registered design rights (UK RD) dominate the disputes. Hillner suggests that this is due to the fact that more than twice as many respondents invest in UK registered design rights than in EU registered design rights (Hillner, 2017a). The low outcome with respect to unregistered design rights is not surprising given that around half of the respondents are unaware that such rights exist (infographic 3, appendix 8). One can see that it is not at all uncommon for design right disputes to involve other forms of IP. Therefore it is difficult to compare patents and registered design rights in terms of significance as attempted in section 3.7.8. Whilst there is a clear distinction between design rights and patents, due to the fact that functional aspects of a design are excluded in the former, the definition of registered design rights means that all owners of registered design rights will by default have an unregistered design right for the first few years (see paragraph on IP awareness above), and there is also an overlap between registered design rights and copyright.

Hillner states that '76.7% of respondents claimed that the design was used in a product, which [the respondents] were selling at the time of infringement' (Hillner, 2017a). This means that infringement of design products or product concepts that are not market ready, i.e. ready to be sold, or do not have proof of market, i.e. are being sold already, appear to be rare. This confirms the point made in section 5 which claims that pre-market products are hardly under threat of copying.

'The fact that only 4.8% of respondents stated that the design was licensed to another business may suggest that design right stakeholders are more aware or more protective of their rights if they trade the designs directly.' (Hillner, 2017a) This means that: A) IP strategies are closely connected to business

models, and B) deficiencies in the awareness of potential infringement may limit the effectiveness of IP strategy implementation.

The relevance of company sizes: Infographic 8 (appendix 8) examines the sizes of the respondents' companies by comparison to the opposing firm. In relation to patents, Weatherall et al. claim that 'Larger firms are disproportionately represented in listed cases, while SMEs and micro firms are rarely litigants.' (Greenhalgh et al, 2010, p.3). Hillner suggests that this hypothesis does not apply to design rights (Hillner, 2017a). The proportion of companies who are litigating potential infringers, and conversely those who defend themselves against others does not seem to depend on whether the other party is larger or smaller. Only companies that defend themselves against smaller claimants are visibly fewer than the number if those companies who litigate smaller firms. Whilst one needs to admit that the number of defendants, who responded to the survey, is small, and not statistically representative, we can conclude from the claimants' responses that contesting and litigating design right infringement is not a large firm's game (Greenhalgh et al, 2010, p.3), when it comes to registered design rights. Micro-scale companies and SME's alike own registered design rights, and do take action regardless of the size of the opponents' business.

Reactions to infringement and success rates: Whilst only about a third of respondents were aware of a potential infringement situation, amongst those who were aware, very few design right owners (only 5%) refrained from taking action (infographic 9, appendix 8). 'A high percentage seek legal advice (solicitor: 40.2%, Contacted a patent or trade mark attorney: 39.1%) and send an infringement letter (67.0%). Only 16% of claimants issued a court claim.' (Hillner, 2017a) This leads to the question why there are so few cases of litigation. Do claimants succeed with their pre-court challenges such as infringement letters? Or do they give up prior to filing a claim?

Hillner's paper also examines how various reactions to the actions taken by the owners of registered design rights in response to the perceived infringement of their rights: 'Those respondents, who took some sort of action were subsequently asked how the other party reacted. The question [which was aimed at one particular incident of infringement] was formulated as follows: What response did you (as infringed party) receive from the other party? OR How did you (as allegedly infringing party) respond to the claim?' According to the author 39.9% defendants who had been contacted by the survey respondents that took action, ceased to infringing permanently, and 14.0% temporarily (Hillner, 2017a). This means that over 50% of the actions taken were successful. This concurs with Greenhalgh et al's claim that 'solicitors' letters often resolve disputes' (Greenhalgh et al, 2010, p.1). In 25.8% of the cases the defendants who were challenged through infringement letters and other actions, claimed that the design was invalid (Hillner, 2017a). The survey results suggest that design rights can be enforced through pre-court measures. Comparing these results to the insights obtained through the Trunki-versus-Kiddee case study, we may assume that infringement letters sent to retailers are particularly effective.

The survey discussed by Hillner (2017a) comprises 32 responses from owners of registered design rights related to incidents of infringement that were litigated in court. This number may be too small to be statistically representative. However, the results may still provide an indicative insight on the success prospects in relation to design right litigation. Hillner explains that 'Over a third of the cases involved

were judged in favour of the claimant. 15.6% of cases were still pending, and another 15.6% were settled out of court, including one case that was reported by a defendant.' (Hillner, 2017a) Most of the other respondents (28.1%) did not provide an answer. With only 6.3% of cases judged in favour of the other party versus 34.4% in favour of the respondents (all of whom were claimants), we may conclude that the success rate in relation to the litigation of registered design rights is fairly high.

Duration of litigation: In the previous section, we learned that the litigation process in relation to Trunki-versus-Kiddee took almost four years. Even a successful case can be compromising if it consumes funds, staff time and energy over extended periods of time. The responses of 20 survey respondents shed some light into the average duration of the design right litigation process. According to Hillner, the shortest example of the litigation of registered design right litigation took two months, while the longest took four years (Hillner, 2017a). It took 1 year and 8.65 months on average to resolve the dispute. This could be problematic for a start-up, since continuous progress is required to establish a firm, and a lengthy court process can be disruptive to the business, as testified in the Trunki-versus-Kiddee case study.

8.3. Behaviour patterns and views towards design IP

This final subsection establishes some principle facts in relation to how registered design rights are perceived and used in the UK. Given that success prospects in relation to the litigation of design right infringement is high, the affordability of litigation needs examining.

The infographic 10 (appendix 8) shows the amount of funds invested in legal fees required for the litigation of design right infringement. Although the investment is by tendency significantly higher than the investment in the annual acquisition of IP, very few cases cost more than £100K. Whilst inventors and angel investors agree that defending patents in the early stages of a design business start-up development is prohibitively expensive, the defence of registered design rights seems not only affordable with over 63% spending less than £10K, but also recommendable given the prospects of the case to be judged in favour of the claimant as highlighted above.

Radical versus incremental innovation: The sections 3.2 - 3.5 in the literature review discuss the relevance of radical innovation in relation to product innovation and we concluded that innovations can be more or less radical. Infographic 11 (appendix 8) shows that, when asked how to rate the quality of their infringed design(s), over half of the respondents rated them as 'definitely radical' (18.80%) or 'rather radical' (33.5%) (Hillner, 2017a). This response may be to some extent subjective, yet it suggests that radically innovative products benefit from design registration more than others. Given that a product requires a degree of novelty to qualify as a registered design, perhaps those designers who see their novelties as incrementally innovative may shy away from registering.

Timing of Infringement: According to Hillner almost 40% of infringements of registered design rights happen within two years of registration. After the second year the likelihood for an infringement to occur diminishes year on year (infographic 12, appendix 8). Hillner argues that 'the value of

design depends on the product life cycle. The closer to the end, the lower will be the cumulative value that can be appropriated from a design.' (Hillner, 2017a) So the risk of an imitation to occur is proportionate to the commercial value of the product as well as the product live span.

Perceived robustness and confidence: In his paper, respectively in the study this paper is referring to, Hillner defines *robustness* as 'the level of protection offered by the type of right' (Hillner, 2017a). This definition concurs with the definition in this PhD study (section 3.7.6). When asked to rate the robustness of different forms of IP 'on a scale from 1 to 5, one being least robust and five being the most robust' (Hillner, 2017a), the average of 526 responses reveals that registered design rights are seen as significantly less robust than trade marks and patents (infographic 13, appendix 8). Registered design rights received a rating of 3.27, as opposed to trademarks with 3.94, and patents 4.10. This result again, may explain why designer-entrepreneurs are drawn towards patents rather than design rights. Unregistered design rights received the lowest rating: 1.94. A confidence rating that was conducted to compare registered and unregistered design rights triggered comparable responses. According to Hillner, the average mean of confidence in registered design rights was 3.20 on a scale from one to five, and with respect to unregistered design rights it was 1.96 (infographic 14, appendix 8). It is worth pointing out that almost 20% of respondents ticked 'don't know' when rating the robustness of and their confidence in registered design rights, and just under 50% of respondents did not know how to rate unregistered design rights (Hillner, 2017a). There appears to be a significant lack in faith in design rights, which in turn may explain the keen interest in patents, which could be observed in conjunction with the majority of case studies.

Robustness — average mean:

Registered Design Right:	3.27
Unregistered Design Right:	1.94
Copyright:	3.24
Trade mark:	3.94
Patent:	4.10

Confidence — average mean:

Registered Design Right:	3.20
Unregistered Design Right:	1.96

There can be no doubt that confidence in registered design rights is much lower than in Patents. What is also striking is that almost one fifth of respondents do not know how to rate registered design rights, despite the fact that they have invested in it. It is likely that their decision to invest is not so much influenced by their faith in the IP, but by the low cost and effort required to obtain registered design rights. The values stand, perhaps unsurprisingly, in close correlation to the responses obtained with respect to the perceived robustness of IP. This means that, if the robustness of IP is increased, confidence in the use thereof will grow proportionately. Changes in the legislation would affect designers' attitudes and behaviours. Therefore enhancing the utilization of IP through improvements in the IP legislation could increase the use of IP, which in turn would benefit the economic output.

Despite the lack of confidence in registered design rights as a form of IP, respondents feel relatively positive about the costs involved in registering designs (infographic 15, appendix 8). The ratings are fairly positive with an average mean of 3.48 (between 'Average' and 'Good Value for Money') This confirms the assumption made earlier that design right owners appreciate registered design rights due to their affordability, and not due to their robustness.

According to Hillner '54.4% of respondents expect[ed] the number of design rights infringement cases to increase in the [following] five years. 26.0% expect[ed] it to remain the same, only 2.1% expect[ed] a decrease' (Hillner, 2017a). The remaining 25% stated that they would expect the risk of infringement to remain more or less the same.

8.4. Focus group comments

The data collected through the focus group meeting constitutes the qualitative component in relation to the design right infringement survey inquiry. As explained in section 4.2.1., the focus group meeting was held prior to the design of the questionnaire. Its aim was to verify the relevance of diverse survey questions, and to address the concerns of the stakeholders who were invited to join the meeting.

Costs: Hillner explains that the most prominent problem were the costs involved. Worldwide protection multiplies the costs for design right protection / design patents (Hillner, 2017a). However, according to Rob Law (section 7), it may be possible to enforce copyrights through reference to a EU registered design right. This possibility is likely to vanish, should the UK leave the EU in 2019. The focus group also referred to 'costs of enforcing rights'. However, the quantitative findings above suggest that this litigation costs are not prohibitively high. It is likely that the focus group's comments, who met in July 2015, when the Trunki case was already widely known, was commenting on enforcement costs with a few high-profile, and indeed costly cases in mind.

Design attributes: Whilst stating that 'many designers are unaware that design rights don't protect functionality' (Hillner, 2017a), the focus group identified three key design attributes, including functionality, which 'determine the behaviour of a product' (Hillner, 2017a). The other two attributes mentioned were: personality (aesthetic qualities) and performance, a derivative of how the product is made. The value of a design depends on these attributes, which can be protected through a variety of different means. Hillner's paper states that functionality can be protected through patents, and the other two attributes through design rights and copyright, but it does not expand on how exactly these protection mechanisms may perform in relation to the attributes listed. This will be discussed further in the latter part of this thesis.

The focus group appears to have predicted some of the survey findings, for example the fact that 'The majority of design right infringement cases are thought not to involve litigation' (Hillner, 2017a). According to Hillner, the focus group speculated that 'A lot of designers who consider their design as being infringed tend to "stick their head in sand" or "move on". At the same time infringers reportedly tend to back down when challenged that they are infringing.' (Hillner, 2017a). The latter point can be judged as confirmed through the survey findings which provides evidence for the success

rates of litigation processes. To what extent design right owners 'stick their heads in the sand' cannot be judged based on the quantitative data available.

Litigation success prospects: The focus group suggested that 'The success in litigation is thought to be dependent on the size of the opposing party.' (Hillner, 2017a). The survey findings do not support this point of view. The idea that 'If you hit the target 1 out of 5 you are doing great' as expressed by one of the focus group delegates, cannot be supported either, because the success rates related to actions in response to infringements are almost 54%, and only around 25% of defendants claim the design to be invalid.

The relevance of a business model: What is particularly interesting in conjunction with this PhD thesis is the suggestion that the choice of IP protection according to Hillner is 'determined through the business model' (Hillner, 2017a). Considering the designer-entrepreneurs, who were / are part of Design London / Innovation RCA, the need for a patent appeared to be a necessity and business models evolved around it. The alignment, or potential misalignment, of IP strategies and business models is of greatest significance in conjunction with this thesis. Hillner (2017a) lists the following options as the most common practices:

- Assignment of rights to a client (1)
- A company (usually a large company) that creates design for itself, e.g. in-house design or proprietary design firms. (2)
- Licensing of rights to a client. In this case the obligation to protect needs to be negotiated amongst stakeholders (3)
- Assignment of rights to an intermediary company that deals with licensee/rights enforcement. This can protect the design company. (4)

These options connect closely with the categorisation of design businesses published by The Big Innovation Centre (section 2.2).

- Design Services Businesses would commonly assign rights to a client (1) or license rights to a client (3)
- Designer-'makers' would create design for themselves (2) — and we may argue that in light of crowd-funding and e-commerce, this may not be limited to large companies — though some designer-'makers' may choose to license to a client (3), or to assign their rights to an intermediary company (4).
- Design 'aggregators' are partially on the receiving end and obtain rights through assignment (reverse 1) or through license (reverse 3), or obtain rights from an intermediary company (reverse 4)
- According to The Big Innovation Centre (2012), Global manu-services businesses do not rely much on design rights. But if we extend these possible configurations in general, then we may assume that global manu-services businesses would acquire rights through assignment (reverse 1) or license (reverse 3). It is more likely for a global company to employ their own division for this purpose than to use intermediary companies.

Hillner highlights that 'The different approaches to managing design rights may result in different attitudes to protection / infringement.' (Hillner, 2017a). He also reveals that the value of a design depends on its life-cycle. 'The greater the life-cycle of a product, the more recommendable investing in a registered design right will be.' However, lifecycles can be difficult to predict.

Soft benefits: According to Hillner, the focus group highlighted the value of soft-benefits, i.e. non-monetary benefits which relate to reputation building that derives from accreditation. His paper suggests that 'The value of […] attribution depends on where the product is sold. The accreditation through up-market retailers provide stronger credentials for the originator of a design than a budget-retailer' (Hillner, 2017a). Confidence which came to mention in case study 5.1.4 (Roli) and case study 6.2 (Haberman) can also be seen as soft benefits.

Complexity: In line with Hargreaves' point of view, it is stated that 'the design rights system would benefit from a process of simplification'. This can be related back to the patchwork of IP discussed by Hargreaves which was mentioned under 8.2. The complexity of the UK design IP system means that it is more difficult for designers to choose between multiple overlapping options, and to establish a reliable IP strategy that supports the business development plan surrounding a start-up.

8.5. Quantitative data: Insights

The majority (54.73%) of design right owners belong to the product design and industrial design sector. Design rights are comparably inexpensive, both in terms of acquisition and maintenance. There is a perceived connection between registered design rights and innovation, radical innovation in particular.

Design rights and the litigation of design right infringement is not *a large firm's game* as suspected by Greenhalgh et al. But litigation of design rights is a *minority sport*, with only 33.7% of respondents overall being involved in disputes, and out of those only 16% of defendants issuing a court claim. The reason for appears to be two-fold: On the one hand 69.9% of claimants sent an infringement letter, and, court claims included, 53.9% of actions led to the permanent or temporary discontinuation of the infringement. This means that there is a reasonably high success rate with and without taking infringement cases to court. On the other hand, a limited level of confidence in registered design rights with an average mean of 3.2 out of 5 may discourage design right owners who are confronted with a potential infringement situation from taking court action. Although the survey was conducted independently of the PhD study, and in pursuit of a different set of aims and objectives, it does help to answer questions that are related to, however not identical to those raised in section 4.4.

- Do design rights provide a basis for an alternative IP strategy in conjunction with start-up business developments?
- Is the UK design right robust enough to effectively harness design-led start-up incentives?

The data above would suggest that, yes, design rights are sufficiently reliable due to the percentage of successfully contested infringement cases. Where there is perceived infringement, it can be contested through infringement letters as highlighted above. As claimed by the focus group, 'infringers reportedly tend to back down when challenged that they are infringing'. Litigation prospects also speak in favour of the effectiveness of registered design rights. Here the focus group seemed mistaken. The claim that 'The success in litigation is thought to be dependent on the size of the opposing party.' (Hillner, 2017a), is not supported through the quantitative data. Regardless of business sizes, over one third of cases were judged in favour of the claimant, as opposed to only 6.3% of cases judged in favour of the defendant (Note that the low numbers of court cases mean that the data is not statistically representative).

Design rights are much more affordable than patents in terms of acquisition and also in terms of litigation. Over 40% of registered design right owners spend no more than £1,000 in total per annum on the acquisition and maintenance of IPR, and just under 30% spend between £1,001 and £10,000. 50% of the owners of registered design rights who responded to the infringement of their IP through litigation, spend less than £5K on legal fees in pursuit of the process. One could speculate that claimants may drop cases, where these become too expensive. However, the high success rate of court litigation suggests that higher investment is often not required to enforce rights. Almost 45% of respondents rate registered design rights as good or very good value for money.

Despite these results, confidence in registered design rights is mediocre at best. Whilst some 20% of respondents see themselves unable to rate its robustness (infographic 13, appendix 8), amongst those who provided a rating, patents are considered to be significantly more robust means of protection than registered design rights, and so are trade marks (although the protection applies to different aspects of innovation). The limited confidence in registered design rights contradicts the quantitative findings that are related to dispute resolution, which suggest that registered design rights are a reasonably reliable form of IP protection. What might be the reason for this contradiction?

The UK IP framework surrounding designs, i.e. product languages, is theoretically effective. However, it has been utilised very little in the past. Due to unclarity about how it needs to be implemented (section 7), owners of registered design rights do not know how reliable their IP actually is. In practice, registered design rights may have been used effectively on occasion. However, Trunki-versus-Kiddee case is of a seminal nature. It will inevitably set a strong benchmark for future court hearings. Therefore it has affected the views of many who have lost faith in registered design rights. This section in combination with the previous, confirms Tushnet's hypothesis that design rights and design patents are subject to interpretation, and the holistic nature in which the designs are judged, leaves a lot of room for speculation. This produces insecurity in relation to the robustness of registered design rights, which, at least in the UK, cannot be considered a form of IP as strong as utility patents in terms of asset reliability. Rob Law, Dids Macdonald and others blame the lack of an Unfair Competition law for the weakness in the British legislation surrounding design rights. Although Macdonald as the CEO of ACID tried to utilise the BREXIT discussions to propose an introduction of an Unfair Competition law, she admitted in a private conversation in June 2016 that the introduction of such is highly likely to take decade or more. This in combination with Rob Law's repeat claim that branding is of highest significance, leaves us with the question to what extend branding and brand positioning can be

deployed to strengthen the appropriability regime of a design-led start-up, and how budding designer-entrepreneurs can pursue the development of brand values, and how they can enhance their chances to successfully position their ventures within emerging or established market environments.

The quantitative findings suggest that pre-market products are hardly under threat of copying. Whilst IP may be worth securing to insure long-term exclusivity, sharing concepts with potential collaborators and investors should be seen as fairly safe. The risk of design right infringement increases in the course of the first two years following market entry, but then diminishes gradually thereafter. Where infringement does occur, design right litigation can be time consuming with just under 1 ¾ years spent on average. Litigation costs are usually within means. Almost two thirds of respondents reported to have spent less than £10K on litigation.

The focus group highlighted three key design attributes:
- Functionality
- Personality
- Performance

In the UK design rights do not protect functionality. However, the notion of *personality* connects closely with Verganti / Del Era's concept of product languages (section 3.4). In a simplified manner, we can conclude that the product functionality is commonly protected through patents, the product personality / product language through design rights, and the product performance (as defined by the focus group) through secrecy.

Most interesting is the differentiation between business models as outlined in Hillner's paper, as these can be connected with The Big Innovation Centre's mapping of design industry stakeholders.

Revenue models:
- Assignment of rights to a client (1)
- A company (usually a large company) that creates design for itself, e.g. in-house design or proprietary design firms. (2)
- Licensing of rights to a client. (3)
- Assignment of rights to an intermediary company that deals with licensee/rights enforcement. This can protect the design company. (4)

Business models:
- Design Services Businesses
- Designer-'makers'
- Design 'aggregators'
- Global manu-services businesses

The second and the third revenue model is most common within the case studies, all of which fall into the second category of business models: Designer-'maker'. This gives rise to the question what might be other possible variations, and which are the most effective? IP connects here, not only with defence strategies but also with revenue models and consequently with business models.

9. Qualitative data 4: Appropriability regimes around design

Having worked as Head of Design for Mothercare, as well as a design consultant for Nigella Lawson, Sebastian Conran is listed as an inventor in no less than 13 patents and in around 30 design patents (figures collected in 2015). Only a few of the latter are attributed to his own firm, Conran Associates. The majority of inventions were filed by clients. Conran explained: 'I do not patent things, because I would not be prepared to fight to protect them. I work for other people and it is their responsibility to patent them.' (Conran, 2014) Here Conran spoke in the position of a design consultant, and his opinions concur with the majority of qualitative responses received during design right infringement survey (see section 8). Conran argued that formal protection should not be necessary to fend off imitators, and that designers deserve a more robust IP legislation, which would allow them to better defend themselves, as current limitations in the IP legislation (2014) result in design not being taken seriously enough.

Conran explained that "if I write a piece of music, or I write a book, I automatically own it. I do not have to write Sebastian Conran. If I design something, I need to register the design in order for the current IP legislation that is going through, to take effect. It [i.e. the current legislation] does not work on unregistered designs." (Conran, 2014)

Before moving on to examining individual initiatives, a few points in relation to Conran's innovation management principles are worth highlighting. The following visuals were shared and discussed by Sebastian Conran (Conran, 2017b):

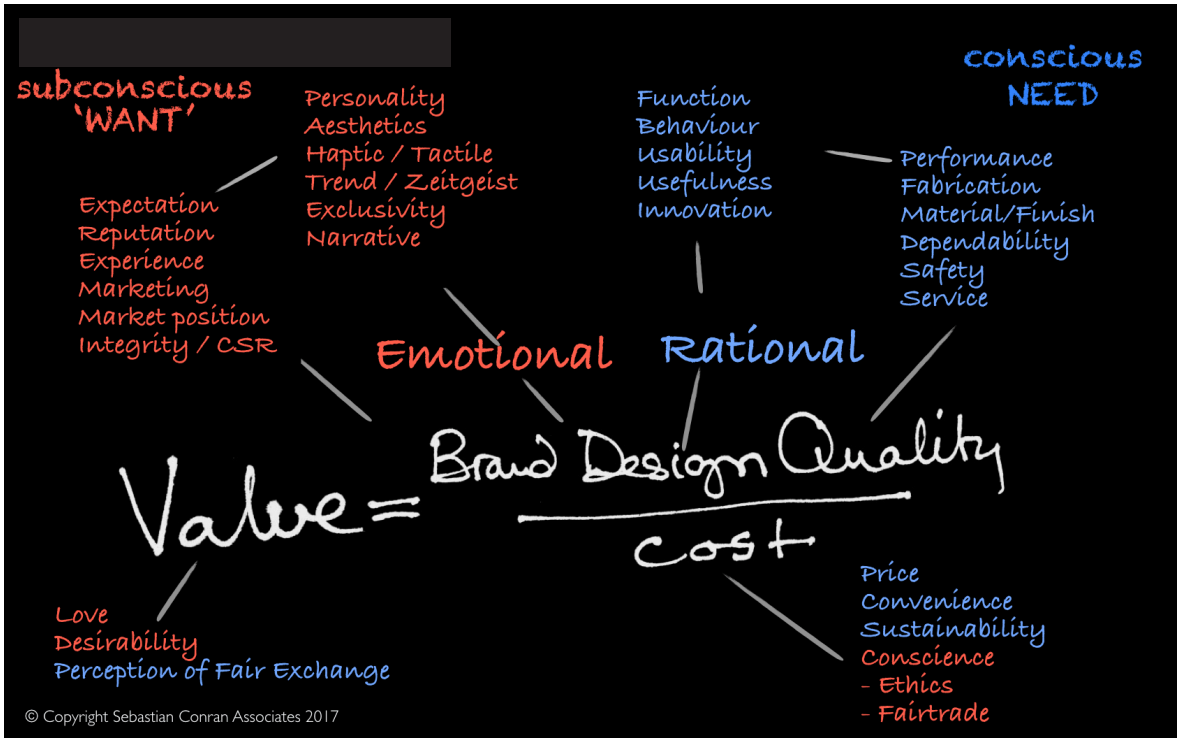

Figure 74: Designing creating value (visual: courtesy of Conran Associates)

A value map drawn by Conran Associates suggests that design carries value in excess of the functional aspect (figure 74). Product languages are part of the value proposition here, and they address both performance related semantics and emotional aspects. Conran distinguishes between need and want, which tallies with the thesis argument in section 3.5. that critiques the demand-push versus market-pull paradigm, arguing that need-pull and demand-pull are fundamentally different and that demand can be pushed, if it does not exist a priory. One could argue that *want* can be both conscious and subconscious. Indeed, the same applies to *need*. *Need*, however, may escape the audience's awareness entirely.

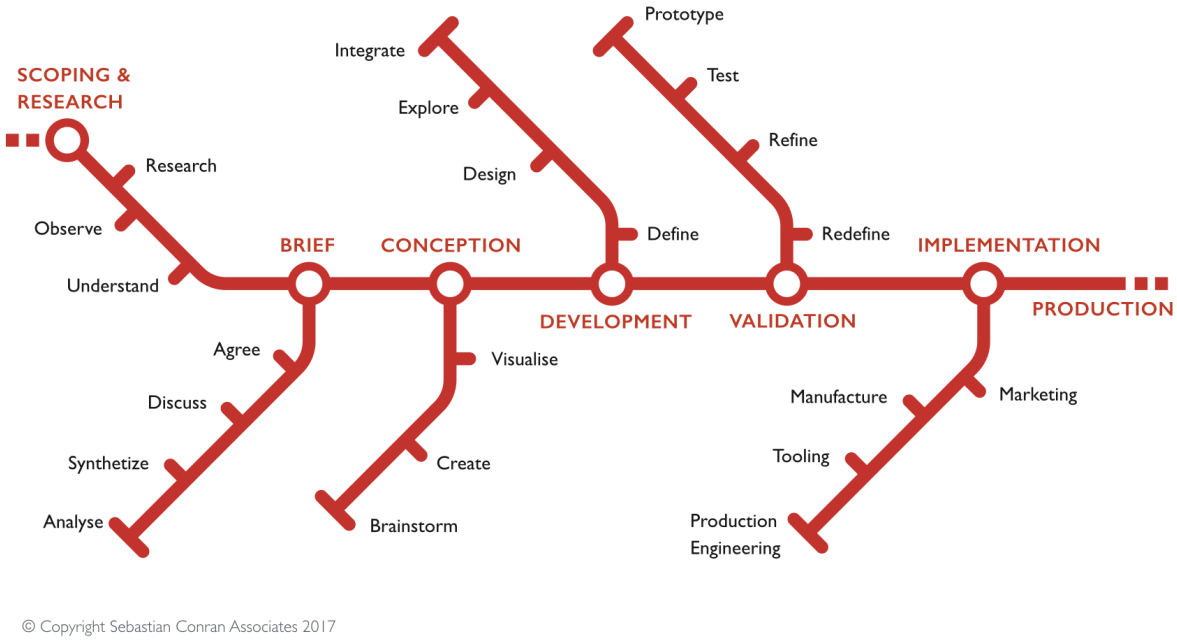

Figure 75: The innovation Journey according to Conran (visual: courtesy of Conran Associates)

Conran Associates deploy an approach that comprises a variety of convergent processes (figure 75). This is not unusual and often expressed in ideation flow charts. A brief emerges from research and analysis. A concept is developed in response to the brief, and subsequently put to the test (validation) before implementation and production process follow. This multilinear process diagram is perhaps a simplified representation of what happens in reality. If tests fail, strategic partners withdraw from the project, etc. the overall process may be significantly more complex.

The diagram shown in figure 75 relates to two of the three business start-up development periods discussed in section 6.7 (theory component 2): the fledgling business development period, and the transitional business development period. The production stage that falls within the latter, precedes the established business development period. What is not included here is the introduction of sales. Conran Associates is a firm established through consultancy work. The route to market outlined above takes commonly 18 months (Conran 2017b). The start-ups examined in section 5 took approximately 3-4 years until they had a market-ready design proposition. Conran draws on significantly greater

amount of experience, an extensive network of professional contacts, and he enjoys an exceptional industry reputation. The reason why it took the RCA alumni, who were interviewed in section 5, significantly longer to take their inventions to market than it took Sebastian Conran, may also have to do with the stakeholder input that is illustrated in the bar chart in figure 76. Design projects that originate in academic studies are not pre-dominantly marketing-driven at the outset. They are usually limited to the conception stage, and sometimes cover part of the development stage, both of which are design-intensive processes.

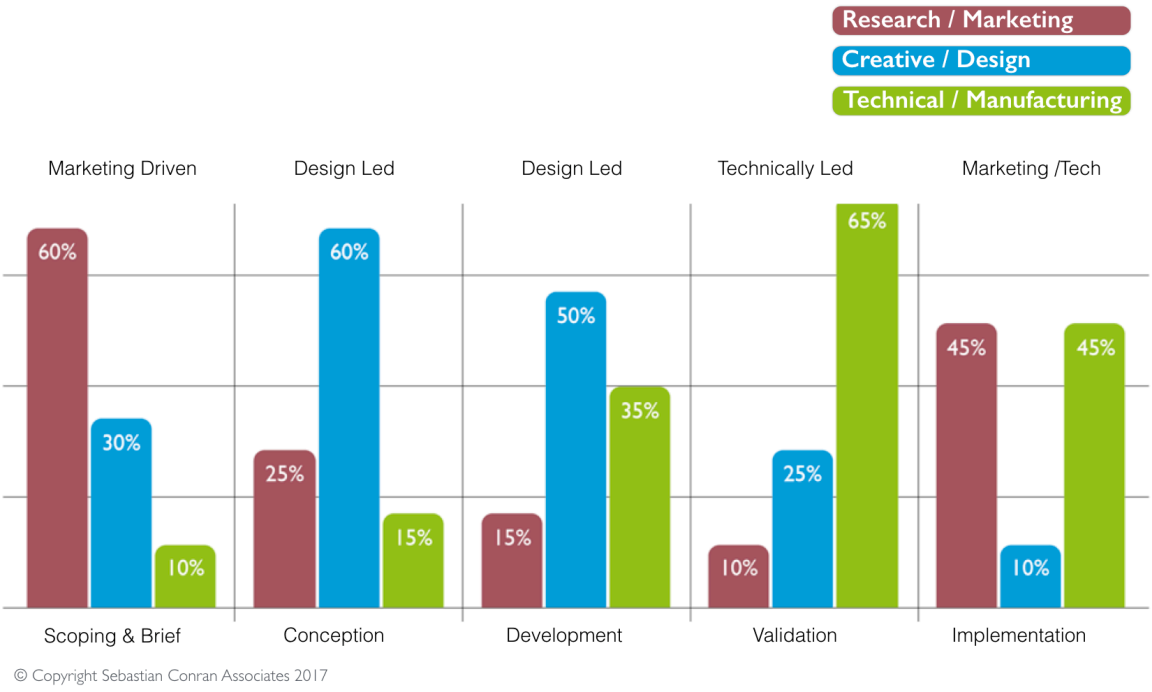

Figure 76: Collaborative accountability: Key Partner / Stakeholder Typical Input (visual: courtesy of Conran Associates)

The validation and implementation stage are processes that require different knowledge competencies. These are the knowledge areas which the designer-entrepreneurs commonly lack (see Roland Lamb's comment in the last paragraph of section 5.1.4. for example). So the designer-entrepreneurs discussed in section 5 will have struggled during the first, the fourth and the fifth stage shown in figure 76. Many of the ideas shown in section 5 were not developed in response to specific briefs. Instead they were ideas that evolved from the identification of opportunities following observations. This meant that research needed conducting and market opportunities exploring after concepts such as RoboFold, KwickScreen had already been developed. Squease and Cupris are exceptions here. These concepts evolved from expert research. By comparison to postgraduate students, an experienced and connected designer such as Sebastian Conran has a better understanding of markets and will find it easier to validate inventive steps, sometimes in collaboration with partners, and to identify implementation options.

9.1. Conran Associates — consultancy services

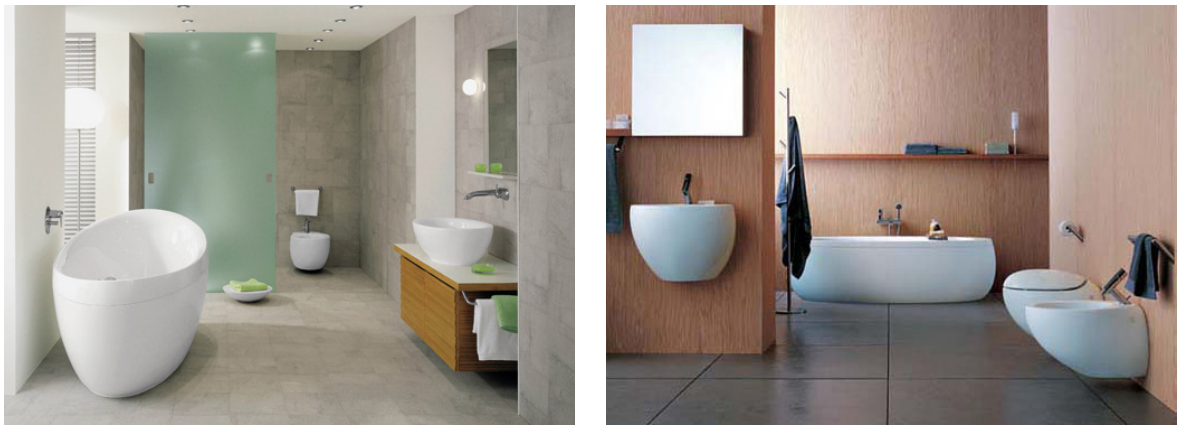

Figure 77: The Conran's design for Villeroy & Boch on the left versus Stefano Giovannoni's design for Alessi on the right (verify image sources — supplied by Conran)

Although Conran seemed adamant that stronger IP legislation is needed, in particular around unregistered design rights, he acknowledged the problems surrounding duplication of innovation: "I have experienced myself several cases where we have been working on projects and we have come up with a solution, where someone on the other side of the world has come up with the same solution." (Conran, 2014) One example is Conran's design of a bathroom suite for Villeroy and Boch. Just prior to the launch he received a phone call from the client suggesting that his designs were copied. Shortly after he received a further phone inquiry whether Conran might have copied somebody else. Finally he received an image showing an Alessi design that was remarkably similar to Conran's (see figure 77). Fact was that neither of the two design firms were aware of each other's design developments. "We were both aware of the Zeitgeist, and we were both going for something that was countering the current trend." (Conran, 2014) Both designs were launched. Upon close inspection, some differences in the design could be noted. Conran explained: "Actually they were different, and the Villeroy and Boch were cheaper, and it is still their flagship range." (Conran, 2014)

The competition between both designs discussed above did not seem to have a critical impact on the economic stability of any of the stakeholders, i.e. Villeroy and Boch, Conran Associates, Alessi, Giovannoni. This may be due to the fact that none of the firms involved here were companies built around a single product as is Magmatic Ltd, where the company name is much less known than the product name Trunki.

It seems clear that the impact which the drop in Trunki-sales had on Magmatic Ltd was much more significant than that which the reduction in numbers of sales of any of the two aforementioned bathroom suites may have had on Alessi and Villleroy and Boch respectively. The possible reasons for this are as follows:

- Conran's Villery and Boch bathroom suite was an incremental innovation rather than a disruptive novelty, whereas Trunki was novel (disruptive) to such a degree that it provided Magmatic Ltd a high level of exclusivity. It created a new market.
- Villeroy and Boch, Conran Associates, Alessi, Giovannoni had other income streams, i.e. products, to offset possible drop in sales is another difference.
- All stakeholders involved in the design and in the sales of the bathroom suites, design firms and traders alike, were established firms rather than start-ups.

Insights: From the points raised in the previous paragraph, it follows that:

- Competition in a market with few market players impacts the individual stakeholders much more profoundly than competition in a loosely controlled main stream market, where market shares are more or less evenly distributed (first point)
- Designer-entrepreneurs who entertain multiple income streams, can mitigate the economic impact if one income stream is compromised (second point)
- Established firms that are developing side-line businesses or spin-outs, are less vulnerable than businesses during the transition period (third point)

The first two insights suggest that there is an inverse relationship between the number of a venture's innovation propositions and a venture's reliance on market exclusivity, the third leads to the question how a start-up can establish a status of similar stability, despite the given restrictions in relation to finances, market position, and access to assets.

Focusing on niche markets in a high-risk-high-returns manner means that IP is of greater significance here than in a loosely controlled mainstream market setting with a high number of competitors. Conversely one could argue that the likelihood of duplication of innovation, which was discussed in section 6.4., may be proportionate to the number of competitors.

Incremental innovation is more likely to be duplicated than radical innovation, because here the market environment is conducive to coherent innovative thought processes. Need-pull and demand-pull initiatives, i.e. market-driven innovation (as discussed in section 3.5), can also increase the likelihood of duplication of innovation.

9.2. Universal Expert

The previous example illustrates a relatively typical design consultancy scenario. However, Sebastian Conran operates not only as a design consultant, he is also an entrepreneur. Universal Expert is the brand name used for a collection of kitchen ware designed by Conran Associates. This initiative does not make Conran a designer-maker in the strict sense. It is manufactured by a project partner. However, he did initiate the project and sustain the authority over the project due to his IP ownership.

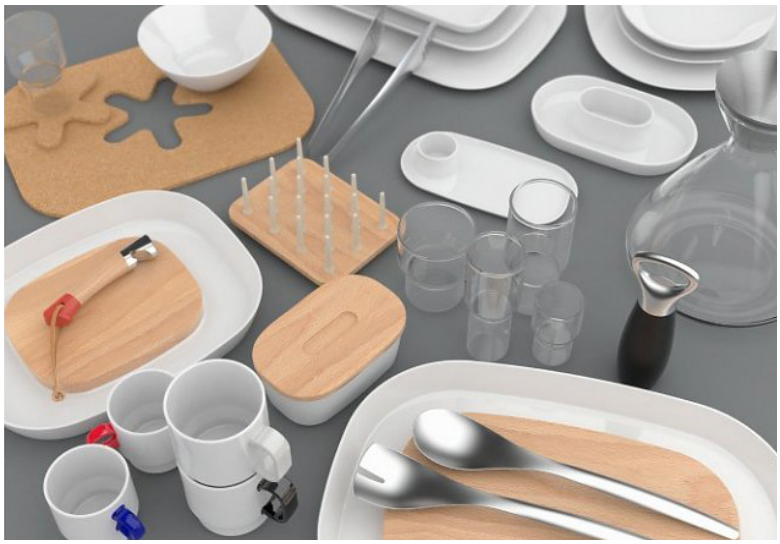

Figure 78: Conran's Universal Expert collection of kitchen ware. This project was self-initiated and marketed with a partnering firm based in Hong Kong. The collection features over 200 products. (image source: http://www.universalexpert.co.uk/news)

Following the design and production of the Universal Expert collection Conran first "worked with a retailer, John Lewis, to bankroll it, as it were. But, of course, John Lewis have only got 40 shops" (Conran, 2015). Trading through John Lewis alone was not viable for a project of this scale. Conran claimed that "to get the volume efficiency, you need about 1,000 outlets." He knows that it takes much more than just robust IP to successfully market design solutions. "To launch something like this is several million Dollars." (Conran, 2015) Luen Fung, a Hong Kong based export trader, shared the costs for the design and the marketing, and they covered the entirety of costs involved in stocks and tooling. Given these complementary assets and his brand, Conran was able to establish distribution in the USA, Japan and Europe by 2014. Scandinavia and South Africa were soon to follow. Conran hoped to extend distribution across about 40 countries in total by May 2014. Despite the scale of this endeavour, Conran addressed issues with the IP: "I think we started off registering, but once you have got 200 items. It takes £200 an item to register [this figure has since been reduced as outlined in section 3.7.5]. It is not feasible." (Conran, 2014) The expense needed would be considerable if one was to protect the designs internationally, in particular if we take renewal fees into account. Conran explained that he has "to design these products for £2-3,000 a product, and at that level you cannot

justify paying 4 or 5 times that patenting." When asked how he protects his work, he points at the label at the bottom of the oil and vinegar dispensers: "It is this bit: Design Sebastian Conran. It is using the brand. It makes all the difference." (Conran, 2014) The Trunki case confirms that brand imitation is comparatively rare, and Rob Law claimed to have sensed the value of branding at an early stage. Whilst branding strengthens a designer's market position, brand reputation needs establishing over time. Registering a trademark helps little if there is no positive brand recognition within target audiences.

The above scenario is based on data collected through an interview in 2014, and on secondary data obtained in the following year. When spoken to on 21 June 2017, Sebastian Conran admitted to difficulties in the marketing of the Universal Expert range: The partnering firm in Hong Kong had closed down (Conran, 2017a). As a consequence, the supply and distribution chain had to be redeveloped. When asked whether or not the Universal Expert is still produced in Hong Kong, Conran states that "there are basically five makers on the Universal Expert […] The five makers call their supplier out of Hong Kong" (Conran, 2017b).

Conran could draw from experience when engaging a strategic partner based in Hong Kong in the production and distribution of the Universal Expert products. He had opened his first office in Hong Kong in 1988 (Conran 2017b). Like Orbel, Conran engaged his business partner in pursuit of both upstream and downstream value chain access. As pointed out in section 3.1, giving away too much control over value chain components increases the risk for start-ups, because this leads to a high dependency on the collaborating partner. Progress between 2014 and 2017 was not as expected since the partner did not perform as well as hoped. Conran could rely on his consultancy business as a fallback option. A start-up could suffer significantly, perhaps grind to a halt, if the sole project partner proves unreliable. Conran, on the other hand, managed to identify other innovation opportunities (see sections 9.3 - 9.5). He also found alternative business partners to continue his pursuit of manufacturing and marketing the Universal Expert range.

Giving away control over both upstream and downstream value chain assets would be very dangerous in a tightly controlled market. Clarysse and Kiefer referred to the example of Arctica when discussing potential value chain bottle necks (Clarysse and Kiefer, p.82f). This risk does not present itself to Conran's Universal Expert since the market of homeware products is not tightly controlled as opposed to the sector of HVAC in the UK. Alternative strategic partners can be found and the need to speed up the route-to-market is not as strong as it is in an uncertain market environment (section 3.3).

This case study makes it clear that registering a large range of products as designs, and to do so across number of territories, is not viable even for an established firm. Relying on informal IP such as copyright and unregistered design rights, remains the only option here. However, these forms of IP are perceived as comparatively weak as the section 8 has shown. Brand assets and industry reputation can enhance the strength of informal and formal IP. Transitional start-ups as discussed in section 3.3 can transfer reputation obtained through consultancy work to entrepreneurial initiatives.

Insights:

- IP alone does not warrant for value chain control. Relinquishing too much control over the value chain, and engaging individual partners both upstream and downstream can be risky, since the dependency is increased.
- Formal IP is often unaffordable for series of products, in particular if they require international protection.
- Formal IP that is not subject to a novelty check such as registered design rights may prove unreliable when challenged. The fact that two very similar bathroom suites appeared almost simultaneously suggests that registered design rights related to incremental innovation can easily be challenged in court.
- Brand value can be a more valuable asset than IP in the context of consumer products.

9.3. Consequential Robotics

In 2016 Conran Associates engaged in a new venture which is being developed under the title 'Consequential Robotics'. This is a new 'service-robotics start-up developing solutions for applications in homecare, health, education, and life style' (consequentialrobotics.com, June 2017). Conran's cofounders are Professor Tony Prescott, Director of the Sheffield Robotics research institute, and Dr. Ben Mitch, an expert in the field of biometric robotics. A combined sum of £100K has been invested, and each of the three founders hold 30% equity in the business. David Lane, Founding Director at Edinburgh Centre for Robotics, is Consequential Robotics' chairman. The company received a £600K investment offer in exchange of 10% of the business. This would suggest that the company value might have increased to about £3-6m within the first year of its existence. However, the investment was rejected to allow for continued business development and value growth. Equity investment remains under consideration for later stages of the business development.

Figure 79: The firm's flagship product is MiRo (the name stands for biomimetic robot), an assistive robot that looks like a mix of a small dog and a bunny. For economic reasons, the robot moves on wheels, which according to Conran use thirty times less energy than legs. The eyes on the side reflects the characteristics of prey who need 360 vision and are generally perceived as cuter than predators. However, Miro's cameras are directed to the front, which provides the robot with stereo vision.

Conran highlights his keen interest in creating emotionally engaging products. He explains that it is key to get the product personality right (Conran, 2017b). This highlights not only the value of product languages, but also indicates a new dimension in relation to Steffen's indicative function (see section 3.4): The indicative function here goes well beyond the ambition to 'visualise and explain the various practical functions of a product and how it should be used' (Steffen, 2010), since MiRo is a mimetic device which users interact with as if it was a living entity. The mimetic quality, in terms of not only behavior but also visual appearance, determines how users react to a device. Consequential Robotics are well-aware of this: "Being animal-like rather than human-like people respond to MiRo with a

different set of expectations that are more easily matched by today's AI." (Consequential Robotics, nd) Therefore the field of artificial intelligence may provide entirely new perspectives in relation to the concept of aesthetics, which in turn may further enhance the significance of product languages in the long-term future.

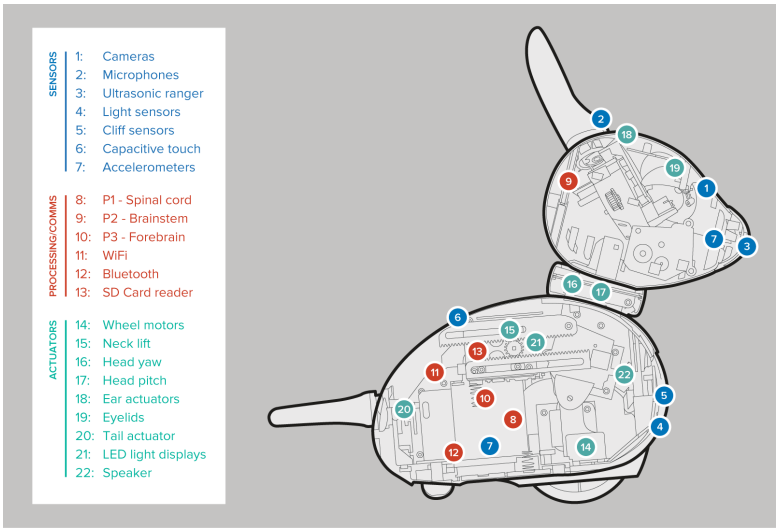

Figure 80: MiRo is a hardware device. The product connects with an open source software platform. A 3D simulator called MIROism provides a virtual test environment which allows software developers to test software algorithms in a virtual before transferring them to the robot. Using an open source physics engine called Gazebo, developers can bring MiRo to life.

The software development according to Conran is the next big step: "System control architecture needs to be done and the prototype demonstration needs to be done, and we need commercialisation strategy." (Conran, 2017b) Consequential Robotics "rely on other people to write what we call behaviors and skills, what you would call actions" (Conran, 2017b). The company deploys open innovation methods such as university challenges to allow for other innovators to contribute to the technology development. At the same time Conran highlights that his "last three employees have come from engineering college rather from art college" (Conran, 2017b), which might be an indication that technology is becoming more significant than the visual design aspect. MiRo currently sells for £2,200 a piece. A software enabled version is due to become available in September 2018, and a simplified version will be made available for £600 in the future. There are currently seven people working on MiRo, two in marketing and administration, and five in design and development.

Figure 81: MiRo is a hardware device. The product connects with an open source software platform. A 3D simulator called MIROism provides a virtual test environment which allows software developers to test software algorithms in a virtual before transferring them to the robot. Using an open source physics engine called Gazebo, developers can bring MiRo to life.

Conran and his business partners rejected an early investment offer. All partners have alternative income streams to rely on. This distinguishes this case from those in section 5. Various designer-entrepreneurs such as Korn and Anscomb (KwickScreen) and the team behind Yossarian Lives! decided to avoid early-stage investment. This was usually to avoid interference with the business development strategy, and to limit the dilution of equity. The seed investment used for MiRo is slightly higher than that which was offered during the Design London / InnovationRCA incubator phase, £100K as opposed to £75K. The fact that all partners, Prescott, Mitch and Conran, pursue MiRo as a sideline business could be seen as a draw-back. However, it does not appear to refrain investors. There is a risk that confidence drops, and individual partners withdraw from the business. On the other hand, the advantage of having senior stakeholders involved in the development and management of a start-up is two-fold:

- financial stability since the partners do not need to draw any salary
- a high level of experience in relevant fields: design business management, knowledge that speeds up the access to complimentary assets

Insights

- The longer a designer-entrepreneur can delay equity investment, the better the bargaining power will be.
- In light of robotics, Steffen's theory of product semantics receives a new facet of product semantics presents itself: the way in which a product resembles a lifeform through shape (form) and behaviour (function), e.g. expressive capabilities.
- the expressive capabilities of a robotic device when interacting with a user.
- Two of the three fonder-partners are robotics experts rather than designers, and so is the company's chairman. In line with The Big Innovation Centre, Consequential robotics is not a design-intensive firm, with only one of the partners a core-designer.

9.4. Inclusiviti

In addition to Consequential Robotics, Conran also started Inclusiviti, another firm focusing on robotic assistive devices. This company, which was set up in September 2016, benefitted from £1m of government funding that was secured in pursuit of developing OmniSeat, a smart wheel chair for elderly, as well as IntelliTable, a semi-autonomous work table for home use as well as for hospitals. Conran owns 50% of the company shares. His wheel chair design benefits from his experience with having designed push chairs for Mothercare.

Figure 82: IntelliTable

Conran's interest in consumer-facing robotics and digital unaided devices has led to other inventions: One product under development is the IntelliTable, a semi-autonomous table that can be voice activated, and uses sonar and ceiling tracking optics as explained on the intellitable page of the venture's website (Consequential Robotics.com, nd). The product is aimed at hospitals, but also at the domestic market. Conran points towards 'a market of ten million hospital work tables worldwide' (Conran 2017b).

Figure 83: OmniSeat wheelchair which uses patented wheel technology.

The product launch for IntelliTable is scheduled for March 2018. It is striking how much faster the route to market is for Conran by comparison to the InnovationRCA start-ups, who take typically 2-3 years to secure first sales. Conran highlights that 'we allow that 18 months' (Conran 2017b). His grip on upstream and downstream value chains becomes apparent the strategic partnerships listed online: Tharsus, 'UK's number one designer and manufacturer of autonomous system robots', designability (Bath Institute of Medical Engineering), and Consequential Robotics are listed as partners of Inclusiviti. The list of Consequential Robotics' research partners comprises Sheffield Robotics (where Sebastian Conran is Designer in Residence, and Tony Prescott holds a professorship), Tharsus, Buzzamo, an electronic systems developer based in California, Gadget Lab, a production firm, and, perhaps unsurprisingly, Inclusiviti. Both Inclusiviti and Consequential Robotics are part of a stakeholder network that combines a complementary competencies and possibly complementary assets.

Insights

- The different development stages articulated in figure 60 make it clear that priorities shift in the course of the design business development.
- Smart-funding can help to delay equity investment and thus to increase the company value prior to shredding equity.
- Building credentials in a B2B environment (hospitals) can benefit the entry to a B2C market (e.g. elderly homes)
- Nesting inventions in different ventures, and connecting these through partnership agreements can serve as a means of risk mitigation.

9.5. Theory component 3: the value of triangulation of inventions

Sections 9.1 - 9.4 make it clear that Sebastian Conran uses a mixed business model. The reliability of his consultancy business as a main income stream allows him to mitigate risks whilst exploring a range of design-entrepreneurial opportunities. If one of the opportunities under pursuit does not work out, respective investments can be written off and focus can be shifted towards the others without the change in circumstances leading to major cash flow problems (2nd insight under 9.1). Careful judgment on resource allocations and the continuous assessment of risks are important here.

In line with Clarysse / Kiefer's entrepreneurial strategy matrix, we can argue that Conran Associates constitutes a hybrid offering that combines revenues generated through customised services and consulting with technology developments in relation to which intellectual capital is accumulated. Through the diversity of initiatives, Conran Associates occupies quadrant 2, 3 and 4 within the matrix (see figure 8 in section 3.3). Given the gradual shift in emphasis away from consultancy services and towards investment opportunities that could be observed between 2014 and 2017, Conran Associates could perhaps be considered as a typical example of what Clarysse and Kiefer refer to as a transitional start-up (see section 3.3) — but only a long-term study would be able to confirm this for certain.

Not only does Conran engage in start-up businesses, he pursues multiple initiatives in parallel. The initiatives discussed in section 9.3 and 9.4 are particularly interesting in the context of this study. Two products fostered through Inclusiviti — IntelliTable and the robotic wheel chair — form a set

of products in combination with MiRo: These products are designed to enhance people's lives, be they used in combination or individually. Once connected with a software system for the domestic environment, this suite of products constitutes a very strong set of innovative propositions, which competitors will find very difficult to imitate in its totality. Even if the USP surrounding one or two of the devices is challenged through competing products, the other components in the system will provide Conran Associates with a market advantage and a degree of exclusivity. This means that the threat of imitation and competition can be mitigated through triangulating multiple inventions or innovative steps. Rather than focusing on a single unique selling point (USP) that is protected through formal IP, a designer-entrepreneur ought to triangulate multiple such USPs through developing innovations that are mutually complementary (i.e. relevant to the business) but can also function and be marketed without one another.

Both Consequential Robotics and Inclusiviti were incepted within the same year. The inventions related to both initiatives can be aimed at the same, or similar markets. Insights gained can be deployed for the benefit of both ventures. The inventions related to each of the two ventures can be taken to market individually. But they can also be promoted in a combined fashion since they can potentially complement each other. The wheel chair and the IntelliTable can both enhance the domestic live of elderly, as can MiRo. One could argue that the inventions themselves become mutually complementary assets.

Noteworthy with respect to Inclusiviti and Consequential Robotics is the fact that each of the three devices under development can work effectively in combination whilst aimed at very similar market sectors. Here the sum of design propositions may be greater than its parts. In combination, the products may be deployed as part of a system of semi-autonomous assistive devices, which can be connected through a bespoke platform. We can refer to this set of circumstances as a triangulation of inventions or as a triangulation of design propositions.

The hypothesis that emerges is that the triangulation of inventions significantly enhances the success-prospects of a design-led start-up. Not all inventions need protecting through formal IP. In fact, it may be preferable if they are not. Secrecy, formal IP, and open innovation principles can be combined in a strategic manner. Through the triangulation of inventions, designer-entrepreneurs can establish an IP ecosystem that is flexible and allows the designer-entrepreneur to dynamically respond to unexpected circumstances.

This opens room for new business- and IP strategies. The assumption in the earlier part of the thesis was that different modes of protection, secrecy, design rights, utility patents, open innovation principles, etc., should be emphasised strategically at different times during the start-up and fledgling phases of the business (section 3.7). However, this alone cannot eliminate the various uncertainties that tend to threaten a start-up's success prospects. The biggest threats relate to the fact that most inventors focus on one individual isolated product. This is what all of the start-ups in section 5 to 7 did. Although a start-up may not be able to engage in multiple ventures as does Conran (which, by the way, stabilises one's position within the collaborative framework), codifiable and tacit knowledge related to a variety of inventions that are pursued by one venture, are perfectly conceivable.

As highlighted in the beginning of the thesis, knowledge surrounding concepts, ideas, production processes, and market opportunities are the only selling points which independent designer-inventors tend to have at the outset. Securing exclusive knowledge in relation to a range of mutually complementary inventions is not only possible, it is highly recommendable. The idea of triangulating inventions is distinct from strategies such as patent fencing and patent thickets, because it does not focus on patents, not even formal IP in general. Instead it is a principle that builds on a degree of complexity that derives from the increase in the number of possible combinations of formal and informal forms of IP and of 'IP in the loose sense' (as articulated in figure 13) where numerous innovative steps are combined.

Some of the InnovationRCA incubatees have combined different novelties in a simple way, such as Roland Lamb who acquired Juce, an established software development platform, or KwickScreen who developed their own bespoke client management platform. Both ventures appear to have developed more strongly than some the others who banked on one invention alone. These added assets, be they integrated through acquisition or developed internally from scratch, seem to strongly enhance a venture's success prospects.

The most important insight obtained through this case study is the advantage that can be gained through the triangulation of mutually complementary inventions. As this multiplies the range of IP-strategic possibilities, it allows the designer-entrepreneur to respond to emerging threats including competition, imitation and value chain bottlenecks. Such flexibility is particularly beneficial in an appropriability regime that is underdeveloped and subject to uncertainties. Rather than using different modes of IP protection in combination to harness one proposition, two or more inventive steps ought to be triangulated in order to secure a market advantage. This triangulation of inventive steps extends Teece's concept of complementary and integrated assets, because inventions here become assets that are complementary to other inventions that are fostered and owned by a single design-led start-up.

10. The principles of a multidimensional business development model

This section discusses the three theory components that were articulated previously (see sections 5.3, 6.7, 9.6) in relation to each other, and in relation to other insights gathered in the course of this study. The designer-entrepreneur's fundamental aim is to establish a dominant design through disruptive innovation. It is understood that innovations can be more or less radical in their nature, and also that incremental innovation can be commercially viable. However, establishing a dominant design within an existing market, a market sector, or an emerging market is perceived as the principle objective in this study. The framework proposed in this section maps the business development variables along a timeline, and it is hoped that this framework allows designer-entrepreneurs to better orientate in the course of their decision-making processes, and to therefore plan in a more strategic way.

10.1. Theory component 1: a framework of business development attributes

This part of the hypothesis maps a range of key variables, which represent business development attributes along a timeline (variable=attribute). According to this diagram, IP, which derives from the team's knowledge about the proposition, impacts the development of many other variables subsequently.

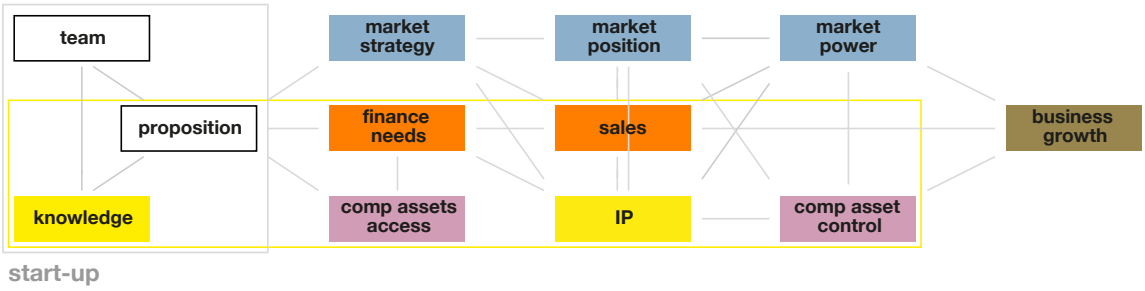

Figure 84: The significance of intellectual property

The start-up comprises three key components: the team, the proposition itself and the team's knowledge that is related to the proposition and its development potential. In Figure 84 yellow represents knowledge related to the proposition directly or indirectly. Over time, it culminates in an IP strategy that needs continuously negotiating in relation to surrounding variables. The yellow outline frames the variables which are within fall within the designer-entrepreneur's control. Market constitutes a conditional factor (although the designer-entrepreneur can choose a focus) and market power a consequence which is dependent on the designer-entrepreneur's intervention (sales strategy etc.)

Through an analysis of data that is grounded in the interviews with designer-entrepreneurs in section 5.3, six key variables were identified: team, the proposition itself, intellectual property (IP), finance, the market (market and sales strategy), non-financial assets related to production and distribution. These six meta variables sum up the most significant aspects in relation to the development of a

design-led start-up. In conjunction with pre-trade early-stage start-ups, the sales strategy is often referred to as route-to-market strategy. One could argue that the market provides a condition due to its characteristics, the route-to-market strategy is developed by the designer-entrepreneur in response to this condition in order to position the business within a market context. Market power is the desired result of this process as it constitutes a prerequisit for business growth.

The start-up itself may be considered as comprising of three elements (variables): team, proposition and the knowledge that is held within the team and / or embedded in the proposition (Figure 84). These three elements are strongly connected. As opposed to other attributes, they form a set of variables which is within the control of the start-up team. The challenge is that the team, the knowledge held within the team, and the proposition itself are so closely intertwined at the outset of a venture that any change in the team will inevitably affect both other factors. Conversely, changes to the proposition will most likely impact the value which individual team members can contribute to the initiative. Changes to the proposition may lead to the redundancy of individual team members and / or may trigger the need for others to join the team. The knowledge is further developed in conjunction with the proposition in the course of the business development. Therefore all three variables are to be considered as inter-dependent. The IP strategy is not something that emerges at one particular point in time and remains unchanged from thereon, instead it is emergent and adjustable. This is why the variables that are dependent on the significance of specific knowledge and on IP, are sat on yellow background (Figure 84-89). IP should not be limited to IP in the strict sense (but also comprise IP in the loose sense (see figure 13) . Not all IP is codifiable, and tacit knowledge can be equally significant.

How the variables relate to each other

As explained in the paragraph above, team knowledge and proposition form a tightly connected unit. As a whole, this could be seen as the independent variable at the outset.

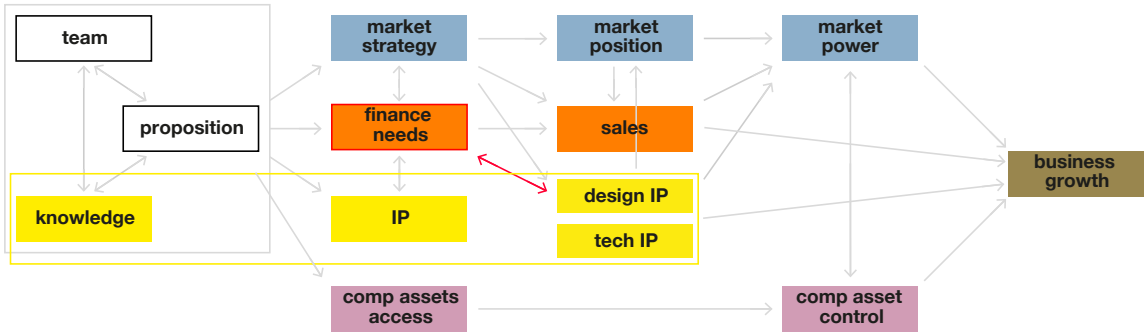

Figure 85: The financial needs and the IP strategy are strongly inter-dependent. The IP strategy, the sales strategy, and the market position form a triangulation of variables, each of which influences both the others. Negotiating the interrelationships between these three variables is the biggest challenge when establishing an innovative design.

Section 5.3 has established that access to assets depends on finances, and which markets can be taken into consideration depends on the proposition itself. It has also been highlighted that IP and finance are strongly interdependent, and this can lead to a catch-22 situation at the outset. Financial needs also depend on the proposition, as do the complementary assets which need accessing. The nature of the market has an impact on both, the sales strategy and possible market positions. The significance of an IP strategy is also market-dependent, and the sales strategy may be affected by the financial needs. The sales strategy (route-to-market), the market position, and the IP strategy all depend on each other. This makes apparent the difficulty. Complex interdependencies make it difficult for the designer-entrepreneur to take clear decisions based on cause-and-effect principles.

As the Trunki-case has shown (section 6), the situation becomes gradually simpler, once a venture is further-developed: Market power is determined by both, the sales strategy and the market position, but also by the IP strategy (figure 85). The control over complementary assets, which can be secured through either integration or exclusive contracts, connects with the market position and with market power. The higher the degree of market power and the better the market position, the easier it will be to secure exclusivity in relation to complementary assets. Conversely market power can be enhanced through securing exclusive access over complementary assets. KwickScreen, for example, secured an exclusive license within the medical sector for the use of a material required for the room divider to function. With the access to the IP, the team behind KwickScreen also secured a material supplier. This shows that control over complementary assets can also benefit from a sound IP strategy. All variables (business development attributes) and their interrelationships determine the degree to which the business can grow.

10.2. Theory component 2: On complementary assets and evolving strategies

This part of the hypothesis builds on Abernathy and Utterback's three stages of the product-life-cycle, the *fluid* stage, the *transitional* stage, and the *specific* stage, which are connected to the pre-paradigmatic phase and the paradigmatic phase (see section 3.2 and 6.7). Due to the close inter-dependencies between team, proposition and knowledge, which came to mention in 10.1, the product cannot be examined in isolation when it comes to start-up businesses. The product, which constitutes the proposition, or part thereof, is closely connected to the other two variables, team and knowledge. This means that the cycles need to be related, not only to an individual product, i.e. the proposition or part thereof, but to the start-up in its entirety. This is why this thesis replaces the product-life-cycle-specific stages (discussed in section 3.2) with start-up business development periods: the fledgling period, the transition period (which is distinct from Clarysse / Kiefer's transitional start-up discussed in section 3.3), and the established period (figure 18).

These three business development periods connect with the distinction between the pre-paradigmatic and the paradigmatic paradigm, whilst the transition period sits in between both. The reason why the emphasis is shifted here from the individual product to the business, is because this thesis assesses the survival prospects of firms, not the success chances of individual products, which is Teece's focus with respect to the performance of established firms.

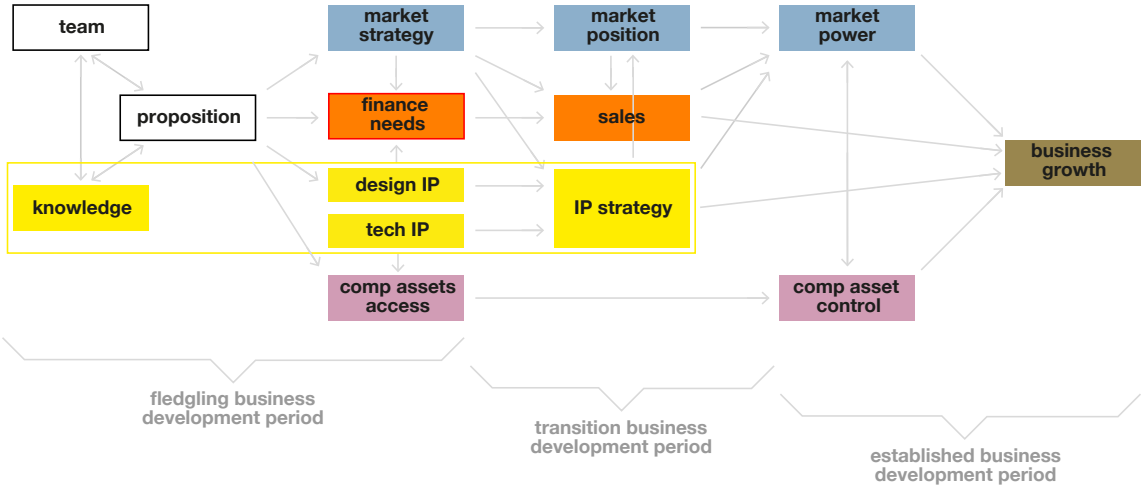

Figure 86: The three start-up business development periods in relation to the variables.

During the fledgling period financial needs are established, knowledge surrounding possible target markets is gathered, audiences analysed. It is worth noting that none of the start-ups examined in section 5, followed a market-pull approach. Some concepts, e.g. Squease, were built around perceived needs, but here no developed market presented itself. Most other initiatives, such as Concrete Canvas, the Seaboard, etc., were technology-push initiatives. This is why there is often very limited market knowledge at the outset. The latter could only be established through continued research efforts on behalf of the start-up teams.

To develop their propositions, ventures require access to complementary assets. Asset acquisition (termed by Teece as integration) is most often unaffordable at the outset of an independent start-up. The ventures examined in section 5 were either bootstrapping, whilst securing a growing funding stream through sales (KwickScreen, RoboFold etc.) or they were focusing on IP in order to secure equity investment (Seaboard, Arctica, Orbel etc.).

The third column of variables in Figure 84, which comprises market positioning, as well as the implementation of the sales strategy and the IP strategy represent the transition period. The three variables on the right relate to the established phase. Once a degree of market power has been established, and the necessary complementary assets have become accessible, the business is established and can focus on growth and asset integration. During the time of the interviews (2013 - 2014) Concrete Canvas was already in this position. KwickScreen and Orbel seemed close.

Two-headed arrows represent unanalysed relationships (Creswell, 2014, p.56), and mark out areas of ambiguity. The two-way interdependencies between finance needs and IP strategy aside, other relationships in figures 84-86 are uni-directional to avoid ambituity. It is important to note that this framework is not prescriptive. Dependencies may vary from case to case.

The interviews in section 5 revealed that a patent-focus can delay market entry due to the time and finances the pursuit of patents commonly consumes. This is different for established businesses who have dedicated teams for legal matters on the one hand, and for sales on the other. In an early-stage start-up the team members involved need to attend to all matters. Start-ups like KwickScreen and Squease who apply a sales-led approach enter markets more quickly than those who focus on patents such as Orbel or Roli. Not only are the sales strategy (route-to-market strategy) and the IP strategy interdependent, they both interrelate to the market, e.g. its size and its complexity. Such a set of intermediate variables brings about uncertainties. It is striking that the highest level of uncertainty, i.e. the greatest level of interdependencies is during the transition period, when sales strategies and IP strategies are implemented in pursuit of a strong market position. It is precisely this situation of ambiguity in combination with a lack in market knowledge which makes it difficult for designer-entrepreneurs to specify the best possible set of strategies.

IP in relation to the three business development periods

Segmenting the business development process of a design-led start-up in no more than three phases may seem simplistic at first glance. However, the set of variables, which these segments need to accommodate is complex, and such are the inter-dependencies between variables. Hence a simple framework makes it easier to manage the data that arises from these variables. Shifting the focus back on IPR, makes it clear that the value of IP develops only gradually from one period to the next. Whilst acknowledging that 'secrecy, first-mover advantages and complementary assets […] are generally more important than patents…' (Greenhalgh, Rogers, 2010, p. 151f), Greenhalgh and Rogers list three key benefits in relation to patents:

• Signalling effect: The signaling effect can help to negotiate favourable terms during fundraising, team building and in pursuit of strategic partnerships. In the eyes of investors, the patent, if granted, provides confidence that third party rights are not infringed (see 5.2.2).
• Market Power: In pursuit of a dominant design, the designer-entrepreneur aspires towards a prominent market position, ideally exclusive access. IP can help to defend and through strategic partnership expand market position.
• Licensing: As previously articulated, licensing can be a means to access new market territories, e.g. overseas markets (e.g. Concrete Canvas in the US), or into new market segments. Proof of market is usually required prior to securing license agreements (e.g. Romulus). As pointed out by Clarysse / Kiefer, licensing alone does usually not generate viable businesses (e.g. early-stage Trunki)

These three key benefits can also be attributed to other formal and informal forms of IP, with the exception of licensing, which requires ownership over codifiable knowledge. Not all benefits are felt by designer-entrepreneurs during the *fledgling period*. Here the benefit of formal IP does not go beyond the signaling effect. It attracts angel investors, although both investors and designer-entrepreneurs know that the litigation of IP infringement would be unaffordable at this point in time. IP may also help to increase negotiating power when discussing strategic partnerships that may be required for accessing complementary assets.

During the transition period, the IP strategy impacts the sales strategy and the positioning within the market. There is a risk of ventures without robust IP being edged out of the market. Competing firms

and competing patents may surface here. This is where the risk of imitation is the highest (see section 8.3 — timing of infringement).

The acquisition of market power marks the beginning of the *established business development period*, IP can help to expand market power as it provides a degree of exclusivity. IP can also allow for accessing new markets through licensing. Concrete Canvas, for example trade their materials in the US under a licensing agreement.

10.3. Theory component 3: The benefit of triangulating inventions

This part of the theory argues that the triangulation of inventions can significantly enhance a venture's success-prospects (see section 9.7). Whilst one must assume that designer-entrepreneurs who start a venture from scratch cannot afford to engage in multiple ventures as does Conran (section 9), the triangulation of multiple inventive steps leads to a significantly increased degree of flexibility in defining an IP strategy, even if the set of innovations is fostered through a single venture, provided that the innovations are mutually complementary in their functions and aimed at one specific market. *Function* here may be seen as articulated in the Offenbach theory that is illustrated in figure 9 in section 3.4. In terms of market application an iconic design such as Conran's MiRo (section 9.4) can be indirectly linked to the function of OmniSeat which benefits from Conran's patented wheel design, and IntelliTable, because all three innovations are of benefit to elderly and they all can also be used in a hospital setting. Bespoke software platforms may further enhance and connect the functionality of all three products. Should one of the products fail or be challenged successfully through a competitor or imitator, the remaining set of inventions are likely to suffices to future-proof the initiative. In Conran's case the innovations are fostered through multiple ventures operating in parallel and in collaboration. Conran's involvement in each of the ventures gives him a strong position within the stakeholder network. An early-stage high-risk-high-return start-up cannot afford to diversify the stakes in this way, because it would compromise the signaling effect which the combination of inventions has on potential investors. Instead all relevant inventions are best owned by one venture. Then all inventions will become part of the same business development model.

Identification of multi-layered variables

Through introducting multiple inventions (or multiple inventive steps) to the proposition, some of the variables which form the business development model, become multi-layered with individual layers corresponding to individual innovations. Some variables such as the team, the knowledge held, the market, will remain single-layered (holistic — connected to the business as a whole), others will be multi-layered such as the proposition itself, the IP that relates to its individual elements. The sales strategy might also be diversified with some parts of the proposition made available for purchase, whilst others are offered through a subscription model, or even free of charge. To cater for multiple inventions, the business development model needs to be adjusted accordingly (see Figure 87).

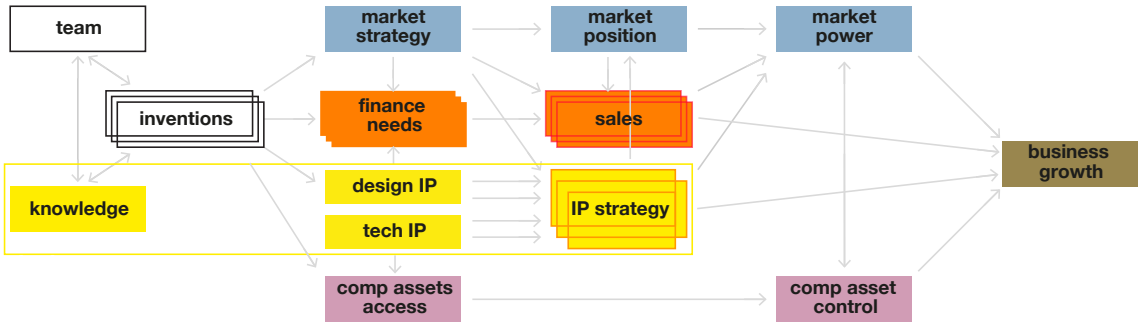

Figure 87: If a proposition comprises multiple innovations (or inventions) some of the variables — proposition, sales strategy, and IP strategy — become multi-layered. Each layer corresponds to one specific invention.

The proposition consists of multiple components (inventions or inventive steps), which all serve objectives that are aligned. In combination, they form a single-minded proposition (SMP). If the alignment of purposes is not given, the venture will appear disjointed, and conflicting situations are likely to evolve during moments of strategic decision-making. Although the innovative proposition components need to be aligned in terms of their purposes and applications, it is important that they can function both in combination (system), or individually.

The team, which commonly consists of very few members only during the fledgling period, is usually required to attend to all inventions. The situation here differs from single-purpose vehicles that are fostered within and spun out of a medium-sized or large established firm. Here small teams can be dedicated to ventures and cease involvement in other operations of the firm. A micro-scale start-up needs to optimise resource utilisation and commit all team members to all inventions that are part of the system.

The market: In light of a single-minded proposition, a start-up must focus on a single market or a specific market segment, even if this proposition consists of multiple components. If multiple markets or market segments are under consideration, then these would need to be closely linked. The markets which Conran Associates focus on in relation to their robotic devices are the healthcare sector on the one hand, and elderly homecare on the other. Both markets are closely linked, and insights gained with respect to one, may be transferable to the other.

The finances are scarce at the outset of a start-up. The variable 'finance needs' is not multi-layered since splitting funds into multiple separate pots would compromise the start-ups financial agility and credibility. One would imagine that allocating specific funds exclusively to individual parts of the proposition would be restrictive. Although finances can be multi-streamed, the team needs to retain the flexibility of shifting funds across where need be. Finance requirements of a venture in pursuit of a set of triangulated inventions will be higher than those of a venture with only one invention under development. Therefore the overall amount of funding needed is likely to increase. However, since certain assets such as team, market knowledge remain centralised, the need for financial resources will be more effective in proportion. Two inventions are likely to require less than double the financial resources by comparison to a start-up that is aimed at one invention alone.

Assets: Access to complementary assets and the prospects of integrating such, may benefit from the increase in credentials that a start-up enjoys if multiple innovations are involved. This thesis uses the terms *complementary assets* and *integrated assets* exclusively in relation to resources that are neither team-related, nor IP- or knowledge-related. This means that the terms are connected to assets which are required for obtaining value chain control both upstream (manufacturing) and downstream (distribution and sales). These assets are likely to be invention specific. Tooling, a manufacturing-related asset, is product-specific. So is the acquisition of materials, unless a specific material such as a polymer is used for a variety of products.

IP connects with the individual components (innovative elements) which are part of the single-minded proposition mentioned above. Each of the components will have a specific set of IPs (strict forms and loose forms of IP included) attached for the benefit of protection. The degree to which IP strengthens the venture's appropriability regime lies in the combination of IPs and how effectively these work in conjunction with each other. Not all IP needs to be first hand. License arrangements as in the case of KwickScreen or Seaboard can strengthen the IP strategy.

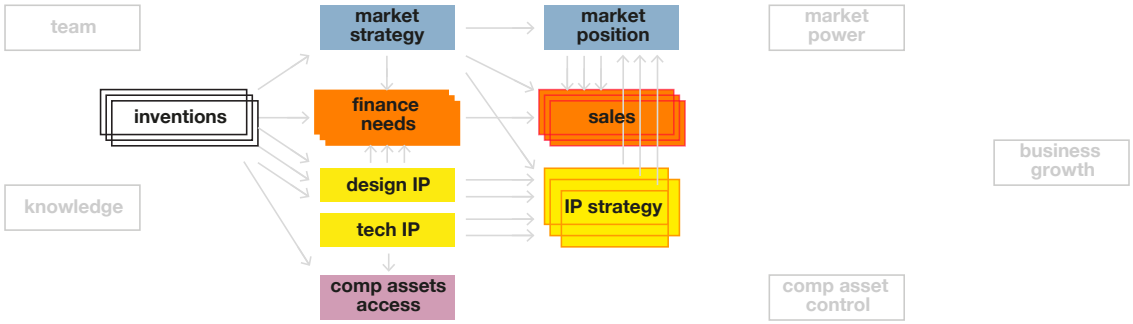

Figure 88: The relationship between the combinatory use of different forms of IP for different elements within the proposition, in conjunction with the sales strategy are of greatest significance to the degree to which the success prospects are increased.

It is noteworthy that the multi-layered variables in Figure 88 are the only elements in the flow-chart, over which the designer-entrepreneurs have true control (independent variables). Market characteristics are given, and finance needs depend primarily on the proposition. We could consider both *market* and *finance needs* as conditions, and the proposition as the independent variable. Access strategies with respect to complementary assets, sales strategies (which we may also refer to as route-to-market strategy), and IP strategy become the intervening variables, which the designer-entrepreneur has control over, and market position, market power, and control over complimentary assets are the dependent variables, which result from the team's decision making and actions.

10.4. Combined theory

The starting point of this thesis was how IP is best managed throughout the design business development process in light of other business development factors (section 4.4).

In pursuit of this question three key questions were raised in section 4.4):

- **How effective are patents and registered design rights with respect to the success prospects of a start-up business, be it design-driven or technology-led?**
- **What other key development factors determine the commercial success prospects of a design-led start-up business?**
- **In what way do IP protection methods and other key business development factors depend on each other over time?**

The effectiveness of registered design rights remains within limits. This form of IP provides signaling effects to imitators and competitors, but does not appear to convince angel investors. It can be secured faster and cheaper than patents. However, it is easy for competitors to circumvent and thus to challenge this form of IP.

The key development factors (variables) far exceed IPRs, which are often overrated by designer-inventors. IP is embedded in a range of other variables. Additional key business development factors have been identified, and preliminarily mapped in section 5.3, which constitutes the theory component 1.

The dependencies between variables, differ between businesses, and depend on business development priorities. A distinction was made between bootstrap approaches and investment-intensive approaches which impact IP strategies or vice-versa. Dependencies change over time as businesses mature.

Section 4.4) also proposed for three key issues to be examined:

- **Potential changes in the vulnerability of businesses**
- **Changes in the value of patents and registered designs**
- **The significance of other appropriability factors such as complementary assets**

The fear of IP to be infringed in the early stages of a start-up is not justified. The longitudinal case studies and the design right infringement survey concur in that imitators wait until proof of market is established. Sales revenues can then help fund litigation processes. Court processes tend to be lengthy regardless whether they involve design rights, patents, or both, and loss of sales can usually not be recovered. If inventors fail lose in court, the financial impact can be considerable, and the survival prospects of the inventing firm can be very limited.

The value of IP depends on the risk of being imitated. As the risk increases only over time, the true value, i.e. the value related to market power and the ability to license out designs, is minimal in the early stages of a start-up. Prior to market entry, the patent fulfils a signaling effect to investors, but the registered design right does not, which means the value related to the latter is only of longitudinal

significance. The Trunki case and the Conran case suggest that brand values can strengthen IP. But brand reputation requires time to develop.

The significance of other factors related to a venture's appropriability regime is largely underrated. IP is part of a network of variables, the dependencies between which require careful management on behalf of the start-up team. IP extends beyond formal IPRs, and can be protected through secrecy, open innovation and strategic partnerships, as well as first-mover-advantages. Other factors such as market knowledge, and initial sales also strengthen the business prospects. How these factors (variables) are managed depends on the start-up team's dynamic capabilities. According to Abernathy and Utterback, the dynamic capabilities[28] of start-ups usually exceed those of established firms (Abernathy and Utterback, 1978, p.5). A well-crafted IP strategy that is managed effectively in relation to other business development factor enhances a start-up's dynamic capabilities.

The theory development was further guided by three preliminary hypotheses:

Preliminary hypothesis 1: Sales-driven strategies help to speed up the route-to-market, but may limit the business growth potential.

Preliminary hypothesis 2: Tech-led strategies harnessed through patents require more development time, but may lead to greater business growth trajectory in the long run.

Preliminary hypothesis 3: Design-led strategies allow for faster access to market because IP is easier, cheaper and faster to secure.

In comparison, the case studies in section 5 do suggest that sales-oriented start-up teams access markets faster than those who focus on technology IP (patents). However, it has not been possible to establish through primary data whether or not a sales-oriented bootstrap approach limits the long-term growth prospects.

The Haberman case confirms that changes in the product language such as in the Birdcup can significantly increase sales, at least in the retail sector, although they are difficult to protect. The success of the Trunki suggests that product languages can lead to high-growth businesses, although this thesis does not offer sufficient evidence to prove that this can be claimed in general.

Even if *design-led strategies allowed for faster access to market*, they are of limited benefit if they are not sufficiently robust to fend of imitators. The most successful start-ups (Roli and KwickScreen) used a combined approach, i.e. a variety of IP including both registered design rights and patents, without de-emphasising other business development aspects such as complementary and integrated assets as well as market-related assets.

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[28] Abernathy and Utterback do not use the term *dynamic capabilities*. This was coined by Teece, Pisano and Shuen in 1997. Abernathy and Utterback use the word *adaptability* claiming that 'small adaltable organisations with flexible technical approaches' are at an advantage over large established firms (Abernathy and Utterback, 1978, p.4).

The examples of MiRo and OmniSeat, which were examined in conjunction with the Conran case, suggest that developing product languages is less time consuming than resolving technical issues such as those related to the software required to operate MiRo, or the wheel technology needed for OmniSeat. It also shows that the product language can be marketed whilst the technology development continues, and the combination of technology concepts and novel product languages can attract investors (e.g. MiRo). Conran claims that different challenges related to design, technology development and marketing, need addressing simultaneously with the emphasis to be shifted periodically (figure 76).

In preparation of a theory-building argument, the following three theory components were introduced:

Theory component 1 consists of a reference framework featuring key business development factors which are referred to as meta variables. These describes the way in which market-related, finance-related, IP-related, and asset-related business attributes develop individually and in relation to one another over time.

Theory component 2 creates the foundations for a business development model through segmenting the development framework into three development periods: the fledgling period, the transition period, and the established period.

Theory component 3 examines the framework in consideration of the possibility that multiple inventions are involved in the business proposition. the value of triangulation of inventions. This may increase the finance needs, but it also increases the number of options for developing finance strategies and IP strategies.

The next section discusses the benefits that derive from the triangulation of multiple innovations in relation to IP-strategic options. IP is examined in conjunction with dynamic capabilities, and the business model canvas mentioned in section 2.3 is critiqued for not supporting this examination in sufficient detail. Building on the dependency diagrams in section 5.3, the next chapter develops a business development framework that maps out business development factors (variables and meta variables) with a view on the three business development segments mentioned above. Towards the end of the section, the business development framework is explored in relation to the case studies featured in section 5.1.5. This illustrates how the business development framework can enhance the strategic decision making in relation to business start-up developments, even if multiple inventive steps are involved.

11. Conclusions: The attributes of a successful design-led start-up

11.1. Invention alignment: defining the selling point

This thesis examined the success-prospects of independent design-led start-ups built around inventive designs. The outcome of this investigation is a business development model in the form of a flowchart which helps to strategically manage business development attributes related to single-minded propositions (SMP) over time. This thesis builds on the fact that the SMP and USP (unique selling point) are not synonyms. The latter term relates to the exclusive access to the proposition, a specific attribute or a characteristic of the proposition, the former to the fundamental purpose, which it is designed to fulfil.

This raises the question how important a USP related to form and / or function is with respect to the SMP's overall performance and its chances of becoming a dominant design. Through securing exclusivity, an inventor establishes a USP. This can also be achieved through IPRs or other means such as secrecy, exclusive licensing, or through controlling critical value chain components and through business relations. Here the value of IP is proportionate to the significance of the USP to the inventor and to the invention itself, i.e. the degree to which the IP enhances the SMP. This determines how useful or necessary the added function is. If the USP is not essential, the IP can easily be circumvented. For example, Magmatic Ltd secured a patent for the closing mechanism of the Trunki case. The case had sold at high volumes prior to the patent filing. Whilst the closing mechanism does provide a certain market advantage, it is not critical to the market position[29]. The closing mechanism may constitute a USP. However, it is not critical to the product performance. On the other hand, the material, which KwickScreen uses through an exclusive license, is essential for the screen to be unfolded without collapsing. Here the licensed IP is critical to the function of the product.

What led to a high dependency on patents for many of the start-ups examined in section 5 was the fact that their single-minded proposition consisted of one component (invention) only. As mentioned in section 3.2, most of the designer-entrepreneurs were fixated on one individual invention. This is with the exception of KwickScreen who later added Romulus, and Roli who acquired Juce. It is easy to envisage the degree to which these two additions enhance the respective ventures' appropriability regimes, and also their flexibility in strategising IP. Conran uses open innovation principles with respect to the software platform designed to control MiRo. Having control over a set of multiple novelties, means that the risk of being edged out of the value chain is minimised.

[29] The main benefit for Magmatic Ltd lay in the fact that they could take advantage of the 'patent-box', a UK tax-saving scheme that was initiated in April 2013 to promote innovation in the UK (UK Government, 2007).

11.2. Risk mitigation through diversity

As highlighted in section 3.7.2, the potentially damaging impact of competition and imitation is increased if inventors limit their innovation to one single inventive step. To strengthen the appropriability regime effectively, different inventions related to the start-up need to be mutually complementary, and so do the forms of IP which protect them. Each component of the proposition needs to be of key significance to the startup's SMP, i.e. to the problem which the proposition seeks to resolve. At the same time, the individual element ought not be critical to the success of the firm overall, because this would increase the adverse impact in case of IP infringement or competition. Inventions or inventive steps ought to be of key benefit, but not indispensable to the way in which a firm addresses the issue(s) which it seeks to resolve, i.e. the SMP. This means that the innovator can resort to the other inventive component(s) and shift emphasis if one of the inventive steps (proposition elements) is challenged by a competitor through imitation or invalidation of the exclusive IP. An effective IP strategy must leave room for the tactical response to unforeseen circumstances.

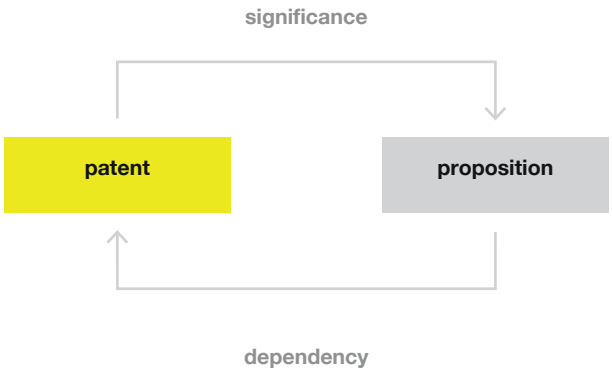

Figure 89: With the significance of the IP, respectively the function which the IP protects, the ventures dependency on the IP increases too.

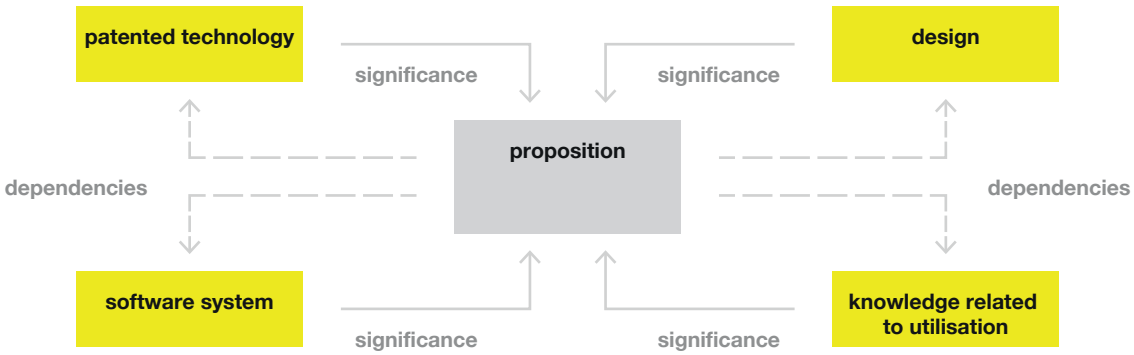

Figure 90: With multiple innovative elements as part of the proposition, the dependency on the individual components, and consequently on the IP that protects them can be reduced.

11.3. IP strategies and dynamic capabilities

Not all inventive elements need protecting through formal IP. In fact, it may be preferable if some do not rely on formal IP. Secrecy, formal IP, and open innovation principles can be combined in a strategic manner. An IP system can be established that is dynamic and allows the inventor to adapt to unexpected changes. IP then becomes a dynamic capability. As highlighted in the beginning of the thesis, independent budding designer-inventors often lack access to assets other than knowledge surrounding concepts and ideas. This is why it is very important to protect the latter. The triangulation of mutually complementary innovations strengthens a start-up disproportionately because it mitigates the risk of being edged out of the market through imitators, and it multiplies the possible options of combining different forms of IP.

Commonly designer-entrepreneurs focus on a SMP that is carried through a single inventive step (Figure 89). This thesis argues that this is compromising. The possible number of combinations of different forms of IP in relation to one single invention is limited. Although various forms of IP can be combined to protect one individual inventive step, certain forms of formal, informal and loose IP, cannot be combined. Secrecy is needed in the run-up of a patent filing process, but once the application is being made public, secrecy cannot be sustained. Public relations that are often required to generate credentials, may conflict with certain objectives and requirements related to patenting and secrecy. Design right protection does not provide an alternative to patents, but can provide a useful addition.

A SMP may comprise several independent but mutually complementary inventive elements. This thesis argues that a design-led start-up is best developed around a combination of two or more inventive steps that can be taken to market individually, but also in combination with each other. The triangulation of mutually complementary innovations (Figure 88) strengthens a start-up disproportionately, as it mitigates the risk of being edged out of the market through imitators, and it multiplies the number of possible options of combining different forms of IP. The triangulation of inventions allows designer-entrepreneurs to make use of a wide range of IP options including secrecy, design rights, patents, and also open innovation principles, which can enhance public exposure and support marketing efforts.

11.4. A critique on the business model canvas

The conventional business model canvas as introduced in section 2.3, is suitable for illustrating a situational snap shot of a company's key particulars and organises them according to nine categories (figure 5): key partners, key activities, key resources, value propositions, customer relationships, channels, customer segments, cost structure, revenue streams. All these criteria describe a venture's status quo. Fledgling start-ups are not aimed at stability but at growth, and this requires the articulation of change. The lean canvas, a derivative framework (figure 6), lends itself better to action-oriented decision making, however, it can articulate only one strategic intervention rather than a string of decisions. What is required instead, is a dynamic system that allows continuous monitoring of the most significant business development aspects (meta variables) over time, i.e. the inter-relations

between the critical business development factors, team, proposition, finance, assets, market. IP can become a flexible 'fabric' that supports the development of all other business development aspects. However, the start-up team needs to be able to manage the respective developments in a context of unforeseen circumstances through their dynamic capabilities. Market knowledge, for instance, is generated over time. Radical innovations are often situated in market niches, or in emerging markets. Therefore the business environment itself is likely to undergo changes. Negotiating these dynamic interdependencies needs a fundamentally different model compared to those that have been deducted from the investigation of the management of established corporations. This is why the conventional business model canvas would be best replaced or complemented with a multidimensional framework for the management of proprietary early-stage design-led start-ups. This allows to continuously negotiate the relationship between the critical business development attributes throughout the fledgling period, which is particularly useful if multiple mutually complementary inventions are at play.

11.5. The business development framework

To provide an oversight of how the different business development attributes (meta variables) relate to each other, and what ought to be the driving factors behind certain decisions, a time-based model is needed. The qualitative inquiry highlighted in addition to the start-up (i.e. the team, knowledge held within and the proposition itself), finance, IP, market-related matters, and complimentary / integrated assets as key components. In figure 91 the latter four meta variables are aligned in four horizontal parallel streams. Depending on the business development stage, fledgling period, transition period, established business, the criteria (variables) take on slightly different characteristics. In the beginning markets need identifying and analysing. Later market power can be developed through the defence and through the expansion of IP, for example (figure 90). The degree to which market power can be acquired, also depends on the way in which the business is positioned in the market. Market positioning, in turn, may depend on the way in which IP is implemented (open innovation, secrecy, formal IP etc.).

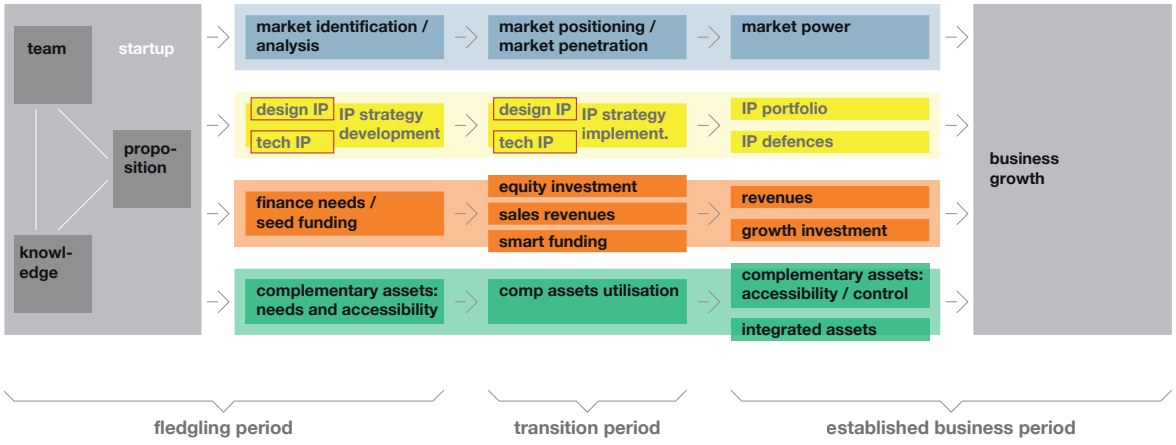

Figure 91: Four of the meta variables (market, IP, finance, complementary assets) are addressed through a range of sub-variables arranged horizontally and colour-coded in line with figures 49.

The value of IP can change significantly over time as explained in sections 3.8, 4, and 10.2. Figure 91 makes it easy to understand that during the fledgling and transition period, IP serves usually as a signaling effect only. The appropriation of value through market power and licensing, can only be expected during the established period, although design IP (design rights) can be secured and utilised significantly faster than technology IP (patents).

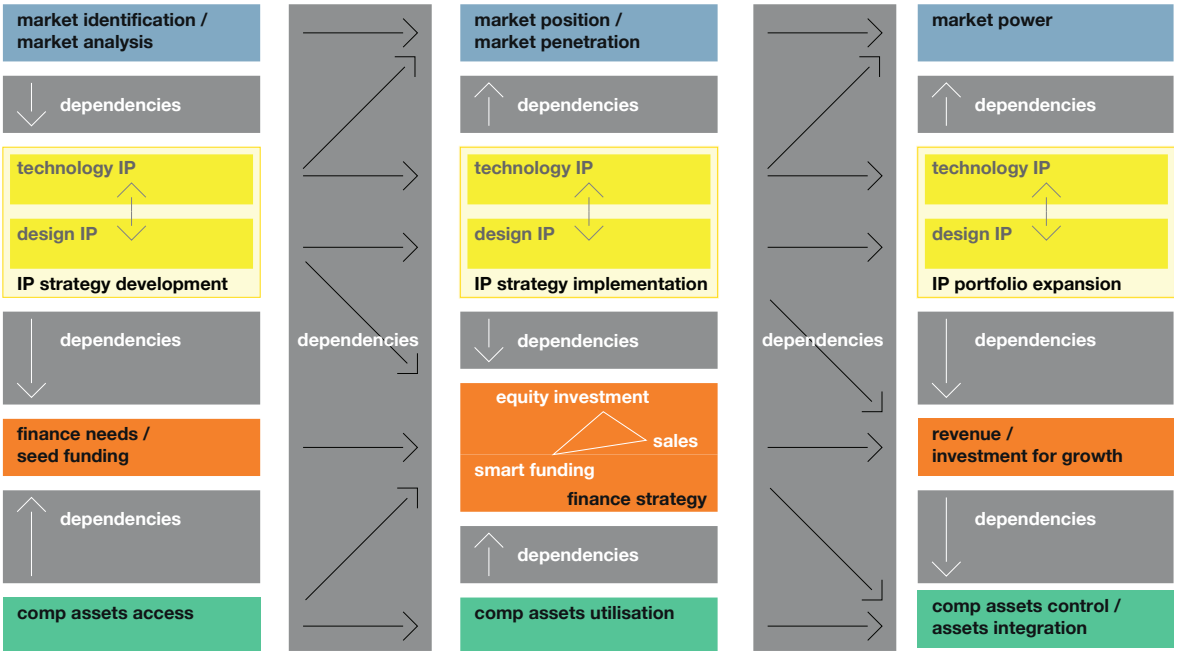

Figure 92: Instead of only defining the variables that relate to the business development, a business model canvas should also allow for articulating their interdependence.

The way in which the vertical arrows are pointed in figure 92 does not necessarily reflect the way in which the variables depend on one another. It would seem unwise to assume that there might be a universally applicable set of circumstances. Instead the dependencies vary from case to case, and also on the views and priorities of the start-up team. In section 5, teams who decided in favour of a bootstrap approach such a KwickScreen, would prioritise the finance needs as the independent variable, and IP investment would be limited in line with funding restrictions. Here the IP strategy depends on the finances, not vice versa. The model shown in Figure 92 is meant to be used as an interactive decision-making aid, not a prescriptive tool that tells designer-entrepreneurs what is to be done. It helps the designer-entrepreneur to discuss and establish priorities and dependencies. To effectively facilitate decision making, double arrows must be avoided, as these represent unanalysed relationships (Creswell, 2014, p.56). The inventors involved in Design London / InnovationRCA frequently reported that they needed a patent to attract angel investment. Conversely, the angel investment was required to invest in a patent portfolio. Investment and funding was perceived as inter-dependent, which often impaired the inventor's decision-making. Whilst it is important to articulate what are the independent and the dependent variables, dependencies also require continuous monitoring. If priorities change, arrows may need reversing. These dependencies are decided at the

discretion of the designer-entrepreneurs, and in view of the circumstances, which inevitably change over time. Therefore it is highly likely that these dependencies also change over time, and their direction and description may need periodically adjusting. The model in Figure 92 allows for the definition (directional) and the articulation (qualitative description) of the interdependencies between two or more neighbouring variables. This helps the designer-entrepreneur establish clarity about what are, or ought to be the independent variables (driving factors) and which are the dependent / intervening variables. Creswell refers to the former also as 'predictors' (Creswell, 2014, p.52). After segmenting it into the three different business development periods that were highlighted in section 6.7, the model can be used in three different stages.

The flowchart in relation to design business development periods

The design business development consists of three distinct phases as highlighted in figure 66 (section 6.7) and in figure 87 (section 10.2). The usability of the model as illustrated in figures 85-88 is limited if dependencies are illustrated through double arrows. As explained above, double arrows reflect ambiguity, which is not conducive to decision making. Designer-entrepreneurs can be torn between the options, and the inventors interviewed in section 5 were particularly torn between IP-intensive (and cost-intensive) strategies and bootstrap options. To make the proposed model usable, one needs to identify independent, intervening, and dependent variables. To determine clear dependencies, the three periods are best examined individually. Although the dependencies increase from left (start-up) to right (established business), the dependencies between individual variables cannot be determined universally, as explained earlier.

The fledgling period

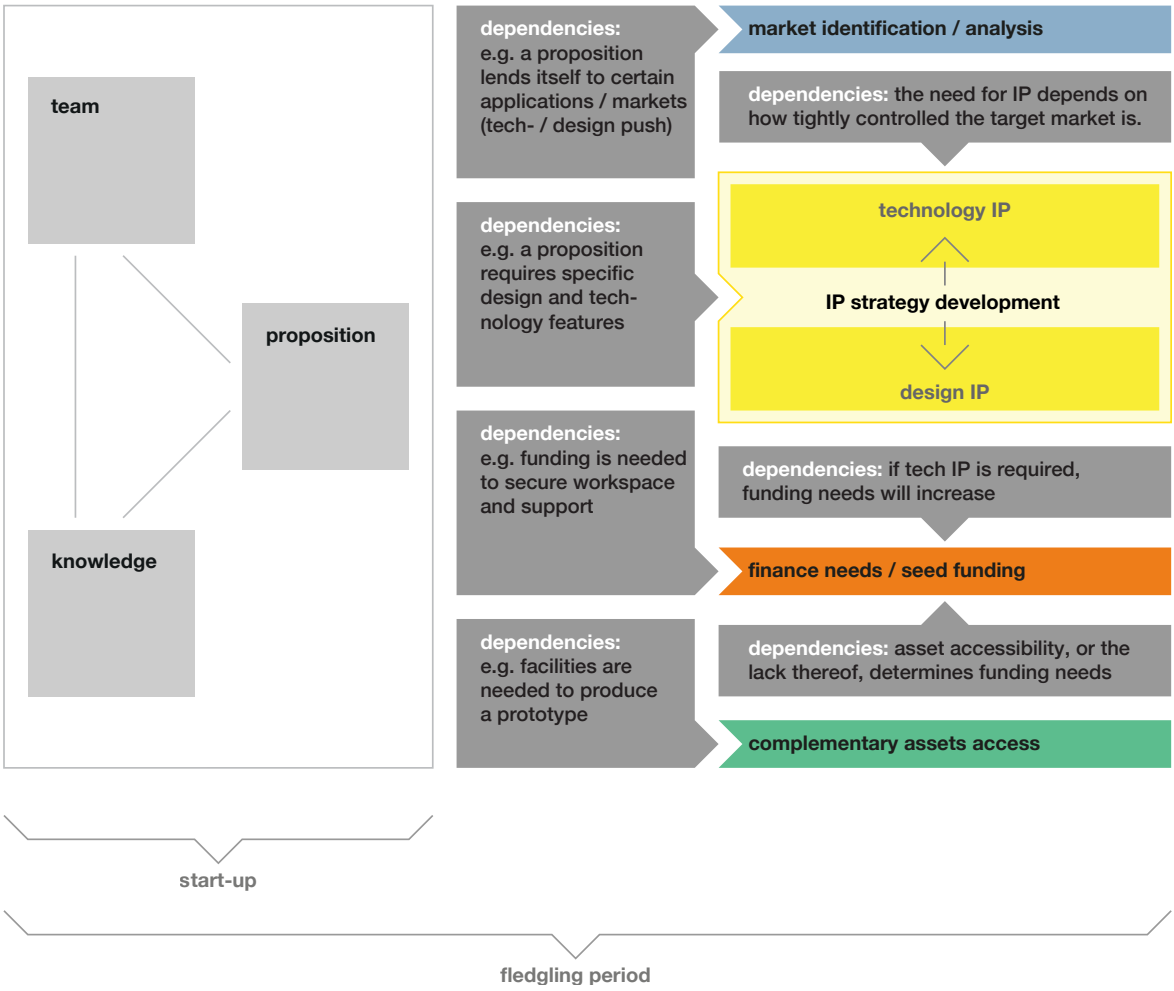

Figure 93: Possible dependencies during the fledgling period of a design business development

As discussed in section 10.1, knowledge, the team, and the proposition can be seen as a strongly intertwined unit that shapes the start-up. At the outset, the target market needs identifying, and finance needs must be established. The interview findings in section 5 suggest that the biggest challenge for designer-entrepreneurs at this point in time is to specify the complementary assets needed in pursuit of proof of concept and to strategise the route-to-market. Experienced designers such as Sebastian Conran find this much easier by comparison. These secondary variables related to market, IP, finance, and complementary assets, depend not only on the start-up (team, proposition, and knowledge), they also depend on each other. The only way in which a designer-entrepreneur can make good use of the model proposed here, is to lock specific variables in order to determine the others. In the example illustrated in Figure 93, the need of access to complementary assets determines the degree to which financial assets are needed. The dependency between two or more variables can be re-configured from time to time. What needs avoiding is to constantly switch between both contradicting options, and to specify dependencies which lead to circular constellations of dependencies.

The transition period

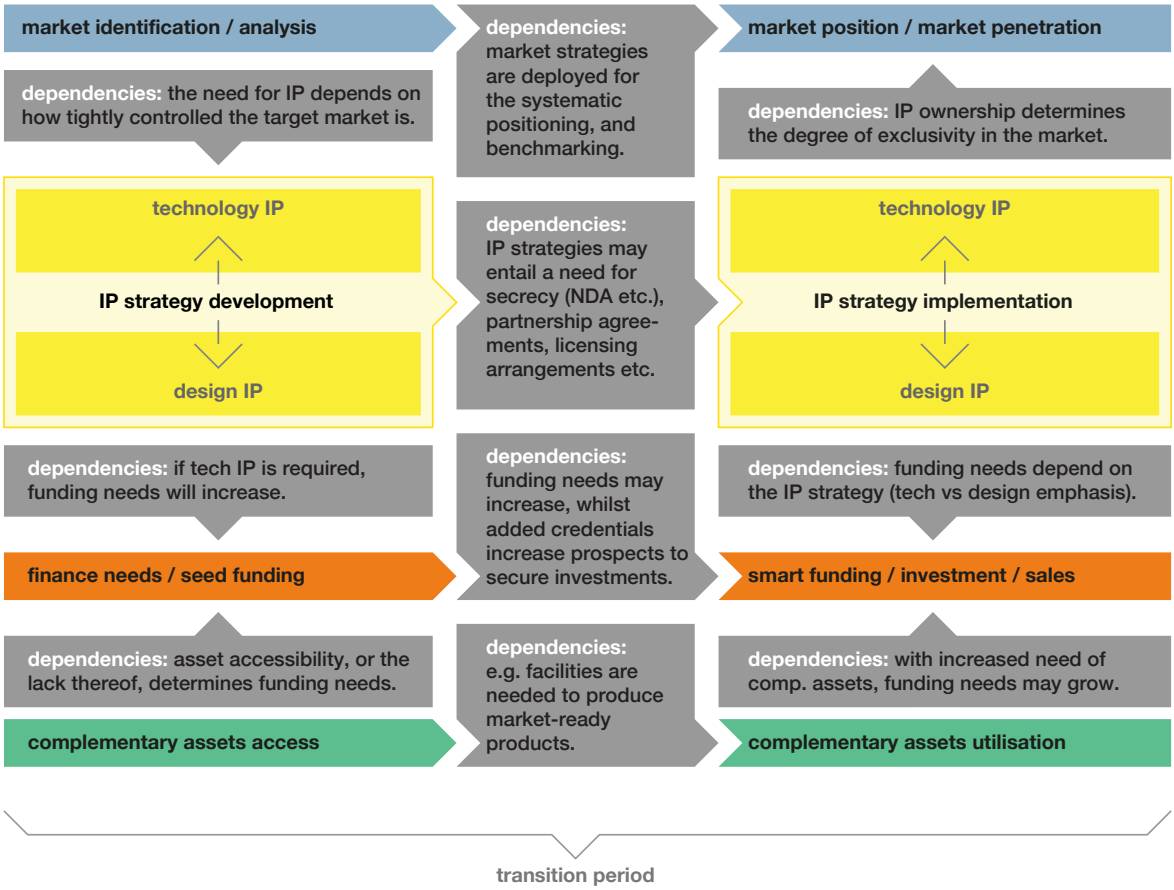

Figure 94: Dependencies during the transition period. There is a mutual dependency between sales and equity investment. The more funds can be acquired through sales, the less investment may be needed, and vice versa.

During the transition period, the market position, the funding strategy (investments, sales) and the IP strategy implementation need negotiating. But which variable determines which? Complementary assets and finance are closely linked. Considering that down-stream value chain access may constitute part of the complementary assets, the latter may be dependent on the market or market sector. The difficulty that has been identified in the course of this study, is that the IP strategy impacts the finance needs. This led some of the ventures examined in section 5 to focus less on the market- and sales-related issues. The fact that exclusive IP can pave the way towards complementary assets and to equity investment, makes it so significant in the eyes of many designer-entrepreneurs.

If the positioning within a particular market proves difficult, a re-examination of the market may be necessary and a shift in focus advisable. Then dependencies may need reversing. Arctica experienced this, when confronted with value chain bottlenecks. Here the difficulty of positioning the business

within a main stream market, forced the team to re-orientate. Through focusing on period properties, a market niche could be identified. In this case, the target market became dependent on the market position and on the lack of assets in the downstream value chain. Changes in the business orientation during the transition period can also have a reverse impact on what were the independent variables during the start-up period: team, proposition, knowledge. It may turn out that the proposition needs adjusting, or a different design solution (proposition) is more suitable for the market area (market-pull). This in turn may mean that existing team members either have to up-skill (knowledge) or cannot contribute meaningfully to the business. This reverse effect can lead to challenges. In the case of Arctica, the designer-entrepreneurs secured a trade sale, having been faced with a tightly controlled market-environment. In this case patents proved critical for the exit.

The established period

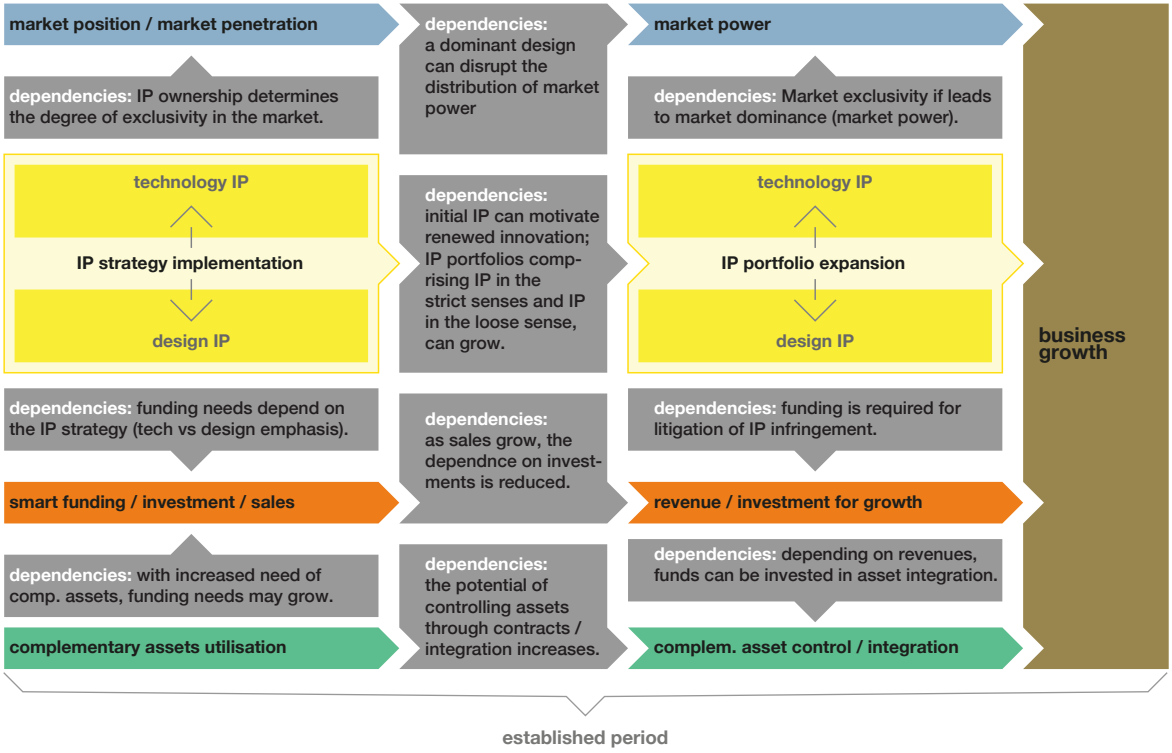

Figure 95: The established business development period. Developments remain necessary to sustain business growth.

The established business is not the core focus of attention of this study, because this is much explored in the existing literature and theories by Schumpeter and Teece. What remains of interest in conjunction with this thesis, is how the business attributes of an established business connect with the development aspects in the transition period. Magmatic Ltd's defence of their IP was unsuccessful. However, their market participation led to a degree of market power that ensured the survival of

the firm during the legal battle against a multinational. With reference to the legal case Trunki-versus-Kiddee, Rob Law states that his firm 'got a lot PR out of it. The equivalent advertising spend is probably about the equivalent of our legal cost.' (Law, 2016). With reference to his product's social media presence, Law claims: 'We have a 30% unprompted awareness of our brand with mums, 70% prompted awareness in the UK, and 70+ thousand following on Facebook which is our core marketing machine…' (Law, 2016). Public awareness may encourage an IP-active approach. With reference to the AnywayUp Cup, Haberman explains: 'We realised that if we did not stop them, then everybody else would infringe' (Haberman, 2014). The greater the public exposure, the bigger the commercial traction, the higher is the risk of infringers to emulate a design and the greater the pressure on the inventor to defend. Following the cost-intensive legal battle surrounding Trunki, Magmatic had to go through an equity investment round in order to prevail. Law retained a controlling majority of the business (Law, 2017), but had to sacrifise a sizeable proportion of the business ownership. Here the IP defence impacted the financial strategy. Figure 94 shows that the business development framework is not a prescriptive unchangeable model. Here the investment for growth depends on the IP defence, not vice versa, which is illustrated in Figure 95. It is a thinking and decision-making tool. In the Trunki-versus-Kiddee case discussed in section 5, the emergence of an imitator challenged Magmatic Ltd's market power, to which the latter firm responded with a media campaign (market positioning). Here the firm had to take a step back and to re-establish itself as a market leader (market share). The journey through the courts led to a severe reduction in profits, which in turn led to the need for equity investment, and also to an IP strategy revision. A conference paper entitled as 'Managing Design IP in the UK — does the end justify the means?' highlights Magmatic's attempt to extend the scope of protection surrounding Trunki through registering follow-up designs (Hillner, 2017b). Rob Law explains that 'a further 10 designs in line drawings [...] protect against anyone who would try to come up with one that looks visually different.' (Law, 2016). This meant that certain priorities which were set during the transition period, had to be reviewed and certain decisions surrounding protection and market participation needed revising. The journey of a business under development, can be illustrated through a series of diagrams, which highlights the strategic adjustments made over time.

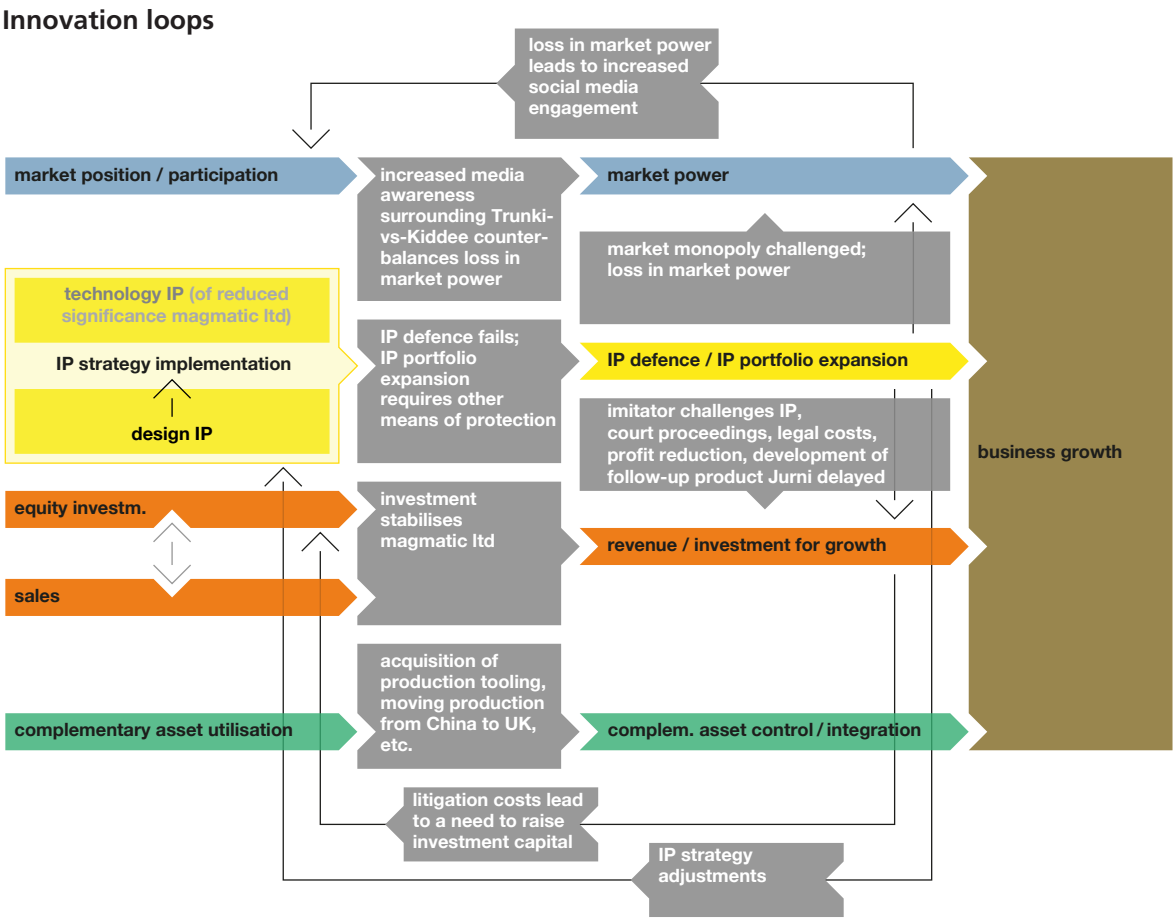

Figure 96: The established business development period. Developments remain necessary to sustain business growth.

Whilst radically innovative start-ups are dedicated to disrupting existing conditions through introducing 'competence-destroying technological discontinuities' (Tushman and Anderson, 1986, p.444), one could argue that an established business strives for stability rather than development. However, continued innovation is important for an established firm to remain competitive in a market environment, the conditions of which are subject to change due to technological or socio-cultural progress. The business development framework comprises a range of decision trees, which can be extracted depending on emerging needs. As explained above, it does not offer a single solution. Instead it offers the flexible choice between different possible sets of priorities that are determined through selection of independent variables. Hypothetically, an entrepreneur could start at the desired outcome — business growth — and reverse engineer the path that leads towards it. Insights gained in the course of the business development may occasionally demand for the redevelopment of the diagram as shown highlighted in the above paragraph with reference to the Trunki case. Renewed innovation may lead to changes in circumstances, which may lead to the need for certain business development attributes (criteria) to be revisited. In such a case, independent variables become

dependent variables. This is shown in Figure 97. Depending on how the business and its SMP develop, new knowledge may need acquiring, existing propositions reconfiguring, the team may need to grow or change, additional complementary assets may need accessing or integrating. It is possible that new markets or market sectors are identified, or existing ones are expanded into new territories. New funding opportunities and income streams may emerge, and the IP strategy may need to change, perhaps through the integration of open innovation elements, or through implementing the IP strategy in a different way such as adding license revenue streams instead of relying on direct sales alone, in particular if trade is expanded into overseas territories. The black arrows in Figure 97 indicate such loops, where growth may lead to possible adjustments.

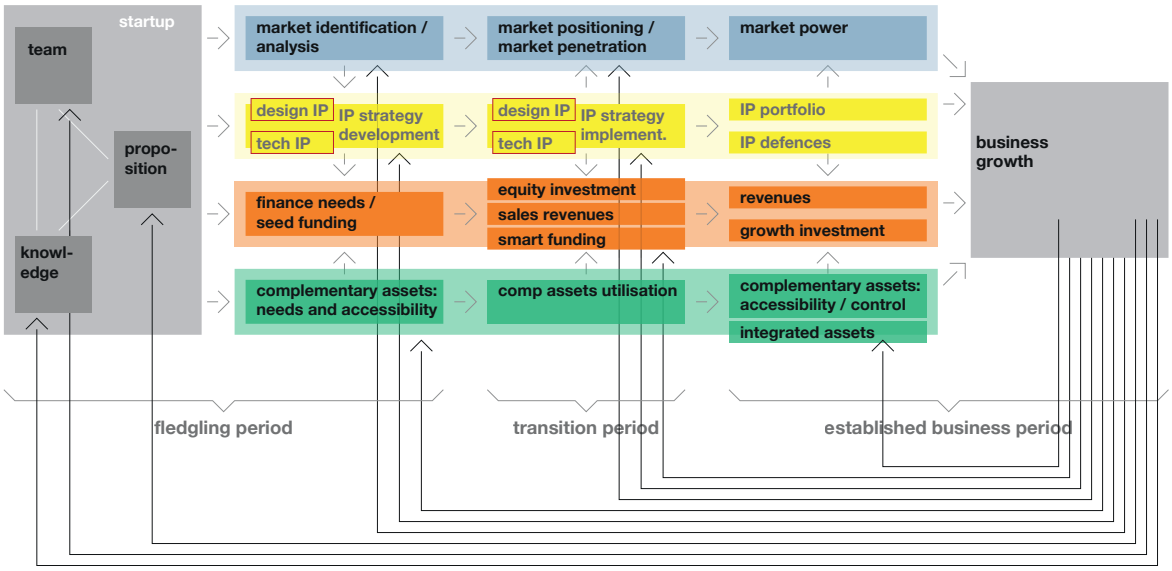

Figure 97: As a business establishes a dominant design paradigm, it may re-define individual business development attributes.

Figure 97 illustrates the complete business development journey. The horizontal arrows pointing from left to right indicate how individual meta variables (market, knowledge / IP, finance and complementary assets) develop and transform over time. The vertical arrows indicate possible dependencies between different meta variables. Defining these vertical dependencies provides the designer-entrepreneur with better clarity about the business development strategy, and the primary business development needs. The black arrows starting with business growth, indicate certain variables which will need revisiting as the business development progresses.

Managing the business development flow for multiple inventions

The difficulty arises where multiple inventions are involved, which this thesis argues can be beneficial to a venture's success prospects. Although all inventions are carried through the same start-up team and aimed at the same or similar markets, each invention may have different constellations of variable dependencies. This can be difficult to illustrate in a simple static flow chart. Although the configuration of variables is always the same, the direction of the arrows which connect them may differ. An inventor may seek the finance to fund innovation through a variety of means, from income generated through sales of existing offerings, or through loans or raising capital from investors (figure 16-18).

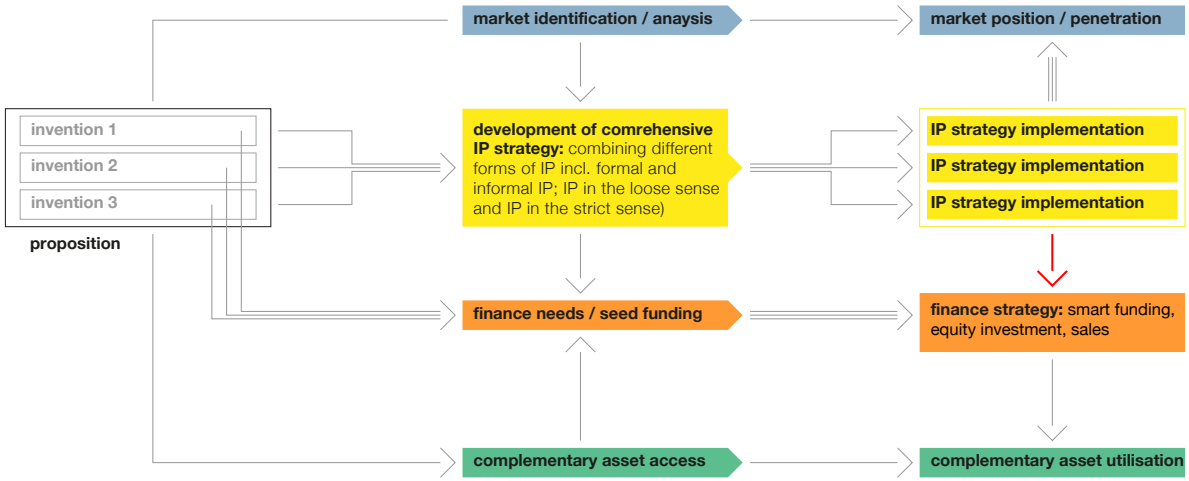

Figure 98: The fledgling and transition period for a start-up using multiple inventions.

To address the difficulties related to multiple inventions, one can focus on the variables that are most significantly affected as shown in figure 88. If updated in line with the variables articulated in figure 97, the diagram would look as shown in figure 98.

Since all variables are aimed at the same market, the complexities arise mainly in relation to IP and finance. More finance is needed, although the fund allocation to individual inventions can be flexible. The IP strategy is more complex and culminates in a variety of protection strategies for each individual invention. The route-to-market can combine equity-investment-based approaches with sales-led approaches. Each invention can be strategised individually here. There can be different market entry points for individual inventions, although they ought to be aimed at one and the same market.

Depending on the route-to-market strategy used for each individual invention, the dependencies between the implementation of IP strategies related to the individual inventions and route-to-market strategies (equity investment versus sales), may differ. Therefore the dependencies between IP strategy and finance (investment / loans versus sales) may vary too.

Business development attributes (variables) and relationship nodes

The diagrams show in figures 93-95 connect mainly neighbouring variables through dependency arrows. Those variables that seem to be most strongly connected according to literature review findings and qualitative research insights, have been positioned next to each other to facilitate the necessary connections. However, it is possible that the access to complementary assets, or the lack thereof, may impact directly the development of an IP strategy. The choice of a target market and the market analysis may reveal insights with respect to the access to complementary assets. This shows that there can be more dependencies than those articulated so far. With the diagrammatic design approach used above, it can be difficult to visually articulate possible relationships between variables that are more distant in the diagram unless they are extracted and organised separately. It becomes clear that the number of dependencies that need articulating in conjunction with a design-led start-up may be greater than those in the diagrams shown in figures 93-97. This in combination with the fact that different approaches such as bootstrapping, equity investment financing, secrecy etc., can be applied to different individual inventions at the same time, makes it difficult to articulate all dependencies in one diagram. It seems important to limit the number of the dependencies to those that are most prominent to avoid confusion and contradictory circumstances. Whilst double arrows need avoiding as this would lead to ambiguities, multiple inventions can be mapped out in parallel with the possibility of highlighting variables and dependencies related to individual inventions.

Figure 99 shows how the business development framework might look if applied to KwickScreen, a comparatively simple example. The two inventions here, KwickScreen which is a somewhat disruptive novelty, and Romulus, which is an incremental innovation, are not strongly connected. Romulus, a bespoke digital customer management system, evolved in the course of the team's KwickScreen marketing efforts. The expansion of the client base around KwickScreen led to the identification of a market-need for better customer management tools. Romulus started off several years later in 2012. Dependencies related to this initiative are marked with grey boxes and grey arrows. Both initiatives were fostered using a bootstrap approach. In Figure 99, one can see some vertical arrows reaching over other variables, connecting market identification, in this case the NHS, with funding for example. KwickScreen was initially part-funded by the NHS (Section 5.1.5). Later the ventures were funded mainly through revenues (KwickScreen: sales, Romulus: licenses). In this model, the coloured boxes, which represent the meta variables in their various incarnations over time, always remain consistent. Investments and loans have been crossed out in this particular example, because these means of funding did not play a major role here. The locations of meta variables, do not change from venture to venture (although they can be sized in accordance to their significance). It is the dependencies that change. Whilst descriptors can be added to the meta variables, the focus remains on the relationship between the business development attributes (meta variables). The arrows shown in this diagram reveal how significant the revenue-based funding strategy was, first for KwickScreen, and later for Romulus, which was almost exclusively funded through revenues received from customers who paid the team for the customisation of the system, and for consultancy services in relation to its usage. IP is not without significance, but it provides a deterring signaling effect to competitors only. The diagram has been drawn based on data collected in 2014/2015, around 8-9 years after KwickScreen was initiated. Start-up business scenarios can be complex. It is important to focus on the most prominent development criteria without denying the complex nature of the dependencies between.

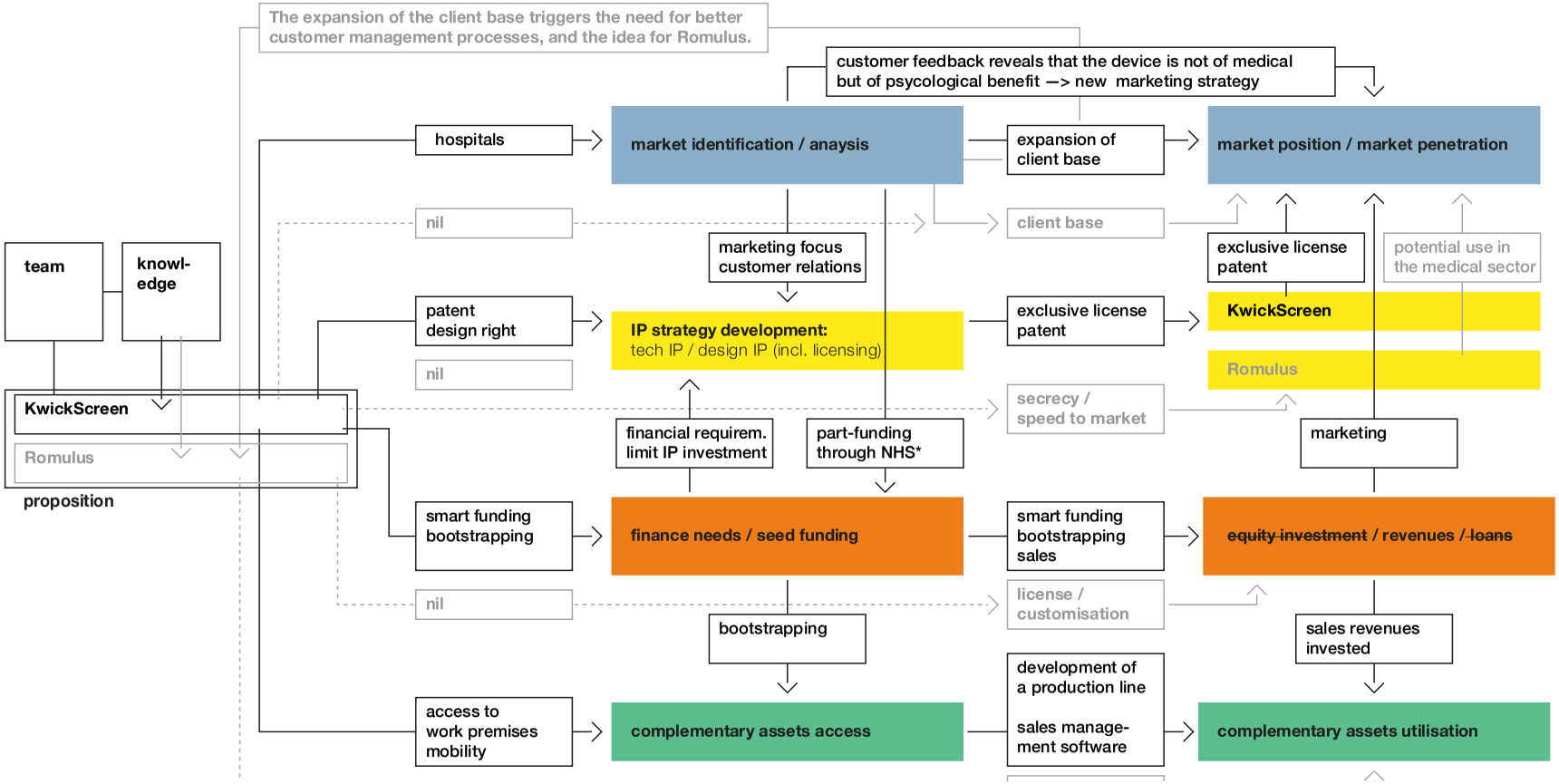

Figure 99: The business development framework used on a venture that pursues multiple inventions. This model, which takes into consideration the wider context allows to extract decision trees.

12. Contribution to theory

The thesis argues that IP should not be treated in isolation when developing strategies for start-up businesses because this makes it difficult to establish the holistic systemic understanding needed for effectively managing the development of innovative start-ups. This is why this thesis connects knowledge in the areas IP, business management, and design innovation as articulated in section 4.4.2. In relation to theories in the area of IP, it fills a knowledge void pointed out by Tushnet (2012a, 2012b) and Collopy et al (2014) through critically evaluating the robustness of registered design rights in the UK. Although these constitute viable protection mechanisms, their reliability remains questionable as evidenced through the Trunki case study (section 7) and through the quantitative data discussed in section 8. Despite the fact that design-driven approaches as advocated by Verganti and Dell'Era (2014) can help to speed up the route-to-market for designer-entrepreneurs, the value which stakeholders in the innovation framework attribute to the visual aspect of design does not commend a shift of focus from technology to product languages. Therefore the prominence of technology advancements in the context of innovation is sustained, and the commercial value that can be appropriated from product languages must be considered as limited. It can be equally difficult to protect abstract concepts such as that of a ride-on travel case for children[30].

Despite their positive signalling effect, the value of patents for design-led start-ups remains at question because of the amount of time and financial resources required to secure them. Dodgson et al. critique 'the frequent inappropriate association of patenting with innovation' arguing that 'Patenting is at best a proxy measure of an element of innovation that is important in some sectors and irrelevant in others.' (Dodgson et al., 2014, p.10). Along similar lines, Salter and Alexy (2014, p.42f) speak of a *blind spot* in relation to a research tradition that focuses on industry sectors such as biotechnology, semiconductors, pharmaceuticals, which use the 'current toolkit of innovation', thus neglecting other mechanisms that support innovation.

Teece (1986) argues that IP in the form of patents can be deployed to compensate a lack in access to complementary assets, and thus allow inventors to strengthen the appropriability regime around their inventive propositions. However, with complementary assets beyond reach, lone inventors and independent start-ups find it difficult to secure their position within the market environment through patents alone. This study introduces a new perspective in relation to innovation management studies through raising the question what means other than patents and complementary assets, designer-entrepreneurs can deploy in order to strengthen the appropriability regimes within their target market environments. The answer to this question can be found in the context of dynamic capabilities. Although this is an expression coined by Teece, Pisano and Shuen (1997), its origins can be traced back to Abernathy and Utterback, who argued that 'In the initial fluid stage, market needs are ill-defined and can be stated only with broad uncertainty' (Abernathy and Utterback, 1978 p.7). They further claim that 'units in different stages of evolution will respond to different stimuli and undertake different types of innovation' (Abernathy and Utterback, 1978 p.8). According to the scholars, small units, i.e. SMEs or lone inventors, are better positioned to introduce radically innovative propositions, whereas large established incumbents find it easier to pursue incremental

[30] The idea of a ride-on travel case was never protected, because Rob Law "could not get a patent to protect the idea of a ride-on suitcase" (Rob Law, 2016). Ideas per se are not protectable through formal IPRs.

innovations. 'As the enterprise develops, however, uncertainty about markets and appropriate targets is reduced' (Abernathy and Utterback, 1978 p.7), and thus the stimulus changes. What Abernathy and Utterback are indicating in their seminal paper on 'Patterns of Industrial Innovation', is that start-ups are best placed to respond to the uncertainty surrounding emerging market, not despite the fact that they have few or no integrated assets, but because they have no or few integrated assets. The paucity of integrated assets makes start-ups flexible. It enhances their dynamic capabilities. Access to complementary and ownership of integrated assets is the strength of established businesses, dynamic capabilities constitute the competitive advantage of start-ups.

This thesis' contribution to knowledge roots in the definition of IP strategies as dynamic knowledge management systems. The latter comprise not only exclusive IPRs, they orchestrate knowledge through the combination of formal IP, of open innovation initiatives, of secrecy and of continued knowledge generation. IP strategies, if regarded as dynamic systems that are developed and deployed over time, and never remain static. They can be closely linked to finance, and also to market-relevant business attributes, because IP strategies may comprise the need to license IP in, or to collaborate with other stake holders. Knowledge can also be generated through customer feedback, in which case IP is connected with the target market. They also connect with complementary assets because the use of such assets may lead to new knowledge, and exclusive IP can facilitate access to complementary assets, because it can serve as leverage during negotiations.

This study culminated in the definition of a business development framework that comprises the most prominent business development attributes (referred to as meta variables in this thesis), in order to systematically connect IP to other business development aspects. The flowchart contributes to existing theory, because it allows for business attributes to be treated as dynamic components of a developing business. Through arguing that the relationships and dependencies between these meta variables may be more significant to the success prospects of a start-up than the temporary status of individual meta variables, this thesis steers away from static models such as the business model canvas. The business development framework is inspired by multi-dimensional models introduced by Myers and Marquis in 1969. Building on Myers and Marquis' argument, this thesis argues that business development incentives can be motivated at various point in time through both push and pull forces, which may relate not only to both market and technology, but also to product languages and other aspects of a value proposition.

This study examined the means that can be deployed by independent start-up businesses to establish radical innovations as dominant designs. In doing so, it has critically analysed Teece's concept of appropriability regimes in relation to small start-up businesses and lone inventors, IP strategies in relation to dynamic capabilities, and it has produced a business development framework, which can be used to generate and manage business development strategies. Lastly, this study has developed a theory component claiming that the combination of multiple mutually complementary innovations that are connected to a single-minded proposition, can enhance a start-up's success prospects, because it increases the range of strategic options available to the inventor.

The *blind spot* mentioned above derives from an exaggerated focus on technology innovation. In 'The Oxford Handbook of Innovation" Salter and Alexy (2014, p.42f) argue that a *protective belt* has

formed around technology innovation as a consequence. The scholars refer to service innovation and business model innovation as examples of innovation that do not lend themselves to patent protection. This thesis addresses this innovation blind spot through critically investigating the value of design-driven innovation which relates to product languages.

Verganti and Dell'Era (2014, p.139ff) discuss design-driven innovation as a form of innovation that is not necessarily tied to advances in the field of technology, but can trigger disruptive changes in markets through changes in the socio-cultural context within which a product is marketed. This thesis identifies and examines examples of innovation, some of which involve technology and product languages such as the Seaboard (section 5.1.4), AnywayUp cup (section 6.2), MiRo (section 9.4), whereas others are non-technical in nature, e.g. Trunki (section 7). The example of Trunki supports Verganti and Dell'Era's argument that design-driven innovation can lead to meaning-change, and to disruption in the market.

In response to the shortfall in scholarly investigations into design-related IP which Rebecca Tushnet (2012a, 2012b) and Denis Collopy et al (2014) pointed out, this thesis comprises the critical review of findings from a quantitative survey into infringement of registered design rights carried out across the UK. This discussion helps to verify the robustness of registered design rights, a form of IP that has not been widely tested in the UK. The statistical findings are complemented through an in-depth examination of the alledged infringement of the Trunki design. This was the first-ever design right infringement litigation case in the UK which was judged in the Supreme Court, and thus sets a precedent for future cases of similar nature. The verdict was in favour of the imitating design by PMS International, which suggests that existing designs can be easily circumvented. Despite this, this thesis has established through the examination of quantitative data that registered design rights serve as effective means of protection because of the signalling it carries. The majority of infringement letters (just under 70%) sent to retailers and imitators suffice to temporarily or permanently cease perceived infringement activities.

Abernathy and Utterback's concept of the product live cycle (PLC) as introduced in 1978 focuses on individual innovations, not the innovating firm. Whilst products and firms are usually strongly interdependent, their fate may differ, in particular if multiple innovations are pursued by a single innovating firm. This study shifts the focus from the product to the firm in order to examine the success prospects of the latter. This new focus of attention is useful for start-ups that are often negected in surveys (Levin et al., 1987).

In his discussion of appropriability regimes, IP and complementary assets, Teece (1986) relates IP mainly to patents, and although acknowledging that many patents can be invented around with relative ease (Teece, 1986, p.287), he does not discuss alternative IP options such as design-related IP. Teece's theories build mainly on innovation fostered by established firms. They do not examine small start-ups which often operate in niche markets or emerging markets. This thesis raises awareness for the potential of small start-ups who introduce novel products without having a clear or strong market position at the outset. The circumstances of such small firms differ from larger ones, due to the lack of access to assets. The framework developed as part of this thesis, helps to identify and map the business development aspects, and thus provides a new tool for managing innovation processes.

Teece, Pisano and Shuen introduced the concept of dynamic capabilities in 1997 arguing that dynamic capabilities are critical for innovators to obtain and sustain a competitive advantage through responding to unforeseen changes in the business environment. This argument connects with Tushman and Anderson (1986), who claim that small firms are better positioned to respond to such changes than large firms whose decision making needs to account for exisitng assets.

This thesis contributes to existing knowledge in that it explains how dynamic capabilities can help to compensate for the lack of access to complementary assets. It discusses how the combination of different forms of IP, comprising both formal and informal IP, as well as IP in the strict sense and IP in the loose sense (section 3.7.3), can help to enhance a firms dynamic capabilities provided that IP stategies take into account the way in which IP depends on other business development attributes such as finances, and vice-versa. Through a range of relevant examples this thesis explains how IP strategies can be strengthened through the strategic triangulation of multiple inventive steps that are related to a single-minded proposition. This thesis acknowledges Teece's discussion of the potential benefit that derives from pursuing multiple innovations in parallel. However, Teece refers to 'multiple (competing) investments' to support diverse R&D efforts to establish which one is the most promising (Teece, 2007, p.17). Teece makes reference to the automobile industry here. The conclusions drawn in this thesis in relation to start-ups suggest that multiple inventive steps pursued by a start-up ought to be mutually complementary, and not competing, so that the range of chosen solutions can be triangulated, and likewise the diverse forms of IP that protect them.

As highlighted in the beginning of this section and also in section 4.4.2, this study contributes to insights in the context of intellectual property research, and it addresses knowledge deficiencies in the context of business management studies as highlighted by Levin et al. (1987). It explains how design-driven innovation as discussed by Verganti and Dell'Era can be appropriated effectively and competitive avantages increased. Most importantly it provides novel insights into the context of dynamic capabilities and explains how these can be enhanced through the strategic triangulation of multiple forms of IP, which can be particularly effective, if IP is derives from the inception of multiple inventive steps that are mutually complementary.

13. Possible future studies

Rather than confirming or invalidating existing theories, this study was designed to be theory-building. It used Grounded Theory methods to generate data, the analysis of which culminated in a business development framework. As much as every theory requires confirmation or invalidation, the business development framework needs to be theoretically interrogated, and it would benefit from being tested in practice.

The verification of the theory provided the foundation of the business development framework, should focus on the definition of sub variables and meta variables, because this could enhance the credibility and the usabilty of the business development framework. In order to remain within scope, the number of case studies included to this thesis had to be limited. However, extracting variables from a greater number of case studies would be likely to produce a more representative set of data. This PhD study was carried out over a six and a half year time-frame, including the gap year highlighted in Figure 16. Longitudinal insights could only be established in a retrospective fashion. This meant that the longitudinal insights were gathered from different case studies than those insights which derived from early-stage start-ups. Collecting data over a longer period of time would allow to re-examine the data collected in relation to early-stage start-ups in a long-term context. Thus predictions could be made and later validated or invalidated. With the help of the business development framework, designer-entrepreneurs can develop decision trees. Through using it as a decision making tool in a business setting, the business development framework can be put to the test. Brand recognition is a business attribute that can help increase market share, and thus to scale businesses. This aspect has not been examined in depth in this study. In light of the above, the following steps could be deployed to build on the knowledge produced through this study:

13.1. Verification of variables through extended comparative studies

The business development framework evolved from data gathered through nine qualitative interviews with designer-entrepreneurs whose businesses were in the early development stage. The diversity of business development attributes is represented through meta variables, which constitute summative categories, each of which accommodates a range of sub-variables that have been developed from the interviews through a process of transcoding. The business development framework could benefit from a review of sub variables based on the gathering of data from a wider range of sources. Taking into consideration a greater number of start-ups might lead to additional insights into characteristics and significances of individual meta variables. This could potentially shed new light into the complex nature of the meta variables shown in figures 50 and 51, as well as into their development-related characteristics. The weighting of meta variables as illustrated in figures 54-55, could also be reviewed following analysis of a larger data set. Some sub variables may be confirmed as more important than others, and additional business development criteria (i.e. sub-variables) may come to the surface.

13.2. Verification of hypotheses through additional longitudinal studies

Three longitudinal case studies were used to verify a range of hypotheses which arose from the incubator case studies presented in section 5.1. Conducting a greater number of longitudinal case

studies could help address some of these theoretical elements such as the arguments surrounding the triangulation of innovation. Ideally the data capture of businesses would be conducted over a longer period of time so that the transition from start-ups to established businesses can be examined. Although a series of follow-up conversations was held with designer-entrepreneurs during the final stages of this study, none of the ventures examined in section 5 had fully completed the transition from a start-up to an established business, except Concrete Canvas who were already established by the time the first conversation took place. Even though the methodology deployed for data gathering here can be applied to longitudinal studies, it may be desirable to add a quantitative facet to the data capture, because this could allow monitoring the development of the sizes as well as the financial growth of businesses. Capturing economic data anonymously across a wider range of inventive start-ups, could make it possible to identify common patterns related to the inter-dependencies of meta variables, a deeper understanding of which could support the further development of the business development framework.

13.3. Model implementation

As indicated, the business development framework would benefit from being used in practice, because its deployment might lead to new insights into the dynamic inter-dependencies between the meta-variables. The business development framework can facilitate the development of decision trees, provided that the user identifies which variables are independent, intervening and dependent. If a digital version of the business development framework was used across a range of different businesses, who enter their data in relation to the meta variables, the inter-dependencies between the latter could be captured regularly over time, which might lead to the revelation of certain commonalities. It may, for example, shed light into which choices and development priorities benefit a venture's speed-to-market and business growth. Designer-entrepreneurs who were interviewed in conjunction with the case studies, were often protective of economic data such as revenues and profit margins. If the business development framework was used in a digital form and anonymised data could be captured in relation to the meta variables, emerging patterns might indicate how successful start-ups typically develop over time. Comparing development priorities across a wide range of users, and measuring them against micro-economic growth could reveal trends and provide clarity about the significance of individual meta variables.

13.4. IP

Intellectual property constituted the starting point of this study. Although it was be evidenced that viable high-growth businesses can be built around IP related to product languages, i.e. registered design rights, the risk of this form of IP to be circumvented or infringed by competitors appears to be comparatively high. The existing IP framework has been questioned by Hargreaves (2011) and others. This raises questions about the future relevance of formal IPR in general. Many creative initiatives that are focusing on novelties that are not primarily of a physical nature — e.g. services and user experiences, social innovation or digital user platforms — can currently be difficult to protect through formal IPR. Additional studies into how these forms of innovation can be harnessed would be of

benefit to the design community. A question that has arisen from the Trunki case study, is related to the potential benefit of a law against *unfair competition*. This law does not exist in the UK. However, its existence could have protected Magmatic's Trunki against the PMS International's competing product, the Kiddee case. Investigating the potential macro- and microeconomic impact which the introduction of an unfair competition law would have in the UK, could be of great benefit to the UK creative industries, and of the UK economy as a whole.

13.5. Relevance of brand assets during the transition period

The business development framework which was developed and discussed in this study lacks one potentially important component: Both Rob Law (2015, 2016) and Sebastian Conran (2015) have highlighted the significance of branding as a defence mechanism against competitors. One could argue that brand assets connect IP (trade marks) with market-specific business development characteristics and that they could be categorised under either of those two meta variables. However, for established businesses, brand propositions constitute valuable assets in their own rights. Their value in relation to established firms is evidenced through franchise business models which elevate the brand to become the core asset. The potential benefit of adding branding as a fifth meta variable to the business development framework, would be worth investigating, even if its significance is not noticeable to designer-entrepreneurs at the outset (see explanation in section 3.7.1). A trademark can be secured relatively cheaply, and, by comparison to patents, swiftly. However, a trademark is of no value unless there is a degree of brand recognition attached. As pointed out earlier in this study (section 3.7.3), brand values grow over time through engaging with customers, clients, or users. It could be useful to investigate in detail how exactly these values grow alongside the other business development attributes contained in the business development framework. In doing so, it might be beneficial to differentiate between business-to-business ventures such as Concrete Canvas or Arctica and business-to-consumer ventures such as Trunki or Roli.

These are just a few suggestions of follow-up studies with reference to areas of business management, IP law, and innovation studies. Since there is very limited data related to early-stage start-ups on the one hand, and design IP on the other, this thesis was developed in a comparatively lateral fashion hoping that it may spark constructive discussions and inspire follow-up investigations that may explore some of the presented research findings in greater depth.

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15. Appendices

The following appendices were added to the thesis to provide additional detail in support of the discussion points and arguments presented.

15.1. Appendix 1: Patent application form (cover sheet) and examination report (PIN entry device)

This patent mentioned in the introduction was terminated for a variety of reasons:
– Various claims were unlikely to be upheld due to their broadness
– Competing patents had been filed by Sharp Kabushiki Kaisha (2009), Sumitoto Chemical Company, Limited, 2011), Seven Hirsch (1980), Nanoventions Inc. (2004), Ford Global Technologies, LLC (2009), and some other inventors
– The market environment was tightly controlled by incumbents such as NCR Financial Services, Triton

Noteworthy is the fact that between application and provision of the examination report almost five years had elapsed.

(12) UK Patent Application (19) GB (11) 2499634 (13) A

(43) Date of A Publication 28.08.2013

(21) Application No: 1203168.8

(22) Date of Filing: 23.02.2012

(71) Applicant(s):
Virtual Typography Limited
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(72) Inventor(s):
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(51) INT CL:
G02B 3/00 (2006.01) ***G02B 27/09*** (2006.01)
G02F 1/1335 (2006.01) ***G06F 3/041*** (2006.01)
G02F 1/167 (2006.01)

(56) Documents Cited:
EP 2397750 A1 **EP 0773462 A2**
US 20070002583 A1

(58) Field of Search:
INT CL **G02B, G02F, G06F**
Other: **WPI, EPODOC**

(54) Title of the Invention: **Lenticular lens**
Abstract Title: **Multidirectional lenticular lens array**

(57) A lenticular touch-sensitive electronic paper display comprises an electronic paper display that uses encapsulated ink particles in pixels 516, which move in accordance with an electronic charge applied to the individual capsules, in combination with a lenticular lens that is mounted on top of the display unit. The lenticular lens 510 may be used to display multiple images simultaneously into different directions. In one embodiment it serves to reduce the viewing angle to one direction, e.g. perpendicular, thus providing privacy and security by preventing bystanders from obtaining information from e.g. and ATM. A preferred version of the lenticular lens uses lenses running both in vertical and horizontal direction, thus restricting the viewing angle in both directions. Preferably the lenticular lens uses grooves 512 at the rear aligned with dead pixels 514 to avoid the information being seen from sharp angles.

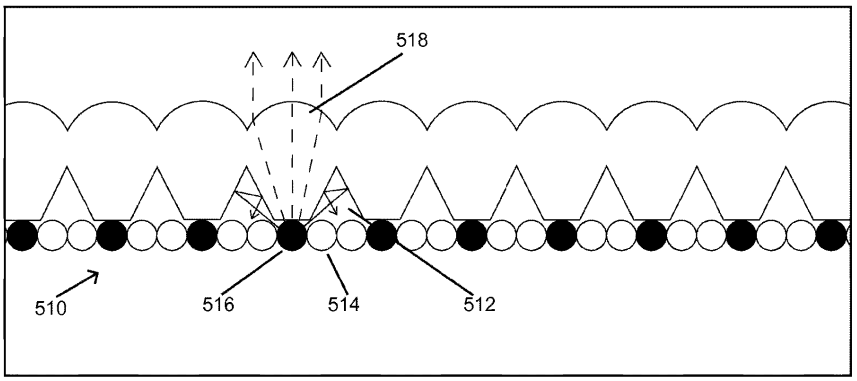


Figure 25

GB 2499634 A

Intellectual Property Office

Virtual Typography Limited
c/o Virtual Typography Limited
11 Brooks Court
The Ridgeway
HERTFORD
SG14 2JF

Patents Directorate

Concept House
Cardiff Road, Newport
South Wales, NP10 8QQ

Direct Line: 01633 811230
†**E-Mail:** Steven.Scott@ipo.gov.uk
Switchboard: 0300 300 2000
Fax: 01633 817777
Minicom: 0300 0200 015

Your Reference: GBP6882
Application No: GB1203168.8

28 November 2016

Dear Sirs

Patents Act 1977: Examination Report under Section 18(3)

Latest date for reply: **30 January 2017**

I enclose a copy of my examination report and a copy of the new citations. Please note that published patent documents mentioned in my report may be obtained for free on the internet and are usually freely available from http://worldwide.espacenet.com.

By the above date you should either file amendments to meet the objections in the enclosed report or make observations on them. If you do not, the application may be refused. I will consider your response and will reply in a timescale consistent with our current target: https://www.gov.uk/government/publications/timeliness-target-for-re-examination-of-patent-applications

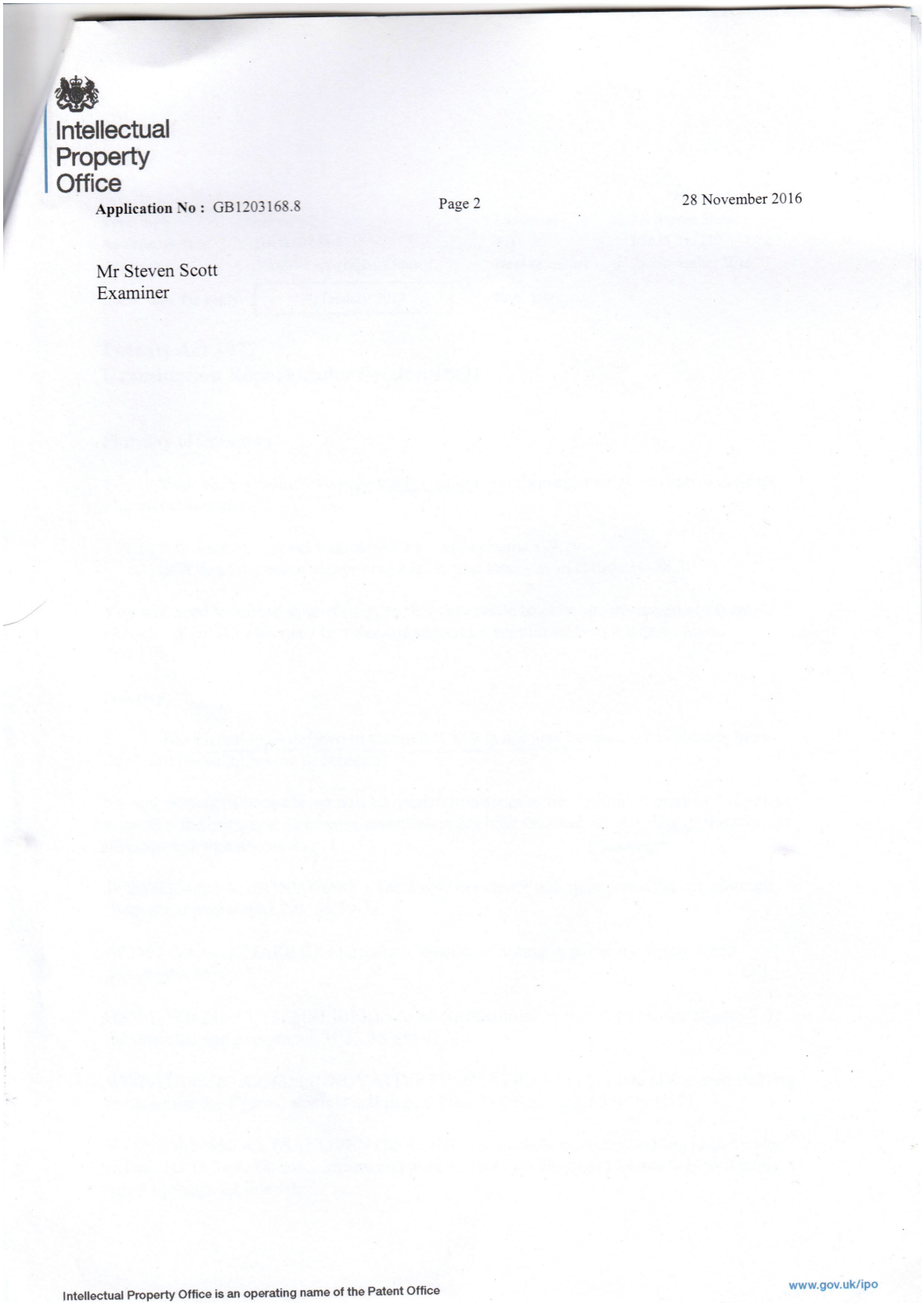
You should note that, in accordance with rule 30(2)(b), the normal unextended period allowed for complying fully with the requirements of the Act will end on 28 November 2017, that is 12 months after the date of this letter.

Online e-filing
You may file such amendments or observations electronically if you wish, using the online patent filing services detailed in https://www.gov.uk/government/publications/how-to-file-documents-with-the-intellectual-property-office.

Yours faithfully

Mr Steven Scott

†**Use of E-mail:** Please note that e-mail should be used for correspondence only.
Disclaimer: Please note the documents we send you may be subject to copyright.



Intellectual Property Office

Application No : GB1203168.8 Page 2 28 November 2016

Mr Steven Scott
Examiner

Intellectual Property Office is an operating name of the Patent Office

www.gov.uk/ipo

Intellectual Property Office

Your ref :	GBP6882	**Examiner :**	Mr Steven Scott
Application No:	GB1203168.8	**Tel :**	01633 811230
Applicant :	Virtual Typography Limited	**Date of report :**	28 November 2016
Latest date for reply:	30 January 2017	Page 1/4	

Patents Act 1977
Examination Report under Section 18(3)

Plurality of invention

1. Your claims define two separate inventions not forming a single inventive concept. The inventions are:

i/ A multidirectional lenticular lens – as in claims 1-9,29.
ii/ A display device comprising a lenticular lens – as in claims 10-28,30.

You will need to amend your claims, so that they relate to only one invention or inventive concept. You will also need to make consequential amendments to the description.

Novelty

2. The invention as defined in claims 1-16,19 is not new because it has already been disclosed in the following documents:

No amendment of your claims will be needed in respect of the document marked * if you can show that the priority date of your invention is not later than the priority date of the relevant disclosure in that document.

JP 2007304432 A, (SONY CORP.) See whole document noting in particular the abstracts, figures and paragraphs 7-9, 36,39,72.

EP2397750 A1, (SHARP KK) See whole document noting in particular figure 4 and paragraphs 36, 76-79.

US2011/228231 A1, (SCHREIBER) See whole document noting in particular figures 7-11, the abstracts and paragraphs 31,37,38 and 41.

WO2011/146267 A2, (3M INNOVATIVE PROPERTIES CO.) See whole document noting in particular the figures, abstract and page 6 lines 19-26 and page 9 lines 12-21.

WO2005/052650 A2, (NANOVENTIONS INC.) See whole document noting in particular figures 1a, 1b 3a-i, 27, the abstracts and page 13 lines 20-23, page 15 lines 8-14 and page 21 line 14 to page 22 line 19.

[Examination Report contd.]

*WO2012/111168 A1, (SUMITOMO CHEMICAL CO.) See whole document noting in particular figures 3-7, the abstracts and the description.

3. The abstracts, figures and paragraphs 7-9, 36, 39, 72, 79 of JP 2007304432 A disclose a lenticular lens sheet with a 2D array of lenses controlling viewing angles in two different directions. The lenses have a top and bottom, may be elliptical and have grooves on their underside (see figures 14,15). A viewing angle may be in a horizontal or a vertical direction. Claims 1-6,8-16 of the current application are not new.

4. Figure 4 and paragraphs 76-79 of EP2397750 A1 disclose a lighting device with a 2D lenticular lens array having elliptically shaped lenses that produce a power distribution that varies both in the X and Y axis. Each lenticule has a top and bottom surface, the top surface having different perpendicular angles of curvature along the major and minor axis of the ellipse. The bottom surfaces of the lenticules form discontinuous grooves at the edges of the lenticules (see figure 4b). This therefore anticipated claims 1-8 of the current application.

5. Figures 7-11, the abstracts and paragraphs 31,37,38,41 of US2011/228231 A1 disclose a transmissive LCD display incorporating a multidirectional lenticular lens 2D array with elliptical elements having a top and bottom surface. Claims 1-5,8-14 of the current application are not new.

6. The figures, abstracts and page 6 lines 149-26 and page 9 lines 12-21 of WO2011/146267 A2 disclose an image projector with a 2D lenslet array such as a "fly-eye array" to converge incident light and a second lenslet array such as another lenticular array to diverge the outputted light. The lenses have a top and bottom surface. Claims 1-3,5,8-14 of the current application are not novel.

7. Figures 1a, 1b, 3a-i, 27, the abstracts and page 13 lines 20-23, page 15 lines 8-14 and page 21 line 14 to page 22 line 19 of WO2005/052650 A2 disclose a 3D image display device having a 2D array of lenticular lenses with top and bottom surfaces. Claims 1,2,8-16,19 of the current application are anticipated.

8. Figures 3-7, the abstracts and description of WO2012/111168 A1 disclose a liquid crystal display device with an upper polarising plate having a sheet element whose surface comprises a plurality of lenticules arranged in a 2D array. The lenticules have a top and bottom surface. Claims 1,2,9-14 of the current application are therefore not novel.

Inventive step

9. The invention as defined in claims 9-16,22-25,28 is obvious in view of what has already been disclosed in the following documents:

Intellectual Property Office

Your ref : GBP6882 **Date of report:** 28 November 2016
Application No : GB1203168.8 Page 3 / 4

[Examination Report contd.]

EP2397750 A1, (SHARP KK) See whole document noting in particular figure 4 and paragraphs 76-79.

JP 2007304432 A, (SONY CORP.) See whole document noting in particular the abstracts, figures and paragraphs 7-9, 36,39,72.

US2011/228231 A1, (SCHREIBER) See whole document noting in particular figures 7-11, the abstracts and paragraphs 31,37,38 and 41.

WO2011/146267 A2, (3M INNOVATIVE PROPERTIES CO.) See whole document noting in particular the figures, abstract and page 6 lines 19-26 and page 9 lines 12-21.

WO2005/052650 A2, (NANOVENTIONS INC.) See whole document noting in particular figures 1a, 1b 3a-i, 27, the abstracts and page 13 lines 20-23, page 15 lines 8-14 and page 21 line 14 to page 22 line 19.

US4333090 A, (HIRSCH) See whole document.

10. Given EP2397750 A1, display devices using lenticular lenses are well-known in the art as shown by JP2007304432 A, making the features of claims 9-16 of the current application obvious.

11. Given US2011/228231 A1, WO2011/146267 A2 or WO2005/052650 A2 claims 15 and 16 relate to features that are entirely conventional and known to the skilled person. Claims 15,16 of the current application are therefore non-inventive.

12. Given JP 2007304432 A, EP2397750 A1, JP 2007304432 A, US2011/228231 A1, WO2011/146267 A2 or WO2005/052650 A2 and the anticipation of claim 10, claims 22-25 merely relate to conventional touch screen devices and are known to the skilled person. Claims 22-25 are therefore obvious.

13. Given JP 2007304432 A, EP2397750 A1, JP 2007304432 A, US2011/228231 A1, WO2011/146267 A2 or WO2005/052650 A2 and the anticipation of claim 25, figures 1, 1A and column 4 lines 8-34 of US4333090 A disclose the randomised allocation of numbers to keys on a key pad. Claim 28 of the current application is therefore non-inventive.

Clarity and Support

14. It is not clear in what sense the lenticular lens is multidirectional, as required by claim 1 and the directions are not very clear from the description. Similarly there appears to be limited support for the first and second angle of curvature in claim 3 and it is not clear what angles these are. It is also not clear how they could be defined as being perpendicular to each

[Examination Report contd.]

other as claimed in claim 4. Figures 11 & 13 show lenticular lenses, but they do not show the angles of curvature and therefore it is not clear what they show. Care should be taken not to introduce any added matter when dealing with this objection.

15. Claim 10 would appear to be excessively broad and it is suggested that it therefore be deleted.

16. Claim 24 claims "with am embossed upper surface" where it would appear the intended meaning is "with an embossed upper surface." Please clarify the claim.

17. On page 8 lines 17-20 of the description, an embodiment of the invention is referred to as an aspect of the invention, containing features that are not part of the independent claims. Please refer to the embodiment using appropriate language.

Registered Trade Marks

18. Although it should preferably be avoided, if you wish to keep the reference to the Registered Trade Mark "3M" on page 3 of your specification, you should acknowledge that it is a Registered Trade Mark, possibly by using the abbreviation "(RTM)". If you do not insert an acknowledgment, I will do so.

Allowability of omnibus claims – 6 April 2017 onwards

19. From 6 April 2017 it will no longer be possible to include omnibus claims in UK patent applications, unless this is the only way to define the technical features of the invention clearly and concisely.

20. If your patent is not granted by 6 April 2017, you will need to delete the omnibus claim(s) from your patent application.

Other

21. You are reminded to render the description fully consistent with any amendment to the claims, and further reminded to fully comply with the Code of Practice when considering your amendment.

appendix 1, fig.8: patent listing on the IPO website (17 October 2018)

Intellectual Property Office

Patents Endorsed Licence of Right (LOR) and Patents Not in Force (NIF)

The tabs below contain information related to Licences of Right and Not in Force patents. This information was last updated on 10 October 2018.

Refine GB1203168.8 Results per page 10 Help Refine

Patents Endorsed Licence of Right (LOR) **Patents Not in Force (NIF)**

Sort By NIF Start Date

NIF Date	Publication Number	Application Number	Details
05 December 2017	GB2499634	GB1203168.8	*Reason Not in Force:* Terminated before grant *Owner:* Virtual Typography Limited *IPC:* G02B 3/00 (2006.01) *Application filing date:* 23 February 2012 *Title:* Multidirectional lenticular lens array *SPC:*

15.2. Appendix 2: UK IPO tribunal cases 2013-2015

Since 2013 12 cases of design rights infringement have been filed with UK IPO. The number of court cases per year is very low, with five in 2013, five in 2014, and so far two recorded cases in 2015. This low number is not surprising, considering the fact that the uptake at PCC level had been similarly low. Collopy et al. (2014) confirm that 'Few disputes on design rights actually reach court' (Collopy et. al., p.20). This low uptake is mirrored through a comparatively low number of registrations. According to Collopy et al. 2,111 designs were registered in 2009, which stands in stark contrast to 'the total number of 232,000 designers' (Collopy et. al., p.81).

Reasons for litigation:
In 0 cases the claimant is the owner of a registered design right
In 12 cases the claimants requested for a registered design right to be invalidated

The outcomes:
In 3 cases a registered design had been successfully defended (no 5, 11 and 12 below)
In 9 cases the registered design rights were invalidated

Litigation costs:
The contribution to costs awarded ranged between £225 and £1,500 with an average of £785.42

The industry sectors involved:

	Industry sector	Reasoning:
1.	Tele communications / mobile telephone	prior art
2.	Child care / baby blanket / baby travel wrap	lack of novelty
3.	Consumables / driving license wallets	prior art
4.	Architecture	prior art
5.	Food	prior art (challenge unsuccessful)
6.	Petcare	lack of novelty (grace period had elapsed)
7.	Consumables / coin bag	lack of novelty
8.	Consumables / wheat bag	lack of novelty
9.	Food	prior art (existing registered design)
10.	Consumables / coin bag	lack of novelty (response to 7)
11.	Food	prior art (challenge unsuccessful)
12.	Furniture	lack in novelty (challenge unsuccessful)

Notes: What is striking in the 7th case listed above is the fact that the defendant had traded the protected product for 10 years before registering the design in 2013. This meant that the design rights applicant had created prior art, which later led to the invalidation of the registered design right. This makes it clear that even the owners of registered design rights are not always fully aware of the pre-requisites for a registered design. The cases above also highlight that being granted a registered design right does not warrant for a successful defence thereof because the novelty at the point of filing can be contested. As opposed to the US-American design patent, neither the UK registered design nor the community registered design is examined upon application.

Reference to High Court cases:
The Dyson v Vax case was referenced in 9 of the above cases
The Pepsico v Grupo Promer Mon Graphic SA case was referenced in 8 of the above cases
The Samsung Electronics (UK) Ltd v Apple Inc case was referenced in 4 of the above cases

Data sources (verifed 17 October 2018):
case no 1: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310884/o34513.pdf
case no 2: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310881/o38313.pdf
case no 3: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310878/o43113.pdf
case no 4: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310866/o44513.pdf
case no 5: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310858/o47113.pdf
case no 6: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310846/o01314.pdf
case no 7: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310628/o13714.pdf
case no 8: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/615697/o23917.pdf
case no 9: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/380136/o49414.pdf
case no 10: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/393537/o56514.pdf
case no 11: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/421277/o15515.pdf
case no 12: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/426251/o21015.pdf

15.3. Appendix 3: The questionnaire used for the Design Right Infringement Survey 2016

The questionnaires were sent through the post with a cover letter. A postal survey was necessary because no email contacts could be made available by the UK IPO and OHIM (now known as EU IPO). During a pilot study, 200 questionnaires were sent out. Following the analysis of the pilot results and minor amendments to some of the questions, a mail shot was sent to the remaining 12,322 contacts in the database.

An online questionnaire was set up because online response are easier to analyse. A url as well as a 3D barcode was included to the printed questionnaire and the cover letter to direct respondents to the online portal. However, the majority of responses were sent through the post. Adding a freepost response envelope significantly increased the response rates.

One of the advisors, a representative of a large international company who provided feedback on the questionnaire design prior to the pilot, stated that 'anyone who has had just two cases within that timeframe is likely to find it difficult to respond accurately'. In order to address this issue, those questions, which were raised to examine the incident of the infringement (question 14-29) were directed towards 'one particular dispute and preferably the dispute which best represents those [the recipient has] been involved with'.

The formulation of questions

It was thought that the longer the questionnaire, the lower the response rate would be. Therefore the number of questions was limited to the best degree possible without compromising the range of answers required to suffice the UK IPO's expectations. It was established that the questionnaire would typically be completed within 5-10 minutes.

The questions were categorised to establish information about:
- The responding person
- The company the respondent works for (if not a sole trader)
- The incident of design right infringement
- The reactions to infringement (if applicable)
- The scale of infringement
- The context of the infringement
- The respondent's attitude and behavior towards design right infringement
- The attitude towards design rights

The questions were phrased in such a way that they could be answered by both infringers and infringed designers / design companies. During the analysis, answers could to be mapped against one particular question raised in the beginning, in response to which the recipients had to state whether they were defendants or claimants. To make sure that recipients understood these terms, a short explanation was added. The terms *infringer* was avoided here, as it was believed that respondents would be reluctant to identify themselves as *infringers* or *potential infringers*.

Terminology

The questionnaire was designed to investigate perceived infringement, alleged infringement as well as actual infringement. This meant that questions needed to be designed to elicit situations where recipients thought to have been infringed with or without taking action, as well as situations where cases were taken to court. This is why the term *dispute* was defined in a liberal way. The term was introduced as 'any kind of awareness of, or correspondence (pre court, in court or out-of- court) related to the actual or potential infringement of IP.' This was necessary in order to direct respondents to one representative sample case that could be discussed and examined in detail without creating confusion.

Visual Design

The format of the printed questionnaire was designed to enhance usability and to save costs. The number of questions fitted in a 16-page A5 booklet or an 8-page A4 booklet. Following the advice given by one of the advisors, it was decided to give preference to the A4 version. It was believed that recipients would perceive this as more manageable and less time-consuming. The questionnaire was printed onto two double-sided A3 sheets, and saddle-stitched.

Type size and line spacing was set to ensure legibility sufficient for recipients of all ages, whilst optimizing the use of space. The layout was designed to achieve a clear structure and an organised feel. Space between questions and tick-boxes was maximised to mitigate the risk of erroneous responses.

To increase response rates, window envelopes were used in combination with personalised letterheads, i.e. letterheads which featured the recipients' names and postal addresses.

Protocol for analysis

The responses received on paper, were be entered into the online survey system in order to prevent errors that would have been likely if transcribing data into excel spreadsheets. The layout of the online survey system (Survey Gizmo was used) was clearer than the rows and columns of an Excel spreadsheet. CSV files as well as diagrams could be exported from the survey system. However, rules need defining to ensure that responses are transcribed systematically.

Omission of questions: Where recipients omitted questions, the remainder of the questionnaire was considered, provided that the missing questions were not critical. Critical were those questions, the responses to which had an impact on other questions, e.g. the question if the respondent was claimant or defendant was considered as critical. The number of incomplete questionnaires was measured against that of accurately completed questionnaires in the analysis of results.

Multiple versus single choices: The risk for errors could be reduced in the online questionnaire through coding the range of available response options. If a respondent stated that no action was taken, then this respondent would not be shown questions related to legal proceedings, for example. The printed questionnaire was more prone to errors. Sentences were added to clarify where respondents were expected to select one option only, and where they were meant to 'tick all that apply'. If more than one options are ticked, despite the fact that the question asks respondents to 'tick one only', the answer was ignored, and the question treated as unanswered.

Ambiguous responses: The gap between tick boxes has been made clear to prevent ambiguous responses. If a tick or cross is found between tick boxes, without a clear proximity to one of the two neighbouring tick boxes, the answer was ignored, and the question be treated as unanswered.

Additional options: Space was provided in relation to some questions to allow respondents to add options that are not listed. The space provided on the printed questionnaire was limited in size in order to keep the amount of pages within limits. The corresponding space in the in the online questionnaire could be designed to be flexible in size.

Comment boxes: It was originally considered that comment boxes could be added to each question to obtain feedback to enhance the questionnaire for future purposes should it be reiterated. To keep the questionnaire short and inviting, and to keep print production and mailing costs down, these comment boxes were eliminated. Instead, a larger feedback box has been added at the end of the printed questionnaire.

Intellectual Property Office

DRI **DESIGN RIGHTS INFRINGEMENT SURVEY**

It should take only a few minutes to complete the survey. You should not need to look up or refer to other sources of information. Your best reasonable guess will be better than leaving a question unanswered. You are welcome to complete the questionnaire online through scanning the QR code above or by using the following weblink: **http://sgiz.mobi/s3/IPO-Research-into-Designs-Infringement**

YOUR DETAILS

All information received will be treated in strictest confidence!

Q1 Which one of the following describes your primary work or role relating to designs?
[Please select one only]

- ☐ Designer
- ☐ Design Owner
- ☐ Design In-house Lawyer
- ☐ Design Business Adviser
- ☐ Design Product Retailer
- ☐ Design Product or Product Component Manufacturer
- ☐ Design Management
- ☐ Design Consultant
- ☐ Other (please state below)

_____

Q2 Which one of the following describes your primary business area relating to designs?
[Please select one only]

- ☐ Advertising and Marketing
- ☐ Interior Design and Architecture
- ☐ Crafts
- ☐ Product / Industrial Design
- ☐ Furniture Design
- ☐ Graphic Design
- ☐ Fashion Design
- ☐ Film, TV, Video, Radio and Photography
- ☐ IT, Software and Computer Services
- ☐ Publishing
- ☐ Museums, Galleries and Libraries
- ☐ Music, Performing and Visual Arts
- ☐ Service Design
- ☐ Other (please state below)

_____

Q3 In your work relating to design are you: [Please select one only]

- ☐ Self-employed
- ☐ Employed
- ☐ Both self-employed and employed
- ☐ Unemployed or retired

Q4 What is the size of your organisation/firm
FT=full-time / full-time equivalent
[Please select one only]

- ☐ Sole trader
- ☐ 2-9 FT employees
- ☐ 10-49 FT employees
- ☐ 50-250 FT employees
- ☐ >250 FT employees

Q5 How long have you been involved in design related work?
[Please select one only]

- ☐ Less than 5 years
- ☐ From 5 to 10 years
- ☐ From 11 to 20 years
- ☐ More than 20 years

Q6 Have you or your company invented or developed products that are significantly improved or completely new to the market in the last five (5) years?
[Please select one only]

- ☐ Yes
- ☐ No
- ☐ Don't Know

01

YOUR BUSINESS / THE BUSINESS YOU WORK FOR

Q7 Do you / Does your company create or own any of the following Intellectual Property (IP) rights? [Select all that apply. If none applies, please skip and move to the next question]

- ☐ Patent
- ☐ Trade Mark
- ☐ Copyright
- ☐ UK Registered Design Right
- ☐ Community Registered Design Right
- ☐ UK Unregistered Design Right
- ☐ Community Unregistered Design Right
- ☐ Other rights (please state below)

_____

Q8 Which of the following Intellectual Property (IP) rights have you NOT heard of before? [Select all that apply. If none applies, please skip and move to the next question]

- ☐ Patent
- ☐ Trade Mark
- ☐ Copyright
- ☐ UK Registered Design Right
- ☐ Community Registered Design Right
- ☐ UK Unregistered Design Right
- ☐ Community Unregistered Design Right

Q9 Approximately how much (in Pound Sterling) does your company spend each year on obtaining and maintaining IP rights it owns? [registration fees, renewal fees, searches, legal fees etc.]

_____

- ☐ Don't Know

INCIDENCE OF INFRINGEMENT

In the following "dispute" means any kind of awareness of, or correspondence (pre court, in court or out-of-court) related to the actual or potential infringement of IP.

Q10 Have you or your company been involved in any dispute involving any of the following design related rights in the past five (5) years? [Please select one option for each category]

yes	no	don't know	
☐	☐	☐	**1.** Copyright
☐	☐	☐	**2.** UK Registered Design Right
☐	☐	☐	**3.** Community Registered Design Right
☐	☐	☐	**4.** UK Unregistered Design Right
☐	☐	☐	**5.** Community Unregistered Design Right
☐	☐	☐	**6.** International (Non-UK/Community) Design Right or Design Patent

Q11 If you have ticked YES for any of the questions 10 (1-5) – were you a claimant or a defendant? [Please select one only]

- ☐ Claimant (infringed party)
- ☐ Defendant (allegedly infringing party)
- ☐ Both
- ☐ Don't Know

Q12 If you have ticked YES for question 10 (6) – were you a claimant or a defendant? [Please select one only]

- ☐ Claimant (infringed party)
- ☐ Defendant (allegedly infringing party)
- ☐ Both
- ☐ Don't Know

02

Q13 If you have ticked YES for question 10 (6) – which countries were involved?
[please state whether you or your company were defendant or claimant or both in each case]

_____

_____

_____

If you have been involved in more than one (1) dispute surrounding design right infringement - irrespective of the country in which the infringement occurred - please answer Q14 to 29 with respect to one particular dispute and preferably the dispute which best represents those you have been involved with.
If you have not been involved in any dispute as per above definition, please jump to Q41 on page 7.

Q14 In respect of the particular dispute you are using to answer the following questions were you a claimant or defendant?

- ☐ Claimant (infringed party)
- ☐ Defendant (allegedly infringing party)

Q15 … was the other party based in the UK or overseas?
[Please select one only]

- ☐ UK
- ☐ EU
- ☐ Overseas
- ☐ Don't Know

Q16 … which of the following IPRs were involved:
[Please select all that apply]

- ☐ Copyright
- ☐ UK Registered Design Right
- ☐ Community Registered Design Right
- ☐ UK Unregistered Design Right
- ☐ Community Unregistered Design Right
- ☐ International (Non-UK/ Community) Design Right or Design Patent
- ☐ Patent

Q17 … and in relation to your company, was the business size of the (main) party opposing you:
[Please select one only]

- ☐ Very much larger
- ☐ Larger
- ☐ About the same size
- ☐ Smaller
- ☐ Very much smaller
- ☐ Don't Know

Q18 At the time of infringement, was the design …
[Please select all that apply]

- ☐ Licensed to another business
- ☐ Used in a product, which you or your business were selling
- ☐ Published but not yet licensed
- ☐ Don't know
- ☐ Other (please state below)

_____

REACTIONS TO INFRINGEMENT

Q19 In respect of the particular dispute what action(s) did you take?
[Please select all that apply]

- ☐ **1.** No action **[Please go to Q21]**
- ☐ **2.** Contacted a solicitor to discuss next steps
- ☐ **3.** Contacted a patent or trade mark attorney to discuss next steps
- ☐ **4.** Sought pro bono legal advice to discuss next steps
- ☐ **5.** Created public awareness through social media
- ☐ **6.** Sent letter to the other party
- ☐ **7.** Mediation
- ☐ **8.** Issued Court Claim
- ☐ **9.** Issued Defence
- ☐ **10.** Issued Counterclaim
- ☐ **11.** Other (please state below)

_____

03

Q20 If a claim was issued in court, which court(s) were involved:
[Please select all that apply and go to Q22]

Note: IPEC was previously the Patents County Court or PCC

- ☐ Intellectual Property Enterprise Court (IPEC)
- ☐ Intellectual Property Enterprise Court (IPEC) — Small Claims Track
- ☐ Patents Court (High Court Chancery Division)
- ☐ Court of Appeal
- ☐ Court in another country
- ☐ Other (please state below)

_____

Q21 If you answered NONE to Q19 (1), why did you choose NOT to take action?
[Please select all that apply]

- ☐ The infringement was trivial
- ☐ Uncertainty about validity of the design
- ☐ Too costly
- ☐ Too time consuming
- ☐ Too stressful
- ☐ Advised not to by lawyer / legal advisor
- ☐ The other party was too big
- ☐ The other party was too small
- ☐ The other party was overseas
- ☐ It would be difficult to prove
- ☐ It would have damaged the relationship with actual or potential business partners
- ☐ Rely on other rights e.g. trade mark to defend our interests
- ☐ Other (please state below)

_____

_____

Q22 If you have ticked any of the options 2-10 for question Q19, what was / were the reason(s)?
[Please select all that apply]

- ☐ Defend potentially lucrative market
- ☐ Start negotiations on licensing / assignment agreement
- ☐ Defend our Design Right(s) as a matter of principle
- ☐ Defend our business as a matter of principle
- ☐ Maintain reputation as an aggressive competitor
- ☐ To be paid damages
- ☐ Other (please state below)

_____

_____

Q23 What response did you (as infringed party) receive from the other party?
OR **How did you (as allegedly infringing party) respond to the claim?**
[Please select all that apply]

- ☐ Agreed to license / cross license / buy or sell the design
- ☐ Permanently stopped infringing
- ☐ Temporarily stopped infringing
- ☐ No response
- ☐ Alleged that the design was invalid
- ☐ Counterclaim for infringement of other designs
- ☐ Does not apply
- ☐ Other (please state below)

_____

Q24 As infringed party: **If the allegations of infringement were ignored, why do you think that was?** OR: As allegedly infringing party: **If you ignored the allegations what were your reason(s)?**
[Please select all that apply]

- ☐ Didn't think there was infringement
- ☐ Thought the other party was too small to be a threat
- ☐ Believed that the design right was invalid
- ☐ Don't know
- ☐ Other (please state below)

_____

_____

Q25 If court proceedings were started, what was the outcome?
[Select one only. If not applicable, please skip and move to question 29]

- ☐ Case still pending
- ☐ Court judgment in our favour
- ☐ Court judgment in favour of the other party
- ☐ Out-of-court settlement
- ☐ Other (please state below)

_____

_____

_____

04

Q26 If a claim was issued in court, how do you feel about the litigation process?
[Please select one only]

- ☐ Very pleased
- ☐ Reasonably content
- ☐ Not sure
- ☐ Rather disappointed
- ☐ Extremely disappointed

Q27 How do you feel about the outcome of the legal dispute?
[Please select one only]

- ☐ Very pleased
- ☐ Reasonably content
- ☐ Not sure
- ☐ Rather disappointed
- ☐ Extremely disappointed
- ☐ Case still pending

Q28 How long were legal proceedings from issuing the claim to final court judgment/settlement?
[Please complete]

_____ years _____ months

- ☐ Does not apply

Q29 If you chose not to start proceedings, why?
[Please select all that apply. If not applicable, please skip and move to the next question]

- ☐ Potential gains didn't justify the cost
- ☐ Not worth damaging the relationship with actual or potential business partners
- ☐ Uncertain about the validity of the registered design
- ☐ Uncertain about the validity of the unregistered design
- ☐ Would take too long
- ☐ Other (please state below)

_____

SCALE OF INFRINGEMENT

In the following questions (Q30 to 46), please refer to multiple incidents of infringement if you have experienced more than one (1) dispute surrounding design right infringement (including Community Design Rights/international Design Rights).

Q30 In the last five (5) years, how much did you spend on legal fees when enforcing registered and / or unregistered design rights?
[Please select one only. If not applicable, please skip and move to the next question.]

- ☐ Nothing
- ☐ Less than £1,000
- ☐ £1,000 – £5,000
- ☐ £5,000 – £20,000
- ☐ £20,000 – £100,000
- ☐ £100,000 – £500,000
- ☐ £500,000 – £1m
- ☐ Over £1m
- ☐ Don't know

Q31 In the last five (5) years, how much revenue did you lose due to infringement of your registered and / or unregistered design rights?
[Please select one only. If not applicable, please skip and move to the next question.]

- ☐ Nothing
- ☐ Less than £1,000
- ☐ £1,000 – £5,000
- ☐ £5,000 – £20,000
- ☐ £20,000 – £100,000
- ☐ £100,000 – £500,000
- ☐ £500,000 – £1m
- ☐ Over £1m
- ☐ Don't know

Q32 In the last five (5) years, what was the value of staff time lost due to infringement of your registered or unregistered design rights?
[Please select one only. If not applicable, please skip and move to the next question.]

- ☐ No loss of staff time
- ☐ Less than £1,000
- ☐ £1,000 – £5,000
- ☐ £5,000 – £20,000
- ☐ £20,000 – £100,000
- ☐ £100,000 – £500,000
- ☐ £500,000 – £1m
- ☐ Over £1m
- ☐ Don't know

05

Q33 To the best of your knowledge, how many incidents of design rights infringements have you experienced in the last five (5) years?
[Please select one only]

- ☐ None
- ☐ One (1)
- ☐ 2-5
- ☐ 6-10
- ☐ More than 10
- ☐ Don't know

Q34 To the best of your knowledge, how many designs (involving design rights) have you allegedly infringed in the last five (5) years?
[Please select one only]

- ☐ None
- ☐ One (1)
- ☐ 2-5
- ☐ 6-10
- ☐ More than 10
- ☐ Don't know

Q35 If any of your designs have been allegedly infringed, would you describe the majority of the infringing design(s) as:
[Please select one only]

- ☐ An identical copy
- ☐ A nearly identical copy (differences are hardly noticeable compared with the original)
- ☐ Still a copy but with some noticeable differences
- ☐ Don't know
- ☐ Does not apply

Q36 If any of your designs have been allegedly infringed, was this mostly done intentionally or inadvertently?
[Please select one only]

- ☐ Intentionally
- ☐ Inadvertently
- ☐ Don't know
- ☐ Does not apply

CONTEXT OF INFRINGEMENT

Q37 Would you describe the innovative quality of your infringed design(s) as radical or incremental?
[radical innovation relates here to designs which have a disruptive impact]
[Please select one only]

- ☐ Definitely radical
- ☐ Rather radical
- ☐ Not sure
- ☐ Rather incremental
- ☐ Definitely incremental

Q38 If you have ever had any REGISTERED design infringed approximately how many years after registration did the infringements occur?
[Please select one only]

- ☐ Less than one (1) year
- ☐ From 1 up to and including 2 years
- ☐ From 2 up to and including 3 years
- ☐ From 3 up to and including 5 years
- ☐ From 5 up to and including 10 years
- ☐ More than 10 years
- ☐ Does not apply

Q39 If you have ever had any UNREGISTERED design infringed, approximately how many years after first marketing the design in public did the infringement occur?
[Please select one only]

- ☐ Less than one (1) year
- ☐ From 1 up to and including 2 years
- ☐ From 2 up to and including 3 years
- ☐ From 3 up to and including 5 years
- ☐ From 5 up to and including 10 years
- ☐ More than 10 years
- ☐ Does not apply

06

ATTITUDES AND BEHAVIOURS TOWARDS DESIGN RIGHT INFRINGEMENT

Q40 If your design(s) have ever been infringed, how did you find out about the infringement?
[Please select all that apply. If none applies, please skip and move to the next question]

- ☐ Seen at trade fairs
- ☐ Emails from others
- ☐ Seen in someone else's catalogue
- ☐ Online search
- ☐ Seen at retail store(s)
- ☐ From customers
- ☐ From suppliers
- ☐ Regularly monitoring the market
- ☐ Other (please state below)

_____

_____

Q41 What kind of activities do you employ to monitor the market for infringement?
[Please select all that apply. If none applies, please skip and move to the next question]

- ☐ Search design rights register(s)
- ☐ Employ solicitor to monitor
- ☐ Employ patent or trade mark attorney to monitor
- ☐ Read trade journals
- ☐ Rely on customers and suppliers
- ☐ Other (please state below)

_____

_____

Q42 Have you / has your company joined a trade association in response to the risk of Design Right infringement?

- ☐ No
- ☐ Yes, member of (list all that apply):

_____

_____

_____

ATTITUDES TOWARDS DESIGN RIGHTS

Q43 IP robustness is understood here as the level of protection offered by the type of right. On a scale of 1 (least robust) - 5 (most robust) please rate how robust you consider the following protection methods:
[Please select one option for each category]

	1	2	3	4	5	Don't know
Registered Design Right	☐	☐	☐	☐	☐	☐
Unregistered Design Right	☐	☐	☐	☐	☐	☐
Copyright	☐	☐	☐	☐	☐	☐
Trade Mark	☐	☐	☐	☐	☐	☐
Patent	☐	☐	☐	☐	☐	☐

Q44 How do you rate your confidence in the system for protection of REGISTERED and UNREGISTERED Design Rights on a scale of 1 (least confident) - 5 (most confident)?
[Please select one option for each of the two categories]

	1	2	3	4	5	Don't know
Registered Design Rights	☐	☐	☐	☐	☐	☐
Unregistered Design Rights	☐	☐	☐	☐	☐	☐

07

Q45 How do you rate the costs involved in registering a Design Right?
[Please select one only]

- ☐ Very good value for money
- ☐ Good value for money
- ☐ Average
- ☐ Poor value for money
- ☐ Very poor value for money
- ☐ Don't know

Q46 Do you expect Design Rights infringement to increase or to decrease in the next 5 years?
[Please select one only]

- ☐ I expect an increase
- ☐ I expect a decrease
- ☐ I expect it to remain the same
- ☐ Don't know

Q47 Would you be available for a 20-minute telephone interview on the topic of Design Right infringement?
[The telephone interviews are scheduled for June / July 2016]

- ☐ Yes, my number is: _____
  my email address is: _____
- ☐ No

Q48 Would you like to receive a copy of the survey report?
[to be issued towards the end of 2016]

- ☐ Yes, my email address is as above
- ☐ Yes, my email address is: _____
- ☐ No

If you have any comments to any of the questions or the questionnaire in general, please use the following text box. [feel free to continue on a separate sheet if required]

Thank you! Please return your completed questionnaire to us using the supplied **Freepost Envelope**

or alternatively, complete the survey online using the QR code on the first page, or copying the following web link in your browser:

http://sgiz.mobi/s3/IPO-Research-into-Designs-Infringement

by 20 May 2016

All information received will be treated in strictest confidence:

Safeguarding your data is important to us. Only anonymised summaries of data will be published in reports resulting from the survey. Your contact details have been selected at random from the publicly available register of UK companies or the UK IPO's database of Registered Design Rights holders. Your replies will play a crucial role in making evidence-based policy relating to Design Rights infringement and protection.

Dave Green
Project Administrator
Faculty for Creative Arts
University of Hertfordshire
College Lane
Hatfield AL10 9AB

in collaboration with the
UK Intellectual Property Office
Intellectual Property Office is an operating name of the Patent Office

08

15.4. Appendix 4: Patents, registered design rights, and trade mark related to Seaboard

At the time of the interview Roland Lamb claimed to have two patent applications pending. The first one was filed in June 2009, and published in January 2011 (appendix 4, figure 1). In June 2010, Lamb filed for PCT (appendix 4, figure 2) to secure the possibility of extending the scope internationally. Noteworthy is the fact that he applied as a person, not as a company. This means that the patents are tied to him rather than the firm. Lamb filed his second patent in June 2013 (appendix 4, figure 3). The illustrations and the abstracts shown on the diverse patent applications reveal how the project had progressed technically. A second patent is often necessary, if patents connected to academic patents are filed prematurely.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 270 634 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.01.2011 Bulletin 2011/01

(51) Int Cl.:
G06F 3/041 *(2006.01)*

(21) Application number: **09251684.8**

(22) Date of filing: **30.06.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

(71) Applicant: **Lamb, Roland Oliver**
London, NW6 6AB (GB)

(72) Inventor: **Lamb, Roland Oliver**
London, NW6 6AB (GB)

(74) Representative: **Hedley, Nicholas James Matthew et al**
Kilburn & Strode LLP
20 Red Lion Street
London
WC1R 4PJ (GB)

(54) **Force-sensitive processor interface**

(57) The present invention provides an interface for inputting data into a processor (6), the interface having a three dimensional input surface (1) and comprising;
an array of sensors (4) responsive to forces applied to the input surface and providing an input to the processor (6) containing data regarding the magnitude of the forces applied to the input surface and the location on the input surface where the forces are applied,
a layer of soft resilient material (2) overlying the sensors and capable of transmitting forces exerted on the input surface to the sensors.

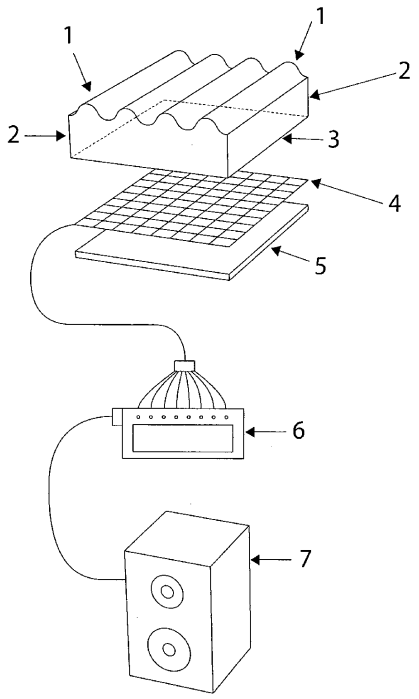


Figure 1

EP 2 270 634 A1

Printed by Jouve, 75001 PARIS (FR)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
6 January 2011 (06.01.2011)

PCT

(10) International Publication Number
WO 2011/001145 A2

(51) International Patent Classification:
G06F 3/041 (2006.01)

(21) International Application Number:
PCT/GB2010/001267

(22) International Filing Date:
30 June 2010 (30.06.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09251684.8 30 June 2009 (30.06.2009) GB

(72) Inventor; and
(71) Applicant : **LAMB, Roland Oliver** [US/GB]; 54 Brondsbury Villas, London NW6 6AB (GB).

(74) Agents: **HEDLEY, N., J., M.** et al.; Kilburn & Strode LLP, 20 Red Lion Street, London WC1R 4PJ (GB).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2011/001145 A2

(54) **Title**: PROCESSOR INTERFACE

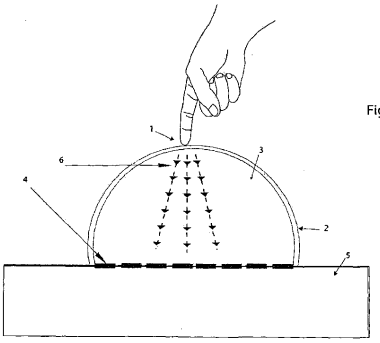


Figure 1

(57) **Abstract**: The present invention provides an interface for inputting data into a processor, the interface having a three-dimensionally shaped input surface (2) and comprising; an array of sensors (4) responsive to forces applied to the input surface and providing an input to the processor capable of registering the magnitude of the forces applied to the array of sensors and interpreting the location of pressure on the input surface, a three-dimensionally shaped layer of soft resilient material (3) arranged between the three-dimensionally shaped input surface (2) and the array of sensors (4) and capable of transmitting forces exerted on the three-dimensionally shaped input surface (2) to the sensors.

(12) UK Patent Application (19) GB (11) 2515286 (13) A

(43) Date of A Publication 24.12.2014

(21) Application No: 1310763.6

(22) Date of Filing: 17.06.2013

(71) Applicant(s):
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(Incorporated in the United Kingdom)
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(72) Inventor(s):
Roland Lamb
Ning Xu

(74) Agent and/or Address for Service:
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20 Red Lion Street, LONDON, WC1R 4PJ, United Kingdom

(51) INT CL:
G10H 1/32 (2006.01) ***G06F 3/041*** (2006.01)
G06F 3/045 (2006.01)

(56) Documents Cited:
EP 2333645 A1 **EP 0194861 A2**
WO 2011/100441 A1 **US 4359726 A**
US 20110314923 A1 **US 20070046642 A1**
KR 1020130047254

(58) Field of Search:
INT CL **G06F, G10H**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Pressure-sensitive interface**
Abstract Title: **Pressure-sensitive interface**

(57) Apparatus for providing variable electrical characteristics responsive to a pressure applied to the apparatus is disclosed along with a corresponding method of manufacture. The apparatus is for use as a user interface for an electronic device such as a musical instrument. It comprises a first electrode 100, a second electrode 140, and an electrically conductive pressure sensitive layer 120 (such as a piezoresistive film) arranged between the first and second electrodes and arranged for being electrically connected to both the first and second electrodes, wherein the pressure sensitive layer has an electrical resistance that varies according to a level of pressure applied to the electrically conductive pressure sensitive layer. The apparatus further comprises at least one electrically insulating spacer layer 110, 130 arranged between the pressure sensitive layer and one of the first and second electrodes, preventing electrical current flowing from the one or more of the first and second electrodes and the pressure sensitive layer when no pressure is applied to the apparatus. Also disclosed is a flexible electronic interface device for operating a computer and a corresponding method of manufacture.

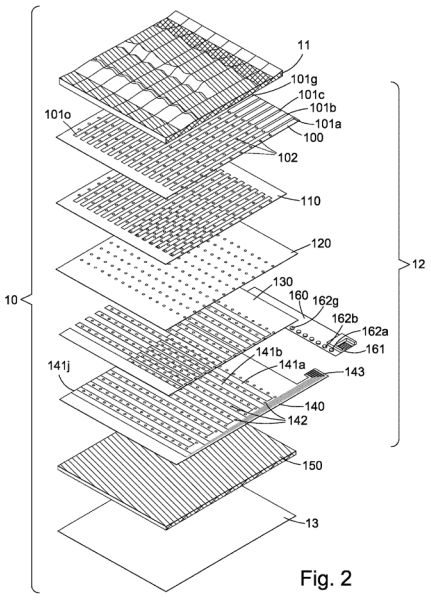


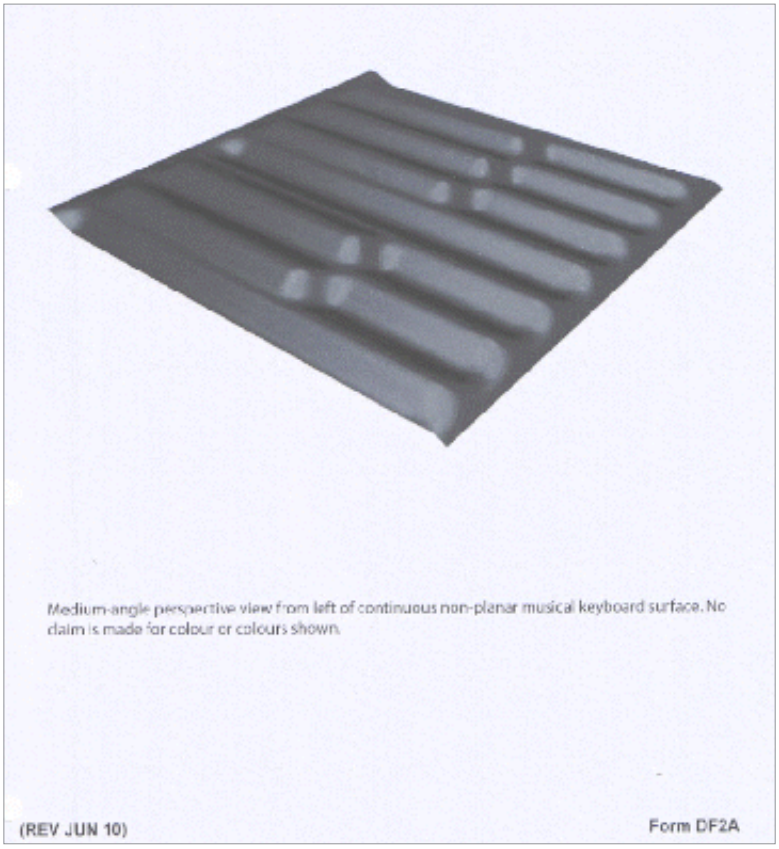
Fig. 2

GB 2515286 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

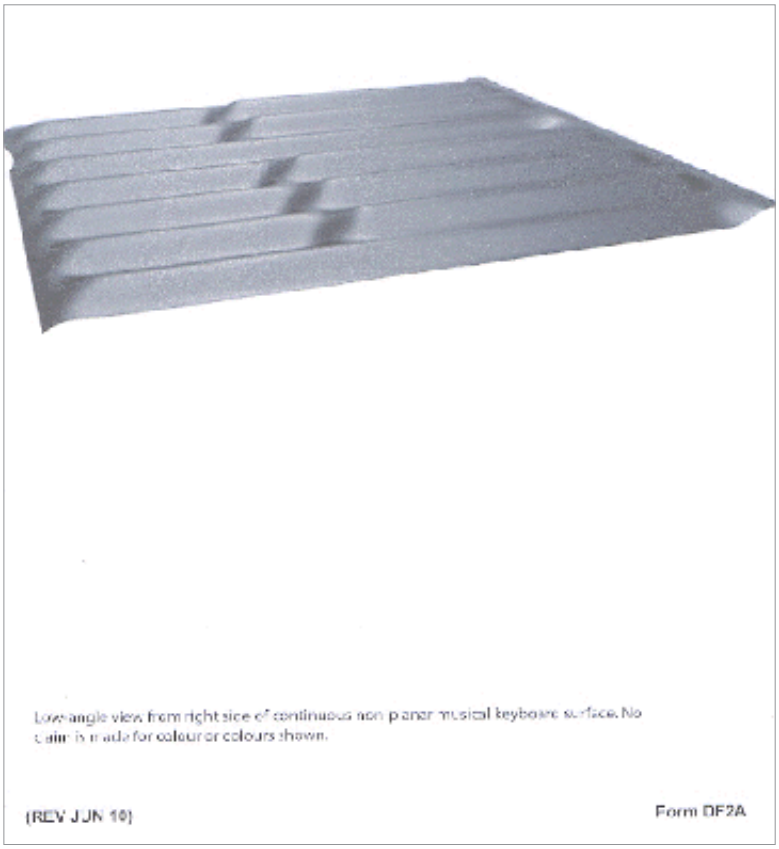
appendix 4, fig.4-7:

Registered Design filed by Lambde Ltd (Roland Lamb's firm) in 2010. Lamb had made best use of the one-year grace period available for registered design rights.



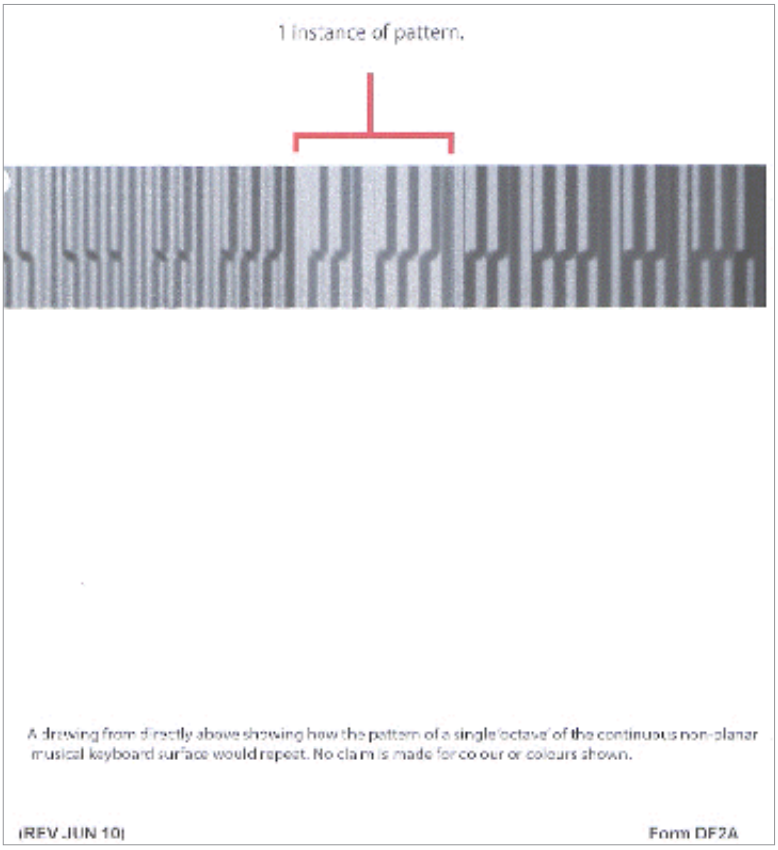
Medium-angle perspective view from left of continuous non-planar musical keyboard surface. No claim is made for colour or colours shown.

(REV JUN 10) Form DF2A



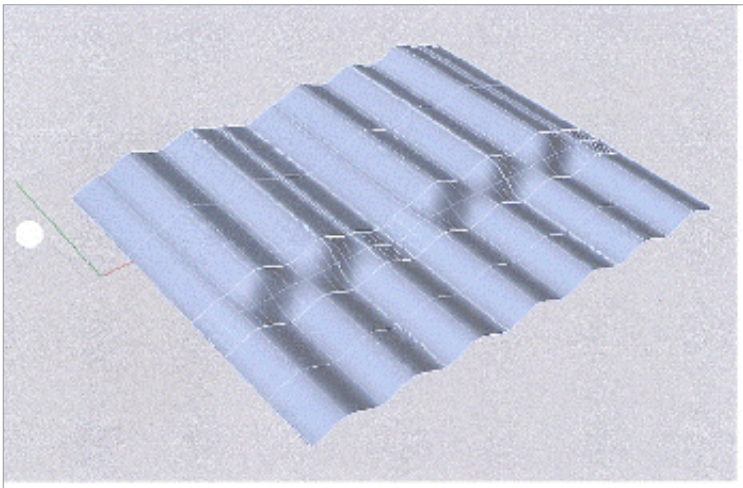
Low-angle view from right side of continuous non-planar musical keyboard surface. No claim is made for colour or colours shown.

(REV JUN 10) Form DF2A



A drawing from directly above showing how the pattern of a single 'octave' of the continuous non-planar musical keyboard surface would repeat. No claim is made for colour or colours shown.

(REV JUN 10) Form DF2A

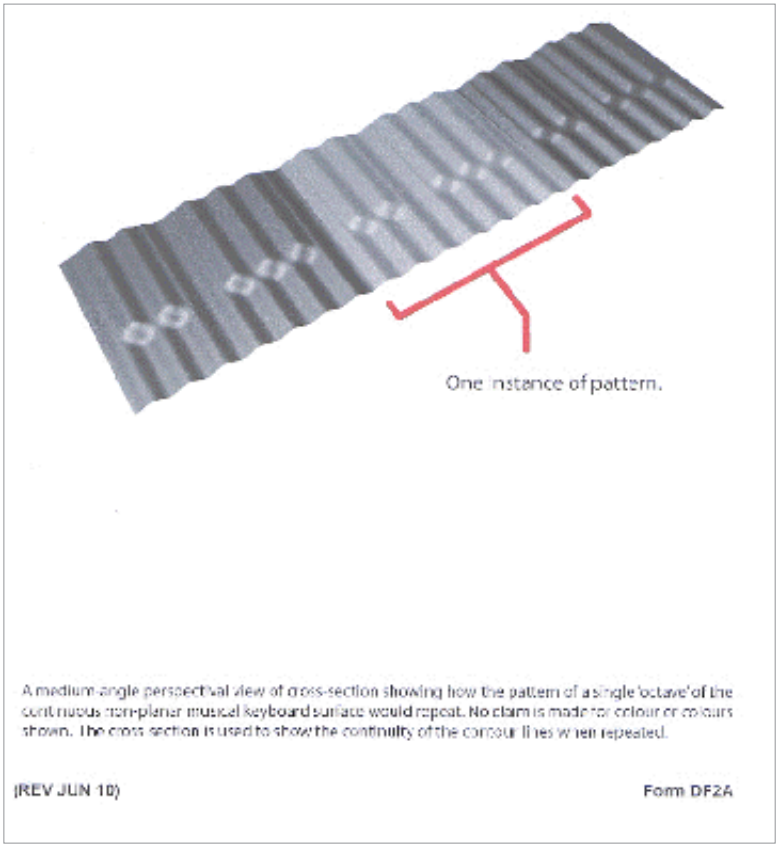


Horizontal cross sectional view from above and slightly to the left of continuous non-planar musical keyboard surface. No claim is made for colour or colours shown. The contour lines of the cross section are provided to show the form of the surface more clearly.

(REV JUN 10) Form DF2A

appendix 4, fig.8-9:

Registered Design filed by Lambde Ltd (Roland Lamb's firm) in 2010. Lamb used the maximum amount of visuals allowed to illustrate his design.



appendix 4, fig. 10

In 2014 Lamb secured SEABOARD as a trade mark, whilst he kept changing his company name multiple times, until he ended up with Roli. It is noteworthy that Lamb secured SEABOARD as a word, not as a visual, which means that the trademark has greater scope. The name is non-descriptive, and there fore permissable as a trade mark.

Trade mark

SEABOARD

SEABOARD

Application number	86184307
Application language	en
Application date	2014-02-04
Trade mark office	United States - USPTO
Registration office	US
Registration date	2013-10-02
Kind of IPR	Trade mark
Trade mark type	Word
Kind of mark	Individual
Nice classification	9,15,28
Current trade mark status	Application filed
Status date	2014-05-14
Trade distinctiveness	false
Comment	To ensure the most reliable and accurate search results of U.S. applications and registrations, us ers, particularly those filing applications with the United States Patent and Trademark Office (USP TO), should access the Trademark Electronic Sea rch System (TESS) at www.uspto.gov and searc h U.S. application and registration data using th e available assisted search forms and other sear ch tools available on the USPTO website. (For im portant information regarding the USPTO's classi fication of the mark shown in this record, please click on the 'question mark' icon below that appe ars to the right of the words 'List of goods and s ervices').

15.5. Appendix 5: Orbel IP portfolio

Opposite is a list of patents and designs filed by Adam Sutcliffe for Orbel. Entertaining patents and designs across a multi-national territory can be costly. Raising equity investment often becomes a necessity.

Application No.	Registration No.	Title	Country	Property Type
0611809.5	2439061	Hand Gel dispenser	United Kingdom	Patent
	8,714,853	Hand Gel dispenser	United States	Patent
PCT/GB07/002225		Hand Gel dispenser	Patent Cooperation Treaty	Patent
2007258990		Hand Gel dispenser	Australia	Patent
10104608.4		Hand gel dispenser	Hong Kong	Patent
13161437.2		Hand Gel dispenser	European Patent	Patent
2009-514904	5246718	Hand Gel dispenser	Japan	Patent
1120596.0		Sprung Dispenser	United Kingdom	Patent
PCT/GB12/000870		Sprung Dispenser	Patent Cooperation Treaty	Patent
002203687-0001	002203687-0001	Hand gel dispenser without on/off switch	European Community	Design
002203687-0002	002203687-0002	Hand Gel Dispenser with on-off switch	European Community	Design
86065	86065	Hand gel dispenser without on/off switch	Argentina	Design
86066	86066	Hand gel dispenser with on-off switch	Argentina	Design
12293/2013	349097	Hand gel dispenser without on/off switch	Australia	Design
12295/2013	349099	Hand Gel Dispenser with on off switch	Australia	Design
201330444263.8		Hand gel dispenser	China	Design
A2013/00861		Hand gel dispenser	South Africa	Design

Other Patents Pending

15.6. Appendix 6: Field notes from an angel investor event

I spoke to four angels, and noted the names of three of those. These names are not conveyed in this study due to privacy reasons. One investor was reported to have invested £45K into a company which grew to a value of £27m.

Insights:

In response to the question whether or not IP is important one investor stated that it depends on "the sphere" (this may be referring to the business environment as discussed in the literature review). The the other three claimed that IP mattered. Two of them stated that patents were 'pretty important'. One of these two explained it was due to the fact that a patent insured that the innovation does not infringe the rights of third parties. Two of the investors considered patents as indicators of a novelty's development potential. But both perceived the team as equally important — Can the team present? — Both investors expressed a preference to invest in a variety of businesses to mitigate risks. Most of the companies in their portfolio are technology-based.

One investor stated that he liked to invest in companies that had "not too many investment rounds", because this helps to limit the dilution of shares. He also prefered ventures that were already trading or close to trading, as opposed to early-stage start-ups. He stated that he consulted other investors with expertise in the field if he felt unsure about an investment. He further pointed towards the fact that angels often create syndicates with a lead investor. Following the pitch presentations, there were a lot of post-presentation conversations amongst investors, possibly more than between investors and entrepreneurs.

The London Business Angels stated that the highest amount of investment in 2013 was in the Cleantech sector with £32.3m. This was followed by Digital / Software which attracted £21.5m worth of investment. Technology, Media, and Telecom (TMT) received £19.9m.

During the pitches I sat next to one of the angel investors, who commented some of the presentations. To my surprise only two out of six presentations were part of the InnovationRCA incubator. Stair-Rover, a novel skateboard invented by a student from the Royal College of Art, did not seem to compare favourably in my view. Although the investor did not seem to be put off by the oddity of the product or its target audience, he claimed that the profit margin was too low. He pointed out that the presenters have once referred to a 10-fold return, and once to a 17-fold return. Either way, the projected profit did not support such business growth according to the angel investor. Other companies were already trading, or much closer to market than the design-led ventures. BuffaloGrid, an initiative to bring mobile electricity to audiences that are off the grid, impressed many investors, including my neighbour. A potentially large market and good growth potential paired with a successful trial meant that Buffalo Grid was rated highest on my neighbour's score sheet. They received 9 out of, well, 10, I presume (the questionnaire asked for five to be the highest score). DefiniGEN, a stem cell initiative from the University of Cambridge, whom the investor had pointed out as his other favourite, was down as 8 on his proposition rating. To my surprise he rated Stair-Rover also as 8, despite his reservation about financial forecasts. Also surprising was the fact that he rated Chirp, communication concept that builds on sonar frequencies, with 3, although I had the impression that the presentation was entertaining and convincing. The business angel seemed tech-savvy. He commented on the technical protectability of Buffalo Grid, when the presenter was asked about the possibility of users interfering with the Buffalo Grid technology. Perhaps the investor was concerned about the potential ease with which Buffalo Grid could be circumvented. He pointed out that battery-less phones might cut the life-span of Buffalo Grid short. Nonetheless, he was very positive about this venture, and I saw him conversing and exchanging contacts with the entrepreneurs at the end of the event. Given that he was from India, and the trials were run in his home country, he confirmed that the market potential was here.

It was reported that in 2013 there were 80 applicants for 5 places at InnovationRCA.

Stair-Rover and Buffalo grid were given only 6 minutes as opposed to 15 to present, 'because they were pre-revenue and earlier stage – it was felt that a longer slot could have disadvantaged them.' Reshni Soman, InnovationRCA

15.7. Appendix 7: Qualitative data 1 — analysis and framework component filtering

This section features the data that has been extracted from the interviews in conjunction with the Grounded Theory analysis, and how the concepts were transcoded and analysed in a series of five steps as decribed in section 5.3 of this thesis. In total eight case studies were included to this analysis, and the data was aligned in a single spread sheet converged into one single spread sheet during step 4 (appendix 4), and subsequently converged in step 5 (appendix 5).

Appendix 7.1: First Step: concept labelling (see step 1 in section 5.3)
This was the first step undertaken after highlighting notable concepts in the interview transcripts. The keywords were listed in the order in which they were mentioned by interviewees in separate documents, one for each interview. A set of words or an entire sentence was copied over, if the context within which the terms were used, seemed important. As the data can also be found in the four columns on the right hand side of the tables shown in appendix 7.2., only one set of sample data related to the first step was included in this thesis (refer to Appendix 7.1 on the following three pages).

Appendix 7.2: Second step: categorisation of concepts (see step 2 in section 5.3)
I pursuit of an alignment subvariables and meta variables were sketched out in these lists of keywords. This was to examine coherences and differences between the different interviews.

Appendix 7.3: Third step: organisation of variables (see step 3 in section 5.3)
The alphabetical ordering of sub variables helped to clarify how frequently each variable came to be mention during the interviews. This reflected the level of significance which individual interviewees attributed to the issues that came to mention.

Appendix 7.4: Fourth step: frequency analysis (see step 4 in section 5.3)
The data related to each individual case study was arranged in case-study-specific variable lists. These lists were aligned horizontally next to each other to facilitate the alignment of concepts.

Appendix 7.5: Fifth step: summative analysis (see step 5 in section 5.3)
This was the last step in the course of the process whereby the attribution of variables to individual case studies that culminated in the diagrams shown in figures 50-51, as well as figures 54-58. The variables in red are the concepts which came to mention only once, twice or three times. In order to mitigate the risk of chance results, these variables were not considered when creating the diagram shown in figure 55. However, the difference between this diagram and the one that reflects all variables listed (figure 54) is minimal (section 5.3).

Appendix 7.6: Analysing the literature review
This appendix shows the data analysis which was carried out in preparation of figure 53 (section 5.3) using the same five steps, can be found here.

Appendix 7.1: case 1, Cupris, first step

label	concept	value		no of iterations
time	**time**	much		
available funds	**money**	-		
activities	**consultancy**	concentrate		
available funds	**wage**	small		
attitude	**commit**			
development pace	**track**	fast		2
investors	**investor**			
incubator	**incubator**			
available time		short		
knowledge	**knowledge**	patent	business	
team	**business partner**			
service	**service concept**			3
patent	**patent**	timing		
development stage	**time**	early stage		
patent	**patent**	timing		
competitors	**competition**	degree		
service	**service concept**			
team	**business partner**			
knowledge	**knowledge**	specialist		
time	**time**	waste		
system	**system**			
service	**service concept**			
database	**database**			
incubator	**incubator**			
investor	**investor**			
ownership	**company**	percentage		
investment (funding)	**investment**	amount		
guidance	**mentors**			
ownership	**equity**			
loan (funding)	**convertible loan**			
business developm. Strategy	**buy them out**			

investment (funding)	**investment**		
guidance	**mentors**	advice	
competition	**competitive process**		
credibility	**track record**		
available funds	**get paid**		2
route to market	**route to market**		
development	**trials**		
target market	**public service sectors**		
target market	**home user**		
patent	**patents**		
target market	**home user**		
development stage	**ready to sell**		
supply chain (Compl. Assets)	**suppliers**		2
industry standards	**follow the quality standards**		
investor (funding)	**investor**		2
incubator (support)	**incubator**		
production knowledge	**experience**	with plastic	
team	**team**	right (appropriateness)	
attitude	**passionate**		
team	**team**	member	
competencies	**responsibilities**	range	
team work	**team**	creative	
proposition (dev. Stage)	**product development**		
market accessibility	**market**	access	
IP reliability	**NDA**	problems	
finance	**money**		
company management	**skill**	general running of the company	
shareholders	**shareholder agreements**		
size (team)	**team**	size	
significance (team)	**team members**	significance	
available funds	**money**	wage	
ownership	**money**	equity	4

required funds	**money**	saving	
service	**service concept**		
market accessibility	**market**	access	
knowledge / experience	**experience**	specialist	
support	**attorneys**		3
support	**accountants**		
IP	**patent**		4
IP	**IP costs**	specialist	
IP	**patent** search	duration	
IP	**IP**	strength	
IP	**design registration**	scope of protection	2
competition (territory)	**competitor**	location	
support	**patent attorneys**		
patent	**patent**	defence	
patent	**patent**	territory	2
patent dispute	**patent dispute**	costs	
market entry	**selling**	start	2
investment (funding)	**investment**	round	2
knowledge (investors)	**investors**	market knowledge	
sales	**selling**		
available funding	**budget**		
production	**production**	tooling readiness	
strategic partnership	**manufacturer**	suppliers	
strategic partnership	**shareholders**	invest	
production	**production**	hardware / software	
fund raising	**investment**	round	
IP - priority	**patent**	prior art	2
IP - scope	**patent**	scope	2
branding (market)	**market**	brand position	3
service	**service concept**		3
legal support	**patent attorney**		4
IP - cost	**patent**	cost	
IP - lifespan	**patent**	lifespan	

Appendix 7.2: Variable definition — categorisation of concepts

Appendix 7.2: Second step, case 1, Cupris

meta variable	sub variable	extension	label	concept	value	no of iterations
-	-		time	**time**	much	
finance	available funds	cash flow	available funds	**money**	-	
-	-		activities	**consultancy**	concentrate	
finance	salary		available funds	**wage**	small	
team	commitment		attitude	**commit**		
business [2]	development pace		development pace	**track**	fast	2
finance	investors		investors	**investor**		
business	incubator		incubator	**incubator**		
-	-		available time		short	
team	knowledge		knowledge	**knowledge**	patent	
team	partners		team	**business partner**		
proposition [3]	service element		service	**service concept**		3
IP	patent		patent	**patent**	timing	
-	-		development stage	**time**	early stage	
IP	timing	strategy	patent	**patent**	timing	
market	competitors	market complexity	competitors	**competition**	degree	
proposition	service element		service	**service concept**		
team	partners		team	**business partner**		
team	specialist knowledge		knowledge	**knowledge**	specialist	
-	-		time	**time**	waste	
?	?		system	**system**		
proposition	service element		service	**service concept**		
proposition	database		database	**database**		
team / business	incubator		incubator	**incubator**		
finance	investor		investor	**investor**		
business	ownership	percentage	ownership	**company**	percentage	
finance	investment		investment (funding)	**investment**	amount	
business	mentoring		guidance	**mentors**		
business	ownership / equity		ownership	**equity**		
finance	loan / dept		loan (funding)	**convertible loan**		
business	investment strategy		business developm. Strategy	**buy them out**		
finance	investment		investment (funding)	**investment**		
business	mentoring	advice	guidance	**mentors**	advice	
market	competition		competition	**competitive process**		
business	credibility		credibility	**track record**		
finance [2]	available funds		available funds	**get paid**		2
market	access strategy		route to market	**route to market**		

proposition	trials / tests		development	**trials**		
market	access strategy		target market	**public service sectors**		
market	access strategy		target market	**home user**		
IP	patent		patent	**patents**		
market	access strategy		target market	**home user**		
proposition	development stage		development stage	**ready to sell**		
assets (compl.) [2]	supply chain		supply chain (Compl. Assets)	**suppliers**		2
proposition	development standard		industry standards	**follow the quality standards**		
finance [2]	investor		investor (funding)	**investor**		2
team / business	incubator		incubator (support)	**incubator**		
team	knowledge / expertise		production knowledge	**experience**	with plastic	
team	members		team	**team**	right (appropriateness)	
team	attitude / commitment		attitude	**passionate**		
team	members		team	**team**	member	
team	knowledge/expertise	responsibilities	competencies	**responsibilities**	range	
team	creative capacities		team work	**team**	creative	
proposition	development stage		proposition (dev. Stage)	**product development**		
market	accessibility		market accessibility	**market**	access	
IP	strength		IP reliability	**NDA**	problems	
finance	available funds		finance	**money**		
company	management		company management	**skill**	general running of the comp	
company	ownership		shareholders	**shareholder agreements**		
team	size		size (team)	**team**	size	
team	composition		significance (team)	**team members**	significance	
finance **company [4]** **finance**	available funds ownership required funds	salary equity	available funds ownership required funds	**money** **money** **money**	wage equity saving	 4
proposition	service element		service	**service concept**		
market	accessibility		market accessibility	**market**	access	
team	knowledge / experience		knowledge / experience	**experience**	specialist	
company [3]	support (legal)		support	**attorneys**		3
company	support (financial)		support	**accountants**		
IP [4]	patent		IP	**patent**		4
IP	costs		IP	**IP costs**	specialist	
IP	patent search		IP	**patent** search	duration	
IP	strength		IP	**IP**	strength	
IP [2]	application process		IP	**design registration**	scope of pr	2
market	competition	territory	competition (territory)	**competitor**	location	

IP	support (legal)		support	**patent attorneys**		
IP	patent	defencibility	patent	**patent**	defence	
IP [2]	patent	territory	patent	**patent**	territory	2
IP	patent	litigation costs	patent dispute	**patent dispute**	costs	
market [2]	entry	sales	market entry	**selling**	start	2
finance [2]	investment	rounds	investment (funding)	**investment**	round	2
business	competencies (investors)		knowledge (investors)	**investors**	market knowledge	
market / finance	sales		sales	**selling**		
finance	available funds		available funding	**budget**		
proposition	development stage	tooling	production	**production**	tooling	
assets (compl.)	manufacturing	partnership	strategic partnership	**manufacturer**	suppliers	
business	ownership	share hlders	strategic partnership	**shareholders**	invest	
proposition	development stage	production	production	**production**	hardware / software	
finance	investment	rounds	fund raising	**investment**	round	
IP	priority		IP - priority	**patent**	prior art	2
IP	scope		IP - scope	**patent**	scope	2
market	brand recognition	branding	branding (market)	**market**	brand posit	3
proposition	service element		service	**service concept**		3
IP	legal support		legal support	**patent attorney**		4
IP	patent	costs	IP - cost	**patent**	cost	
IP	patent	livespan	IP - lifespan	**patent**	lifespan	

Appendix 7.2: Second step, case 2, Yossarian Lives!

meta variable	sub variable	extension	label	concept	value	no of iteratio
proposition	development stage		development stage	**minimally viable product**		
proposition	development stage	prototype	development stage	**working prototype**		
market	market proximity		market proximity	**product development agreem.**		
Team	size		team	**team of three**		
-	-		time	**a number of years**		
assets (compl.)	product development agreement		strategic partnership	**product developm. Agreem.**	with Getty Images	
assets (compl.) [2]	product development agreement		strategic partnership	**affiliate agreement**		2
market	access strategy		market prospects	**customer models**		
proposition	development strategy		strategic partnership	**development / participation**		
market	target audience		audience / users	**artists and friends**		
market [2]	target audience	diversity	audience	**socio-cultural difference / variations**		2
proposition [3]	development strategy	customisation	proposition	**individualisation**		3
proposition	service element		proposition	**services**		
proposition [2]	product		proposition	**product**		2
market	access strategy		route to market	**subscription model**		
finance	funding strategy	bootstrapping	funding	**boot strapping**		
proposition	development pace		development pace	**development**	slower than expected	
team	expertise		team	**developers**		
business [2]	network		network	**connect w. everyone/investm. community**		2
business [3]	development strategy		funding / development stage	**early stage investor**		3
finance [2]	fund raising	timing	funding / team	**early stage investor**		2
team	knowledge	development	time / learning	**development**		
proposition	development pace	resources	development pace	**money**	faster	
finance	smart funding		smart funding	**Deutsche Bank Award**		
finance	self funding		funding	**self-funded**		
finance	smart funding		smart funding	**Amazon web services credit**		
proposition	development pace	knowledge	development	**brain power, development time**		
proposition	product development		development	**product**		
market	target audience	diversity	audience	**general public and some other audiences**		
finance	fund raising		funding	**raise money**		
team	size		team (size)	**developing team**	size	
market	sector		market	**advertising and image search**	applications	
market	niche		market	**niche market**		
team	partners / location		team work management	**distance**	location	

proposition	product development		development	**product**		
finance [2]	fund raising		funding	**raise some money**		2
business	planning	time	time management	**business plan**		
IP	costs	application	IP application costs	**patent**	affordability	
IP	trade secret		IP	**trade secret**	patent eligibility (software	
business	planning		development	**lost my faith in business plans**	value	

Appendix 7.2: Second step, case 3, Arctica

meta variable	sub variable	extension	label	concept	value	no of iterations
IP	patents		IP (patents)	**patents**		3
IP	strategy		IP (strategy)	**different aspects of the product**	different aspects of the product	
IP	patent filing options		patent filing options	**deadline**	patent filing process	
proposition	novelty	inventive step	novelty	**inventive step**		
business	size	investment capital	business size	**small organisation**	investment capital	
IP	patent	strength	IP robustness	**patent**	value	
IP	patent	costs	IP costs	**patent**		
IP	patent	benefits	patent benefits	**patent benefit**	disclosure	
proposition	development stage	market entry	development stage	**on the market**		
team	size		team size	**5 people**	[provoked answer]	
business	development stage		business life cycle	**We started in 2007, and we traded it in 2008**	[provoked answer]	

Appendix 7.2: Second step, case 4, Seaboard

meta variable	sub variable	extension	label	concept	value	no of iterations
proposition	concept		proposition	**concept**		
market	applications		market	**applications**		
team	partners	suitability	team	**partners**		
IP	patent costs	timing of filing	patent costs	**costs of early patents**		
team [2]	knowledge	IP	knowledge	**learned a lot about IP**		2
team [2]	knowledge	product design	knowledge	**product design**		2
team	knowledge	entrepreneurship	knowledge	**entrepreneurship**		
IP	patent	benefits	patent benefits	**spending money**	disclosure	
proposition	development stage		development stage	**spending time**		
proposition	ideas		proposition	**develop all kinds of ideas**	value	
team [3]	commitment	signalling effect	signalling effect	**commitment to this idea**	time / money	3
business	investors	ownership	business partners	**investors / stakeholders**		
proposition	technology		proposition	**technology**		
IP	patent		IP	**patent**		
IP	asset		intellectual asset	**asset**	relationship	
market [2]			market	**industry**		2
IP	patent timing		IP timing	**patent** pending		
IP	strategy		patent number / territory	**patent** — a few which are strong	global	
IP	patent		patent	**patent process** — extended	before the examination	
proposition	development stage	technical	development stage	**technical development**	confidence	
proposition	development stage	prototype	development stage	**perfectly working demonstrators**	confidence	
market	proximity / sales		market proximity / sales	not officially started **sales / pre-ordering**		
proposition	alternative applications			**prosthetics**	application	
finance	investment		funding	mostly, **private investment**		
business	incubator	support	support	**Incubator**		
finance	angel investment		funding	**angel investment**		
proposition	public relations	credentials	public relations	**showing [...] market impact**		
finance	investment	private	funding	private **investment**		
team	size	growth	team size / growth	**just me / 4 people / grown quickly**		
team	knowledge	backgrounds	team competencies	**different backgrounds / and skills**		
team	development / changes		team building	**turnover in terms of like people getting involved**		
team	growth	pace	team growth pace	**grow really quickly**		
finance	strategy		finance strategy	**kept it on my own**, until I was in Design London		
team	commitment		team commitment	**commitment to a project**		
team	growth	equity	team building / equity	**stakes of a company**	conservative	
IP	strategy	trade secret/disclosure	IP strategy	**trade secret / public domain**		
assets	manufacturing	integration	manufacturing	**manufacturing**	integration	
assets	suppliers	parts	suppliers	components which are having made for us		
team	development		team building	Building the **team**		
business	partners	suitability	business partnering	finding the right **partners**		
finance	investments		investment	**investment** was a big challenge		
business	management	learning	business management	run a **business**	learning	
business	value		market value	If the **sales** go		

proposition	product	range	product range	a few other **products**	
business	growth		business growth	**growing steadily**	
team	signalling effect	commitment	signalling effect	**commitment**	
team	signalling effect	confidence	signalling effect	real **belief**	confidence
team	signalling effect	confidence	signalling effect	**self-fulfilling prophetic effect**	confidence
team	signalling effect		team	**partnership** things	
business	ownership	equity	company ownership	**money / equity**	

Appendix 7.2: Second step, case 5, KwickScreen / Romulus

meta variable	sub variable	extension	label	concept	value	no of iterations
proposition [2]	concept	significance	proposition	**the whole product is the idea**	worth virtually nothing…	2
market	proof of market	credentials	market	**getting it to work / getting it to market**	market	
IP	secrecey	NDA	IP	**NDA**		
IP	patent costs / litigation costs		patent costs	**cost of the patent / cost of defending the patent**		
IP	patent strength [2]		patent (robustness)	**copying**		2
assets (complem.)	material access [2]	license	complimentary assets	**material technology**		2
IP	patent	significance	patent (significance)	**patent obsessed**	patent value	
IP	patent costs		patent costs	**spend a fortune on patents**	patent costs	
assets (complem.)	material access	license	complimentary assets	**exclusive worldwide license**	major protection	
IP	patent	strength	circumvent	**patent on the KwickScreen itself**	get around	
IP	patent	territory	patent (territory)	**did not even bother paying for any other territories other than the UK.**		
IP	patent	signalling effect	signalling effect	**window dressing**		
IP	tax benefits		intellectual asset	**patent box**	tax benefits	
sales	revenues	business value	sales / business value	**making a million this year in turnover**		
IP	patent	territory	patent (territory)	**patents — didn't really bother about international**		
IP	patent costs		patent costs	**expensive**		
IP	patent	territory	patent (territory)	**American patent**		
IP	patent	territory	patent (territory)	**European patent**		
IP [2]	patent costs	affordability	patent costs	**expensive / prohibitively expensive**		2
IP	patent	significance	patent (significance)	**reliant** on them [patents]	degree of dependency	
IP	protection strategy		IP protection strategy	you can prosecute the **UK importer**		
business developm.	strategy		strategic knowledge	know the best route at an **early stage**		
finance	investors	bus. dev. stage	investors	**investors would probably not touch something that is so early stage that it hasn't got a patent**		
finance	smart funding		smart funding	**innovation programs**	a pot of money	
finance	bootstrapping		bootstrapping	get of the ground without having to **raise capital**.		
finance	bootstrapping		bootstrapping	did everything on a **shoestring**		
assets (integrated)	manufacturing plant		integration	**we set up a manufacturing plant**		
business developm.	pace		business development	Building a business **takes a long time**		
business	strategic partnerships		strategic partnerships	**commercial relationships**		
assets (compl.)	distribution		complementary assets	**distributer**		
business	strategic partnerships		strategic partnerships	**commercial network**		
IP	patent	signalling effect	signalling effect	**patent is worth quite a small amount**	value	
IP	patent	significance	patent (significance)	**patents** are much more **important**, if you have a **big market**		
market	competitors	defence strategy	competitors	**big players / robust barriers**		
finance	funding need		finance / funding	**never had any investment**		
business	independence		independence	**investor**	reporting to someone	
business	development pace	funding	funding / developm. pace	If we had lots of **money** at the very start, we could have done this **faster**		
team	knowledge		knowledge	**learn and learn and learn**		
business	growth		business growth	**grow about 100% a year**		
assets (integrated)	manufacturing		integrated assets	**manufacturing set up**		
business	growth	prospects	growth prospects	**grow 300% a year**		
investors	performance	industry	cultural context	**VC performance in the UK**		

					2nd interview
market	clients		client	**pitch our sales to the NHS**	
market	complexity		market complexity	**complex organisation**	
finance	(available funds)		finance / funding	did not have any **money**	
team	size		team	but we had an intern	
assets (complem.)	distribution		distribution	working with a **distributor**	
market	sales management		sales management	**sales management** processes	
assets (integrated)	customer relations management system		integrated assets	**CRM system [client relationships management**	
market	accessibility / size		market access/market size	**market of hedge funds**	
business	development strategy		spinout	**separate business**	
market	access strategy / pace		route to market (pace)	mostly in the **early stages** it is about **organising yourself**	
market	sales / revenues		sales / financing	**Clients** will come and say: "We want this	
market	access barriers		market access	**barriers of access of customers**	
finance	bootstrapping		finance	**easier to bootstrap**	
IP	patent filing process		patent	**patent** process, it fits less and less well	
finance	strategy		finance	**find some sales before you spend much money**	
IP	patent	value / significance	patent value	**patents** are an **awkward** thing / money in the future	
IP	patent costs		patent costs	**patent cost**	
market [3]	sales	business growth	sales	get some **sales / create business that way**	3
finance	strategy	bootstrapping	bootstrapping	You can live of quite a small **amount of money** if you are young	
proposition [2]	development	prototype	product development	**prototypes**	2
proposition	development	follow-up product	product development	redesigning the **next generation product**	
IP [2]	design registration	signalling effect	signalling effect	**design registration**	2
market [2]	brand recognition		brand building	**Trademark / trying to build a brand**	2
IP	patent costs		patent costs	**Patents** are much, much more expensive.	
IP	patent territory		patent (territory)	need to extend it to the **states**	
team	expertise (sales)		sales management (knowl..	**learning curve** / working with distributors	

Appendix 7.2: Second step, case 6, Concrete Canvas

meta variable	sub variable	extension	label	concept	value	no of iterations
IP	patent		patent	**patent**		
business	incubator		incubator	RCA innovation		
IP	patent		patent	**patent**		
market	sales / customer relations		market / sales	**customers**		
IP	secrecy / NDA	strength	IP (robustness)	**non-disclosure agreement**	a limit to what you can do	
IP	patent		patent	**patent**		
market	PR / design competitions		PR	**press / design competitions**		
business	company value		company value	**start-up**	value	
proposition	credentials / design competition		credentials	**evidence such as winning competitions**		
business	credentials / PR		credentials	**press attention**		
IP	signalling effect	defensibility	signalling effect	**invest / capability to protect**		
assets (complim.)	work space	factory	complimentary assets	in the first phase of our **company development**, they **lent us a factory**		
finance	funding	requirements	funding	**tight for cash**		
IP	patent	territory	patent (territory)	normally **European patent** as the initial **national** filing, and then a year later **PCT**		
market	access strategy	license	license out	**license to manufacture and sell the materials in the US and Canada**		
IP	strategic partnership	defense	strategic partnership	some **large multi-nationals standing behind you**		
IP	protection		IP protection	**protect**		
finance	smart funding	location	smart funding	wanted to remain in the UK. The area, which we are in, has got good **grant funding** under European **trade regulation**		
market	access barrier		barrier to market entry	**difficult as a small company** to supply the shelter into NGOs		
market	accessibility		market accessibility	**civil sectors**		
team	knowledge	learning	Knowledge / learning	**business plan** and **design competitions**		
team	knowledge	engineering	expertise	**manufacturing** and **engineering** in Cambridge		
team	knowledge	business	expertise	**economics and business**		
team	knowledge	mentoring	expertise	**mentoring**		
team	knowledge	personal networks	expertise	**personal network of people**	law / accounts	
finance	angel investment	equity	equity investment	**angel investors**		
finance	smart funding	design competitions	smart funding	raised through **winning design competitions**		
finance	smart funding	government grant	smart funding	a **government grant**		
finance	angel investment	equity	equity investment	**equity investment**		
market	access strategy	licensing	business strategy	**licensing model**		
proposition	tech. developm. costs		technology development	needed a significant **investment** to develop		
assets (complim.)	workshop access		complimentary assets	use the **workshops**		
finance	sales revenues		revenues	**sale**		
proposition	material		proposition	**material**		
finance	venture capital investm.	second investm. Round	equity investment	**venture capital firms**	second funding round	
finance	angel investment	investor group	equity investment	**regional angel investor group**		
business	ownership / shares		investors	**shareholders**		
proposition	technology	novelty	proposition	good fundamental **technology**		
business	credibility	design competitions	credibility	**design competitions**		
business	credibility	business plan competitions	credibility	**business plan competitions**		
business	credibility	business plan	credibility	**business plan**		
business	development stage		business development st	comparable with **well-established businesses**		
market	market position	security	market position	**secure position**		
market	radical innovation/impact		radical innovation	**we are fairly unique**		
market	market power	competition	market power	people will try to get into our **market** as we grow		
finance	loan		funding	The first **loan** we had to take out for the **business**		
finance	risk		risk (financial)	we would have potentially been **personally bankrupt**		
finance	salaries		salaries	**pay ourselves** for a couple of months		
finance	risk		risk	other **risks**		
proposition	development needs		resources	to make the shelter, we had to develop the **material**		3
proposition	development incentive	need-pull	need-pull	**competition** sponsored by the British Cement Association		
market	target markets	diversity	target market	**three main areas**		

IP	open innovation	distributor	collaboration	**distributors**
market	customer relations	customer support	customer support	**customer** who will have a problem
IP	open innovation	customer support	collaboration/co-creation	**support them technically** and **work with them**
IP	open innovation	new market applicat.	open innovation	develop a whole **new application**
proposition	versatility		innovation	**a new plan for construction rather than a product in itself**
market	customer relations		customer relations	important to be in **contact with your customers**
business	development pace	fast	business develpm. pace	**growing very quickly**

Appendix 7.2: Second step, case 7, RoboFold

meta variable	sub variable	extension	label	concept	value	no of iterations
IP	patent	process patent	process patent	**patented a process**		
proposition	software development		software development	**focused on software developments**		
IP	patent		patent	the **patented** bit, which is to form metal		
proposition	software development		software development	the software… we did not patent it		
assets	manufacturing		manufacturing	**manufacturing**		
finance	revenues		revenue	**profit margin / value**		
business			business model	**business models**		
finance	revenue model	contracts	revenue model	**design contracts**		
proposition	competition	territory	competition	**competitors**	America	
IP	territory		patent territory	**patent … in America**		
IP	infringement	IP strategy	infringement	if they **infringe** on our **patent**	protect	
proposition	development	time investment	development	spent **years in laboratories, doing experiments**		
market	territory		territory	**US** and the **EU**		
market	territory		territory / coverage	a couple of **countries** in the **EU**		
IP	affordability		afforability	cannot **afford** to do all of the **EU**		
proposition	competitors	size	competitors (size)	**large competitors**		
proposition	competitors	size	competitors (size)	**small-scale local competitors**		
IP	patent	territory	patent territory	**jurisdiction**	few **regions**	
IP	development		development (IP)	**better version / newer version**		
IP	disclosure		disclosure	filed a **patent** before it was **revealed**		
IP	cost / ownership		IP cost / ownership	**let the RCA own a third of it**		
IP	cost / ownership		IP cost / ownership	pay for your **filing fee**		
IP	cost / ownership		IP cost / ownership	pay for the **maintenance of the patent**		
business	exit strategy		exit strategy / sales	if we want to exit, ever, we need to have something to sell other than our **order book**		
propostion	technology development		technology development	**develop the technology**		
business	value		business value	**value**	**potential**	**protected by a patent**
finance	development strategy		investments vs. sales	**secure investment to get sales**		
finance	development strategy		sales vs. investments	**if you get sales, you get investment**		
finance	investment		investors	**My family and my wife's family put a lot of money in to set up this place**		
finance	loans / debt / cash flow		loans / debt / cash flow	**making money, but not enough to pay back the loans**		
business	model	consultancy	consultancy	**large-scale jobs**		
business	model	consultancy	bespoke service	**build them design tools and software**		
IP	strategy	secrecy	secrecy	we **don't tell people what we are doing**		
business	development strategy		networking	**building a community**		
market	market access strategy		marketing	When I run a **tradeshow, like a conference or an exhibition**		
market	dependencies		partnership dependency	**collaboration with the main UK Rhino retailer**, we are **not getting sponsorship** from Rhino		
market	orientation (niche vs. mainstream)		market (niche vs. mainstre	**getting into the mainstream**		
business	model	consultancy	business model	**consultancy model**		
finance [2]	sales		sales	**sales**		2
proposition	open innovation	collaboration	collaboration	**work with customers**		
market	audience	focus	audience	**Find the right customer**		
market	PR	educational initiatives	PR	**educational work**		
business	business plan		business pan	**business plan**		
business [2]	operations		operations	**operating company**		2
IP	stategy		IP	**we do not patent**		

business	exit strategy		exit strategy	**exit strategy**	
business	development plans		business development	**expansion**	
business	development strategy		business development	**diversification**	
finance	cash flow		finance	**cash flow**	
finance	investment		investment	**investment**	
business	development prospects		business development	We will **grow** organically and painfully	
assets	available resources		assets	**resources**	
finance [2]	long-term depts		depts	We owe all our **long-term depts**	2
finance	family investment		investment	**investment from my family**	
finance	sales	focus	sales	get down to business and start selling stuff	
finance	fund raising strategy		finance	**raising money vs sales**	
finance	fund raising strategy		investment	more **money from my family**	
team	incbator requirements		team	we **did not build teams**	
team	interdiscilinary competencies		team / interdisciplinarity	you **need a team, interdisciplinary**, it does not matter, you cannot do things on your own.	
team	team development strategy		team strategy	**permanent people**	
team	knowledge / competencies		skills	At the moment I **manage all sides**...	

Appendix 7.2: Second step, case 8, Squease

meta variable	sub variable	extension	label	concept	value	no of iterations
assets (compl.)	suppliers		complementary assets	**third-party suppliers**		
assets (compl.)	supply chain	complexity	supply chain / complexity	have three parts to the **supply chain** of producing one		
IP	patentability	codifiability	codifiability	**patent**	definability	
IP	patentability	codifiability	codifiability	**patentability**	had to **patent the layout**	
IP [3]	patent purpose	defence	patent purpose	**not for protection**	patent purpose	3
IP	patent purpose	defence	patent purpose	**safeguard / patent application**		
market	marketing costs		marketing	**putting money into marketing or into the product**		
IP	strategy	investors	investors	**investors** agreed		
IP	patent	signalling effect	patent purpose	**mechanism for getting investment**	America	
market	emerging markets		market – emerging	**the market is so much in its infancy**		
market	market position		market position	**entrant to the market**	competitiveness	
market	market access/territories		distribution – markets	**Most of our sales are in Europe. But we are trading in South Africa.**		
proposition	development stage	clinical tests	investment	**We recently passed our approval for the US, which we had to pay fantastic**		
proposition	development stage	tests	development	vulnerability **tests**		
market	trademark	value	trademark value	**trademark**		
IP	patent	strength	patent strength	patent	weak	
market	competitors	business size	competitors (size)	**small-scale local competitors**		
IP	patent infringement	litigation costs	patent enforcement costs	**if you have the money to invest in a patent […], you probably do not have enough money to enforce it later**		
IP	patent	signalling effect	patent signalling effect	**investors** has never asked **what is the patent for**		
finance	investors	trading strategy	investors	was worried about our **trading strategy**		
proposition	product developm. stage		product development stage	You only file for a **patent** when your **product development is complete**		
IP	strategy	funding/time frame	patenting strategy	**patenting strategy** needs both	**Money and time**	
IP	patent	costs	patent costs	cheaply / lawyer's costs		
proposition	technology development		technology development	**develop the technology**		
proposition	product developm. stage		product development stage	We were still finalising the **production model**		
IP	patent	time frame	timeframe	**UK patent**	**running out of time**	
finance	sales strategy	pricing	sales strategy	**high price / low margin product**		
assets (compl.)	distribution	product update	distribution contract	We had an **agreement with one of the distributers** that we would update our product every quarter		
assets (compl.)	distribution	product update	distribution contract	We had an **agreement** with one of the **distributers** to off-take the product every quarter		
finance	smart funding		funding strategy	worked with an organisation called Unlimited, who were into social enterprising		
finance	smart funding		funding strategy	they offered a **matched funding**		
finance	smart funding		funding strategy	**TSB grants**		
business	incubation	benefits	incubation scheme	The **money** was good / alumni network		
finance	revenue strategy	sales	revenue strategy	It is just about the **sales**		
market	market position	niche	market	**niche market**		
proposition	knowledge/invetors input		investors (knowledge)	**investors have shown really interesting things**		
market	marketing perspective		marketing	**marketing perspective**		
market	customer support	after sales support	after sales support	We do a kind of **buy-back scheme**		
market	market share		market share	We haven't got much **market**		
market	market penetration		market penetration	We do **sales reports**		
team	commitment		attitude	**commitment to the business**		
finance	sales forecast		sales forecast	It depends on the **sales** we have this year. We **forecast** a lot this year.		
finance	break even point		break even point	We might get close to break even		
finance	investors	confidence	confidence	The **investors** will be confident, we will be confident		
finance	funding support		funding support	get **funding**		
finance	seed funding		seed funding	**first round of funding**		
finance	predicted funding requirement		knowledge	**you do not know how much you need**		
team	competencies	experience	multitasking	**you have to do everything**		
team	competencies	development	learning curve	**learning curve**		
team	managerial experience		management	understanding **corporate governance**		

business	management / communication		brokering	communicate to the **investors** in a timely fashion in a non-intensive way.	
assets (compl.)	production line		production (Compl. Assets)	The **production line** is set up	
market	sales strategy — rental scheme		service design	We do **rental schemes** for families who cannot afford it	
market	sales strategy		sales strategy	If it works, then the **money comes off the purchase price**.	
market [2]	marketing		marketing / sales	**marketing** and **sales**	2
finance	sales / production	fulfilment	sales / fulfilment	**We have to worry about sales, we have to worry about fulfilment, worry about logistics at the moment.**	
finance	bootstrapping		work space (Compl. Assets)	**given up our office**	
assets (compl.)	distribution	logistics	Compl. Assets	**outsource our logistics**	
team	collaboration	frictions	interdiscipinarity (team work)	**business guys** coming and just being assholes	
team	shareholder agreement	bad leaver	contract (team work)	We had a **shareholder agreement**, which did actually **specify a bad leaver**.	

Appendix 7.2: Second step, case 9, Orbel

meta variable	sub variable	extension	label	concept	value	no of iterations
assets (compl.)	manufacturing / distibution		comp. assets / value chain	**manufacturer**, who will be a **potential distributor**		
IP [3]	design patents / registered design rights		design patents / reg. designs	**design patents**, here it is called **registered designs**		3
IP	signalling effect		signalling effect	You are less likely to get **investors** to willing to invest without seeing something.		
IP	environment complexity		business environment	They are in an **intricate market**.		
IP	patents		patents	**Patents**		
IP	formal / informal	value	IP (formal / informal)	Every form of IP has value in its own right	value	
IP	patent	filing stage	patent (filing stage)	having **patents pending and patents in place**		
IP	patent	disclosure	disclosure	**patents can be published**		
IP	strategy		IP strategy	**IP strategy** analysis		
IP	jurisdiction / territory		jurisdiction	**territories**		
IP	patent costs		patenting (costs)	**money** will have gone into the **patenting**		
IP	number of patents		patents (number)	**first patent** / 2nd patent		
proposition	product development / testing		product development / testing	**made the product and tested it**		
finance	angel investment		angel investment	**we signed with the London Business Angels consortium**		
team	collaboration/complem. competencies		team collaboration	**probably could have done without Damien**		
team	incubation	management	incubation management	**incubation arrangement**		
team	significance		team	you are still going to **need more than one person generally**	importance	
business	ownership / shares		company ownership (shares)	**shareholders**		
assets (compl.)	manufacturing	location	manufacturing (partnerships)	**manufacture in China**		
assets (compl.)	distribution / markets		distribution (markets)	**distributor has got 2 filling lines, one in China, and one in North America**		
team	knowledge	learning	learning / experience	**maturity in understanding**		
finance	salary	requirements	salary	I can just live on a **medium salary**		
business	exit strategy		exit strategy	we will probably **merge our distributor** at some point		
business	development stage / orders		business developm. Stage	We **have got orders**, we have got **pipeliners**		
business	incubation benefits	guidance/motivation	incubator (benefits)	**Confidence** **guidance, motivation, money**, and then **networks**		
finance	investment		investment	**investment**	significance	
IP	IP strategy (patents)		IP strategy	**You can always get a patent just to get investment and then drop it**		
IP	IP strategy (registered designs)		IP strategy	**rely on design registrations until you have got the network in place**		

Appendix 7.3: Third step: Organisation of variables

Appendix 7.3: Third step: case 1, Cupris

meta variables	variable	extension
?	?	
assets (compl.) [2]	supply chain	
assets (complimentary)	manufacturing	partnership
business	incubator	
business	ownership	percentage
business [2]	mentoring	
business	ownership / equity	
finance	investment strategy	
business	mentoring	advice
business	credibility	
business	competencies (investors)	
business	ownership	share hlders
business [2]	development pace	
company	management	
company	ownership	
company	support (financial)	
company [3]	support (legal)	
company [4]	ownership	equity
finance	available funds	cash flow
finance	salary	
finance	investors	
finance	investor	
finance	investment	
finance	loan / dept	
finance	investment	
finance	available funds	
finance	available funds	salary
finance	required funds	
finance	available funds	
finance	investment	rounds
finance [2]	available funds	
finance [2]	investor	
finance [2]	investment	rounds
IP	patent	
IP	timing	strategy
IP	patent	
IP	strength	
IP	costs	
IP	patent search	
IP	support (legal)	
IP	patent	defencibility
IP	patent	litigation costs
IP	priority	
IP	scope	
IP	legal support	
IP	patent	costs
IP	patent	livespan
IP	strength	
IP [2]	application process	
IP [2]	patent	territory
IP [4]	patent	
market	competitors	market complex
market	competition	
market	access strategy	
market	access strategy	
market	access strategy	
market	access strategy	
market	accessibility	
market	accessibility	
market [3]	brand recognition	branding
market	competition	territory
market [2]	entry	sales
market / finance	sales	
proposition	service element	
proposition	service element	
proposition	database	
proposition	trials / tests	
proposition	development stage	
proposition	development standard	
proposition	development stage	
proposition	service element	
proposition	development stage	tooling
proposition	development stage	production
proposition	service element	
proposition [3]	service element	
team	commitment	
team	partners	
team	partners	
team	specialist knowledge	
team	knowledge	
team	knowledge / expertise	
team [2]	members	
team	attitude / commitment	
team	members	
team	knowledge / expertise	responsibilities
team [2]	creative capacities	
team	size	
team	composition	
team	knowledge / experience	
team / business	incubator	
team / business	incubator	

Appendix 7.3: Third step: case 2, Yossarin Lives!

category	variable	extension
assets (complementary)	product development agreement	
assets (complementary) [2]	product development agreement	
business	planning	time
business	planning	
business [2]	network	
business [3]	development strategy	
finance	funding strategy	bootstrapping
finance	smart funding	
finance	self funding	
finance	smart funding	
finance	fund raising	
finance [2]	fund raising	
finance [2]	fund raising	timing
IP	costs	application
IP	trade secret	
market	market proximity	
market	target audience	
market	target audience	diversity
market [2]	target audience	diversity
market	sector	
market	niche	
market	access strategy	
market	access strategy	
proposition	development stage	
proposition	development stage	prototype
proposition	development strategy	
proposition [3]	development strategy	customisation
proposition	service element	
proposition	development pace	
proposition	development pace	resources
proposition	development pace	knowledge
proposition	product development	
proposition	product development	
proposition [2]	product	
team	size	
team	expertise	
team	knowledge	development
team	size	
team	partners / location	

Appendix 7.3: Third step: case 3, Arctica

category	variable	extension
business	size	investment capital
business	development stage	
IP	strategy	
IP	patent filing options	
IP	patent	strength
IP	patent	costs
IP	patent	benefits
IP [3]	patents	
proposition	novelty	inventive step
proposition	development stage	market entry
team	size	

Appendix 7.3: Third step: case 4, Roli / Seaboard

category	variable	extension
assets	manufacturing	integration
assets	suppliers	parts
business	investors	ownership
business	incubator	support
business	partners	suitability
business	management	learning
business	value	
business	growth	
business	ownership	equity
finance	investment	
finance	angel investment	
finance	investment	private
finance	strategy	
finance	investments	
IP	patent costs	timing of filing
IP	patent	benefits
IP	patent	
IP	asset	
IP	patent timing	
IP	strategy	
IP	patent	
IP	strategy	trade secret / disclosure
market	applications	
market	proximity / sales	
market	impact	
market	public relations	credentials
proposition	concept	
proposition	development stage	
proposition	ideas	
proposition	technology	
proposition	development stage	technical
proposition	development stage	prototype
proposition	alternative applications	
proposition	product	range
team	partners	suitability
team	size	growth
team	knowledge	backgrounds
team	development / changes	
team	growth	pace
team	commitment	
team	growth	equity
team	development	
team	commitment	signalling effect
team	confidence	signalling effect
team	confidence	signalling effect
team	belief	signalling effect
team	knowledge	entrepreneurship
team [2]	knowledge	IP
team [2]	knowledge	product design
team [3]	commitment	signalling effect

category	variable	extension
assets (compl.)	distribution	
assets (compl.) [2]	material access	license
assets (compl.)	material access	license
assets (compl.)	distribution	
assets (integrated)	manufacturing plant	
assets (integrated)	manufacturing	
assets (integrated)	customer relations management system	
business	strategic partnerships	
business	strategic partnerships	
business	independence	
business	development strategy	
business	development pace	funding
business	growth	
business	growth	prospects
business developm.	strategy	
business developm.	pace	
finance	investors	bus. dev. stage
finance	smart funding	
finance	bootstrapping	
finance	bootstrapping	
finance	funding need	
finance	(available funds)	
finance	bootstrapping	
finance	strategy	
finance	strategy	boootstrapping
finance	sales / revenues	business value
finance	investors	performance / industry
IP	secrecey	NDA
IP	patent costs / litigation costs	
IP [2]	patent strength [2]	
IP	patent	significance
IP	patent costs	
IP	patent	strength
IP	patent	territory
IP	patent	signalling effect
IP	tax benefits	
IP	patent	territory
IP	patent costs	
IP	patent	territory
IP	patent	territory
IP	patent	significance
IP	protection strategy	
IP	patent	signalling effect
IP	patent	significance
IP	patent	value / significance
IP	patent costs	
IP	patent costs	
IP	patent territory	
IP	patent filing process	
IP [2]	patent costs	affordability
IP [2]	design registration	signalling effect
market	proof of market	credentials
market	competitors	defence strategy
market	clients	
market	complexity	
market	sales management	
market	accessibility / size	
market	access strategy / pace	
market	sales / revenues	
market	access barriers	
market [2]	brand recognition	
market [3]	sales	business growth
proposition	development	follow-up product
proposition [2]	concept	significance
proposition [2]	development	prototype
team	knowledge	
team	size	
team	expertise (sales)	

Appendix 7.3: Third step: case 6, Concrete Canvas

category	variable	extension
assets (compl.)	work space	factory
assets (compl.)	workshop access	
business	incubator	
business	company value	
business	ownership / shares	
business	credibility	design competitions
business	credibility	business plan competitions
business	credibility	business plan
business	development stage	
business	development pace	fast
business	credentials / PR	
finance	funding requirements	
finance	smart funding	location
finance	angel investment	equity
finance	smart funding	design competitions
finance	smart funding	government grant
finance	angel investment	equity
finance	sales revenues	
finance	venture capital investm.	second investm. Round
finance	angel investment	investor group
finance	loan	
finance	risk	
finance	salaries	
finance	risk	
IP	secrecy / NDA	strength
IP	signalling effect	defensibility
IP	patent	territory
IP	strategic partnership	defense
IP	protection	
IP	open innovation	distributor
IP	open innovation	customer support
IP	open innovation	new market applicat.
IP	patent	
IP	patent	
IP	patent	
market	sales / customer relations	
market	PR / design competitions	
market	access strategy	license
market	access barrier	
market	accessibility	
market	access strategy	licensing
market	market position	security
market	radical innovation (impact)	
market	market power	competition
market	target markets	diversity
market	market pull	techn. applications
market	customer relations	customer support
market	customer relations	
proposition	credentials / design competition	
proposition	technology development costs	
proposition	material	
proposition	technology	novelty
proposition [3]	development needs	
proposition	development incentive	need-pull
proposition	versatility	
team	knowledge	learning
team	knowledge	engineering
team	knowledge	business
team	knowledge	mentoring
team	knowledge	personal networks

Appendix 7.3: Third step: case 7, RoboFold

category	variable	extension
assets	manufacturing	
assets	available resources	
business		
business	exit strategy	
business	value	
business	development strategy	
business	model	consultancy
business	business plan	
business [2]	operations	
business	exit strategy	
business	development plans	
business	development strategy	
business	development prospects	
business	model	consultancy
business	model	consultancy
finance	revenues	
finance	revenue model	contracts
finance	development strategy	
finance	development strategy	
finance	investment	
finance	loans / debt / cash flow	
finance [2]	sales	
finance	cash flow	
finance	investment	
finance [2]	long-term depts	
finance	family investment	
finance	sales	focus
finance	fund raising strategy	
finance	fund raising strategy	
IP	territory	
IP	infringement	IP strategy
IP	patent	territory
IP	development	
IP	disclosure	
IP	cost / ownership	
IP	cost / ownership	
IP	cost / ownership	
IP	strategy	secrecy
IP	patent	process patent
IP	patent	
IP	affordability	
IP	stategy	
IP	open innovation	collaboration
market	territory	
market	territory	
market	market access strategy	
market	dependencies	
market	orientation (niche vs. mainstream)	
market	audience	focus
market	PR	educational initiatives
market	competition	territory
market	competitors	size
market	competitors	size
proposition	software development	
proposition	software development	
proposition	development	time investment
propostion	technology development	
team	incubator requirements	
team	interdiscilinary competencies	
team	team development strategy	
team	knowledge / competencies	

Appendix 7.3: Third step: case 8, Squease

category	variable	extension
assets (compl.)	suppliers	
assets (compl.)	supply chain	complexity
assets (compl.)	distribution	product update
assets (compl.)	distribution	product update
assets (compl.)	production line	
assets (compl.)	distribution	logistics
business	incubation	benefits
business	management / communication	
finance	investors	trading strategy
finance	sales strategy	pricing
finance	smart funding	
finance	smart funding	
finance	smart funding	
finance	revenue strategy	sales
finance	sales forecast	
finance	break even point	
finance	investors	confidence
finance	funding support	
finance	seed funding	
finance	predicted funding requirement	
finance	sales / production	fulfilment
finance	bootstrapping	
IP	patentability	codifiability
IP	patentability	codifiability
IP [3]	patent purpose	defence
IP	strategy	investors
IP	patent	signalling effect
IP	patent	strength
IP	patent infringement	litigation costs
IP	patent	signalling effect
IP	patent	costs
IP	patent	time frame
IP	strategy	funding / time frame
IP [3]	patent purpose	defence
market	marketing costs	
market	emerging markets	
market	market position	
market	market access / territories	
market	trademark	value
market	competitors	business size
market	market position	niche
market	marketing perspective	
market	customer support	after sales support
market	market share	
market	market penetration	
market	sales strategy — rental scheme	
market	sales strategy	
market [2]	marketing	
proposition	development stage	clinical tests
proposition	development stage	tests
proposition	product development stage	
proposition	technology development	
proposition	product development stage	
proposition	knowledge / invetors input	
team	commitment	
team	competencies	experience
team	competencies	development
team	managerial experience	
team	collaboration	frictions
team	shareholder agreement	bad leaver

Appendix 7.3: Third step: case 9, Orbel

category	variable	extension
assets (compl.)	manufacturing / distibution	
assets (compl.)	manufacturing	location
assets (compl.)	distribution / markets	
business	ownership / shares	
business	exit strategy	
business	development stage / orders	
business	incubation benefits	guidance / motivation
finance	angel investment	
finance	salary	requirements
finance	investment	
IP	environment complexity	
IP	patents	
IP	formal / informal	value
IP	patent	filing stage
IP	patent	disclosure
IP	strategy	
IP	jurisdiction / territory	
IP	patent costs	
IP	IP strategy (patents)	
IP	IP strategy (registered designs)	
IP	signalling effect	
IP	number of patents	
IP [3]	design patents / registered design rights	
proposition	product development / testing	
team	collaboration / complementary competencies	
team	incubation	management
team	significance	
team	knowledge	learning

Appendix 7.4: Fourth step: frequency analysis

Diagrams are split and featured on opposite spreads in keeping with the horizontal alignment.

count	team	cupris	yossarian lives!	arctica	seaboard
6	size	1 size	2 size	1 size	1 size
9	partners / members	6 partners/members	1 partners / location		2 partners
30	knowledge / expertise	6 knowledge/expertise	2 knowledge		6 knowledge
1	managerial experience				
2	team competencies				
10	commitment	3 attitude/commitment			5 commitment
2	creative capacities	2 creative capacities			
4	development strategy / growth				3 development / growth
3	confidence				3 confidence
1	significance				
4	incubator	2 incubator			
1	stability (shareholder agreem. etc.)				

count	business / company	cupris	yossarian lives!	arctica	seaboard
8	incubator/mentoring	3 incubator/mentoring			1 incubator (support)
14	ownership/equity	8 ownership/equity			2 ownership / equity
9	credentials	1 credibility			
1	competencies (investors)	1 competencies (investors)			
28	dev./strategy/progress/prospects	2 development pace	5 planning/dev. strategy	1 developm. stage	1 growth
5	management / partners	1 management			2 managem./partners
7	support/network/strat. partnerships	4 support (financial/legal)	1 network		
5	size / value			1 size (inv. capital)	1 value
3	exit strategy				
2	operations				

count	proposition	cupris	yossarian lives!	arctica	seaboard
6	service element	5 service element	1 service element		
5	ideas/concept/novelty			1 novelty	2 concept / ideas
3	software/database	1 database			
17	development stage	4 development stage	2 development stage	1 dev. stage	3 development stage
11	dev. standard/strategy/requirem.	1 developm. standard	4 development strategy		
5	development pace/incentive		3 development pace		
6	product development	1 trials / tests	2 product development		
3	product		2 product		1 product
7	technology development				1 technology
3	applications				1 alternative applications
					1 public relations

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
1 size				
2 knowledge	5 knowledge	1 knowledge / competencies	2 competencies	1 knowledge
			1 managerial experience	
		1 interdisciplinary competencies		1 coll. competence
			2 commitment / collaboration	
		1 team development strategy		
				1 significance
		1 incubator requirements		1 incubation
			1 shareholder	

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
	1 incubator		1 incubation	1 incubation benefits
1 independence	1 ownership/shares			1 ownership / shares
	4 credibility			
6 growth/dev. strategy/pace	2 dev. stage/pace	8 dev. strategy/plans/bus. model		1 dev.t stage/orders
			2 managem./communication	
2 strategic partnerships				
	1 company value	1 value		
		2 exit strategy		1 exit strategy
		2 operations		

kwickscreen/romulus	concrete canvas	robofold	squease	orbel
2 concept				
		2 software developm.		
4 development		1 development	2 development stage	
	3 development needs			
	1 development incentive			
			2 product developm. stage	1 product dev./testing
	2 technology dev.	1 technology developm.	1 technology developm.	
	1 versatility			
	1 credentials/design competition			

Appendix 7.4: Fourth step: frequency analysis

		cupris	yossarian lives!	arctica	seaboard
count	**IP**				
52	patents (general reference)	13 patent		6 patent	3 patent
7	applic. process/options/patentability	2 application process	1 application costs	1 patent filing options	
15	IP timing/strategy	2 timing / strategy		1 strategy	2 patent timing / strategy
4	strength	2 strength			
13	costs/affordability	1 costs			1 patent costs
2	legal support	2 support (legal)			
1	scope	1 scope			
1	priority	1 priority			
5	trade secret/NDA		1 trade secret		
10	purpose				
3	territory/jurisdiction				
5	design patents/registered design rights				
7	open innovation				
2	strategic partnership				
1	formal/informal IP				
1	signalling effect				
1	environment complexity				

		cupris	yossarian lives!	arctica	seaboard
count	**finance**				
6	available funds	5 available funds		nil	
24	investments	5 investment			4 (angel) investment
8	investors	4 investors			
5	required funds	1 required funds			
7	loans/depth	1 loan / dept			
4	salaries	1 salary			
10	finance strategy	1 investment strategy	1 funding strategy		1 strategy
12	smart funding		2 smart funding		
5	fund raising		5 fund raising		
1	self funding		1 self funding		
4	bootstrapping				
11	sales/revenues				
4	financial risks				

		cupris	yossarian lives!	arctica	seaboard
count	**assets**				
7	supply chain	2 supply chain	3 product dev. agreement	nil	1 suppliers
7	manufacturing	1 manufacturing			1 manufacturing
3	materials/resources				
7	distribution				
1	sales channels				
4	work space				

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
11 patent	4 patent	3 patent	5 patent	3 patent
1 patent filing process		1 development	1 patentability	
1 protection strategy		3 strategy/infringement	2 strategy / infringement	4 IP strategy (patents / reg designs)
2 strength				
6 patent costs		4 cost/ownership/affordability		1 patent costs
1 secrecy / NDA	1 secrecy / NDA	1 disclosure		
	2 protection		6 patent purpose	
1 patent territory		1 territory		1 jurisdiction / territory
2 design registration				3 design patents / reg design rights
	3 open innovation	1 open innovation		
	1 strategic partnership			
				1 formal / informal IP
				1 signalling effect
				1 environment complexity

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
1 available funds				
	4 vc / angel investm.	3 (family) investment	2 funding support/seed fund	2 (angel) investment
2 investors			2 investors	
1 funding need	1 funding requirements		1 funding requirements	
	1 loan	4 loans / debt / cash flow		
	1 salary			1 salary
2 strategy		4 fund raising / dev. strategy	1 break even point	
1 smart funding	3 smart funding		3 smart funding	
3 bootstrapping			1 revenue strategy	
1 sales / revenues	1 sales / revenues	4 sales / revenues	4 sales (strategy / forecast)	
	2 financial risks			

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
			1 suppliers / supply chain	
manufacturing (manuf. plant)		1 manufacturing	1 production line	2 manufacturing
material access		1 available resources		
distribution			3 distribution	2 distribution / markets
sales / crm system				
	2 work space			

Appendix 7.4: Fourth step: frequency analysis

		cupris	yossarian lives!	arctica	seaboard
count	**market**				
3	market proximity/proof of market	nil	1 market proximity	nil	1 proximity / sales
6	target audience		4 target audience		
6	market focus (sector/niche/mainstream)		2 sector / niche		
11	market relations (sales management)				
14	access strategy/barriers		2 access strategy		1 applications
5	public relations				1 public relations
3	market impact				1 impact
5	competitors				
4	accessibility/complexity/control				
1	size				
3	branding				
6	market position				
2	territory				
5	marketing				

kwickscreen / romulus	concrete canvas	robofold	squease	orbel
1 proof of market				nil
1 clients		1 audience		
	1 target markets	1 orientation (niche vs. mainstr.)	1 emerging markets	
5 sales (management / revenues)	3 sales / customer relations			
2 access strategy / access barrier	3 access strategy/barrier/m pull	1 market access strategy	2 sales strategy	
	1 PR / design competitions	1 PR / educational initiatives	1 market penetration / access	
	1 radical innovation (impact)			
1 competitors		3 competitors	1 competitors	
1 complexity	1 accessibility	1 dependencies		
1 size				
2 brand recognition			1 trademark	
	1 market position/market power		4 market position/share/perspective	
		2 territory		
			5 marketing / marketing costs	

Appendix 7.5: Fifth step: summative analysis

	team		proposition		IP
33	knowledge / expertise / competencies	17	development stage	52	patents (general reference)
28	development / strategy / progress / prospe	11	development standard/strategy/requirem.	15	IP timing / strategy
14	partners / members / management	7	technology development	13	costs / affordability
14	ownership / equity	6	service element	10	purpose
12	incubator / mentoring	6	product development	7	application process / options / patentability
11	size / value	5	ideas / concept / novelty	7	open innovation
10	commitment	5	development pace / incentive	5	trade secret / NDA
9	credentials	3	software / database	5	design patents / registered design rights
7	support / network / strategic partnerships	3	product	4	strength
4	development strategy / growth	3	applications	3	territory / jurisdiction
3	confidence			2	legal support
3	exit strategy			2	strategic partnership
2	creative capacities			1	scope
2	operations			1	priority
1	significance			1	formal / informal IP
1	stability (shareholder agreement etc.)			1	signalling effect
1	competencies (investors)			1	environment complexity
155		66		130	
142		57		118	

finance		assets		market	
24	investments	**7**	supply chain	**14**	access strategy / barriers
12	smart funding	**7**	manufacturing	**11**	market relations (sales management)
11	sales / revenues	**7**	distribution	**6**	target audience
10	finance strategy	**4**	work space	**6**	market focus (sector / niche / mainstream)
8	investors	**3**	materials / resources	**6**	market position
7	loans / depth	**1**	sales channels	**5**	public relations
6	available funds			**5**	competitors
5	required funds			**5**	marketing
5	fund raising			**4**	accessibility / complexity / control
4	salaries			**3**	market proximity / proof of market
4	bootstrapping			**3**	market impact
4	financial risks			**3**	branding
1	self funding			**2**	territory
				1	size

three or less entries were not considered in the diagrammatic visualisation since most of them rooted in one source (interview) only

101	29	74
100	25	62

Appendix 7.6: Analysing the literature review — 1st step: concept labelling

no	label	concept	context
	market context	**design industry sectors**	strategy
	proposition	**technology aspects**	
	proposition	**product languages**	
	market prospects	**technology-push and market-pull**	dichotomy
	IP	**applicability**	IPR
	IP	**costs**	IPR
	IP	**life-span**	IPR
	IP	**robustness**	IPR
	IP	**usage**	IPR
	IP	**value**	IP
	development pace	**start-ups**	
	IP	**IP**	value appropriation
	investors	**revenue streams**	
	business development stag	**start-ups**	
	incubator	**partners**	business model
	assets	**resources**	business model
	available time	**customer relationships**	business model
	market position	**competition**	
	IP	**knowledge**	
	assets	**collaborative arrangements**	such as outsourcing manufacturing or distribution
	finance	**profits**	theoretical optimum
	market environment	**appropriability regime**	profits
	finance	**profit generation**	
	IP strength	**patents**	can be “invented around” at modest cost
	IP	**complexity**	increases the potential for sequential innovation
	market position	**marketing**	appropriability
	market position	**manufacturing**	appropriability
	market position	**after-sales support**	appropriability
4	market position	**appropriability regimes**	strength
	assets	**fully integrated**	assets
	assets	**third parties**	assets
	complementary assets	**complementary assets**	
	market position	**market power**	
	market environment	**business environments**	complexity
	market position	**market players**	value chain
	asset control	**independent asset holders**	complementary assets
	assets	**integration**	collaboration
	complementary assets	**complementary assets**	control
	market control	**Weak appropriability**	market control
	market control	**tightly controlled market**	
	proposition	**invention**	
	market	**independent businesses**	
	business development stag	**start-up ventures**	
	IP	**patents**	
	market access	**complementary sales and service efforts**	
	IP	**patenting**	access to complementary assets
	market	**targeted industry sector**	
	IP	**patent**	
	complementary assets	**strategic partnerships**	
2	IP	**IPR**	
2	complementary assets	**complementary assets**	contracting or integration
	market control	**appropriability regime**	
	competition	**competition**	market power
	complementary assets	**access to complementary assets**	IPR
3	market control	**appropriability regime**	start-ups / IP / market control
4	market control	**appropriability regime**	market control
	IP	**IP**	complementary assets

	market majurity	**established industry**	limited to incremental improvements
	business development stag	**new, small firm**	
	proposition	**innovative proposition**	
	market impact	**break the existing order**	
	market power	**distribution of power**	
	market advantage	**dominant design paradigm**	new industry standards
	market capture	**price**	competition
	market power	**market leaders**	
	market position	**appropriability regime**	strength
	market strategy	**target markets**	radical disruptive inventions
	proposition	**new products**	
	market advantage	**volume production**	is not a significant advantage in relation to radical innov.
2	innovation	**product, process and service**	innovation
	market dominance	**dominant design paradigm**	
	proposition	**product life cycle**	time frame
	product life cycle	**product price**	
	market size	**small niche markets**	
	proposition	**dominant design**	
	markets	**existing markets**	
	market environment	**environment complexities**	
	proposition	**bespoke services**	
	proposition	**technology offer**	
	market access	**Difficult to enter markets**	complex markets
	IP	**patent**	benefit
	market	**environment complexity**	IP
	market	**market uncertainty**	IP
	market	**target markets**	IP
	asset control	**full level of integration**	independence
	market	**environment uncertainty**	
	market	**environment complexity**	
	market	**market entry points**	
	IP	**IP**	market
	market	**environment uncertainty**	
	market	**environment complexity**	
	proposition	**customised services** or **consulting firms**	
	businesses scalability	**businesses scalability**	
	value proposition	**product des/engineering des/softw. des/organization des/business model des/market des**	
	value proposition	**product function**	
	value proposition	**product language**	
	value proposition	**formal aesthetic and semantic functions**	
	product development	**development of the product**	
	value proposition	**radical innovations of meaning**	
	audience	***socio-cultural regimes***	
	value proposition	**signalling and symbol functions**	
	proposition	**design-driven innovation**	
	market	**market place**	allegiance
	market impact	**dominant product language**	the market impact
	competition	**dominant languages**	competition
	market need	**market-pull**	
	market need	**user-driven innovation**	
	proposition	**radical innovation**	
	market access	**adoption rate in the market**	
	proposition	**breakthrough technological changes**	
	audience	**shifts in socio-cultural regimes**	
	proposition	**technology-push**	
	proposition	**breakthrough product meanings**	
	market demand	**Economic and market demand**	
	market demand	**demand [that is] part of a semantic or then-emerging discourse**	
	proposition	**technology-push**	

market demand	**forms of demand**	econ. or market demand; social meaning; and loose meani	
development incentive	**technological opportunities**		
development incentive	**trigger a market-pull**		
open innovation	**'inbound' and 'outbound' knowledge flows**		
IP	**outbound IP**		
market access	**new market and technological opportunities**	firm size	
asset accessibility	**access to production and distribution networks**	new markets	
strategic partnerships	**collaboration**	new markets, access to production and distribution networ	
collaboration	**collaborative arrangements**	challenges	
collaboration	**open innovation**	financial performance and market value	
complementary assets	**complementary assets**	concerns about loss of intellectual property	
strategic partnerships	**relationships with partners enjoying stronger positions**		
IP benefit	**IPR**	functions as a facilitator for collaboration	
IP benefit	**IPR**	allow for setting boundaries around knowledge areas	
collaboration	**collaboration**		
proposition	**dominant design**	life-cycle	
knowledge sharing	**inbound and outbound knowledge flows**		
secrecy	**protecting some knowledge through secrecy**		
IP	**IPR**	formal and informal	
IP	**IPR**	new and has individual character	
IPRs	**formal IP**	patents rather than design rights	
IP protection scope	**patents**	only protect the technical aspects	
proposition	**design**	aesthetic novelty	
Design Right — scope	**product function**	excluded from design right protection	
Design Right — robustness	**registered design right**	can be invalidated	
market proximity	**Patents**	important when your business is not close to market	
market control	**competitors**		
competitors	**business intention**	made clear to potential competitors	
IPR — lifespan	**patent**	lifespan	
IP costs	**patent**	cost	
IP territories	**patent**		
IP litigation costs	**patent suit**	cost	
IP — signalling effect	**intellectual property**	likely to attract investors	
	Informal IP	secrecy, speed-to-market (lead time), and design complexi	
IP — freedom to operate	**defensive publications**	can be used to secure a company's freedom to operate	
IP — value	**copyright**	had little economic value	
patent — costs	**patent**	high maintenance and enforcement costs	
circumvent IP	**inventive steps**	competitors to circumvent	
secrecy — strength	**trade secret law**	protection is weaker	
secrecy	**secrecy**	lead time and learning curve advantages	
innovations — profitability	**large innovations**	expected profitability	
IP benefit	**patents and secrecy**	benefits and disadvantages	
IP — forms	**IP**	formal and informal	
IP law	**IP**	bias against, even fear of, the visual	
IP filing process	**US design patent**	examination process	
IP — scope of protection	**Design patent**	aesthetic, nonfunctional elements	
IP strength	**patent right**	robustness	
IP — costs	**patent**	expensive	
IP — licensing	**revenues through licensing**	are limited	
IP — licensing	**licensing**	effectiveness	
patent litigation	**patent litigation**	frequency	
IP — licensing	**IPR**	international sales and license revenues	

Appendix 7.6: Analysing the literature review — 2nd step: categorisation of concepts

no of iterations	meta variable	sub variable	label	concept	context
	assets	resources	assets	**resources**	business model
	assets	complementary assets	assets	**collaborative arrangements**	such as outsourcing manufacturing or distribution
	assets	integration	assets	**fully integrated**	assets
	assets	complementary assets	assets	**third parties**	assets
	assets	complementary assets	complementary assets	**complementary assets**	
	assets	accessibility	asset control	**independent asset holders**	complementary assets
	assets	integration	assets	**integration**	collaboration
	assets	complementary assets	complementary assets	**complementary assets**	control
	assets	accessibility	market access	**complementary sales and service efforts**	
	assets	complementary assets	complementary assets	**strategic partnerships**	
2	assets	complementary assets	complementary assets	**complementary assets**	contracting or integration
	assets	complementary assets	complementary assets	**access to complementary assets**	IPR
	assets	control	asset control	**full level of integration**	independence
	assets	accessibility	asset accessibility	**access to production and distribution networks**	new markets
	assets	complementary assets	complementary assets	**complementary assets**	concerns about loss of intellectual property
	business	development stage	development pace	**start-ups**	
	business	development stage	business development stag	**start-ups**	
	business	partners	incubator	**partners**	business model
	business	development stage	business development stag	**start-up ventures**	
	business	development stage	business development stag	**new, small firm**	
	business	scalability	businesses scalability	**businesses scalability**	
	finance	investors	investors	**revenue streams**	
	finance	profits	finance	**profits**	theoretical optimum
	finance	profits	finance	**profit generation**	
	IP	patent	IP	**patent**	benefit
	IP		IP	**IP**	market
	IP	open innovation	open innovation	**'inbound' and 'outbound' knowledge flows**	
	IP	sharing	IP	**outbound IP**	
	IP	benefit	IP benefit	**IPR**	functions as a facilitator for collaboration
	IP	benefit	IP benefit	**IPR**	allow for setting boundaries around knowledge areas
	IP	sharing	knowledge sharing	**inbound and outbound knowledge flows**	
	IP	secrecy	secrecy	**protecting some knowledge through secrecy**	
	IP		IP	**IPR**	formal and informal
	IP		IP	**IPR**	new and has individual character
	IP		IPRs	**formal IP**	patents rather than design rights
	IP	scope of protection	IP protection scope	**patents**	only protect the technical aspects
	IP	scope of protection	Design Right — scope	**product function**	excluded from design right protection
	IP	scope of protection	Design Right — robustness	**registered design right**	can be invalidated
	IP	life-span	IPR — lifespan	**patent**	lifespan
	IP	costs	IP costs	**patent**	cost
	IP	scope of protection	IP territories	**patent**	
	IP	costs	IP litigation costs	**patent suit**	cost
	IP	value	IP — signalling effect	**intellectual property**	likely to attract investors
	IP			**Informal IP**	secrecy, speed-to-market (lead time), and design complexity
	IP	value	IP — freedom to operate	**defensive publications**	can be used to secure a company's freedom to operate
	IP	value	IP — value	**copyright**	had little economic value
	IP	costs	patent — costs	**patent**	high maintenance and enforcement costs
	IP	imitation	circumvent IP	**inventive steps**	competitors to circumvent
	IP	secrecy	secrecy — strength	**trade secret law**	protection is weaker
	IP	secrecy	secrecy	**secrecy**	lead time and learning curve advantages
	IP	benefit	innovations — profitability	**large innovations**	expected profitability
	IP	benefit	IP benefit	**patents and secrecy**	benefits and disadvantages
	IP		IP — forms	**IP**	formal and informal
	IP	scope of protection	IP law	**IP**	bias against, even fear of, the visual
	IP	novelty	IP filing process	**US design patent**	examination process
	IP	scope of protection	IP — scope of protection	**Design patent**	aesthetic, nonfunctional elements
	IP	robustness	IP strength	**patent right**	robustness
	IP	costs	IP — costs	**patent**	expensive
	IP	licensing	IP — licensing	**revenues through licensing**	are limited
	IP	licensing	IP — licensing	**licensing**	effectiveness
	IP	litigation	patent litigation	**patent litigation**	frequency
	IP	licensing	IP — licensing	**IPR**	international sales and license revenues
	IP	suitability	IP	**applicability**	IPR
	IP	costs	IP	**costs**	IPR
	IP	life-span	IP	**life-span**	IPR
	IP	robustness	IP	**robustness**	IPR
	IP	utilisation	IP	**usage**	IPR
	IP	value	IP	**value**	IP
	IP	value	IP	**IP**	value appropriation
	IP	knowledge	IP	**knowledge**	
	IP	strength	IP strength	**patents**	can be "invented around" at modest cost
	IP	complexity	IP	**complexity**	increases the potential for sequential innovation
	IP	patents	IP	**patents**	
	IP	patents	IP	**patenting**	access to complementary assets
	IP	patents	IP	**patent**	
2	IP		IP	**IPR**	
	IP		IP	**IP**	complementary assets
	market	industry sectors	market context	**design industry sectors**	strategy
	market	incentives	market prospects	**technology-push and market-pull**	dichotomy
	market	customer relationships	available time	**customer relationships**	business model
	market	position	market position	**competition**	
	market	accessibility	market environment	**appropriability regime**	profits
	market	position	market position	**marketing**	appropriability
	market	position	market position	**manufacturing**	appropriability
	market	position	market position	**after-sales support**	appropriability

4	**market**	position	market position	**appropriability regimes**	strength
	market	position	market position	**market power**	
	market	accessibility	market environment	**business environments**	complexity
	market	position	market position	**market players**	value chain
	market	position	market control	**Weak appropriability**	market control
	market	position	market control	**tightly controlled market**	
	market	position	market	**independent businesses**	
	market	orientation	market	**targeted industry sector**	
	market	position	market control	**appropriability regime**	
	market	competition	competition	**competition**	market power
3	**market**	position	market control	**appropriability regime**	start-ups / IP / market control
4	**market**	position	market control	**appropriability regime**	market control
	market	majurity	market majurity	**established industry**	limited to incremental improvements
	market	impact	market impact	**break the existing order**	
	market	position	market power	**distribution of power**	
	market	position	market advantage	**dominant design paradigm**	new industry standards
	market	share	market capture	**price**	competition
	market	position	market power	**market leaders**	
	market	position	market position	**appropriability regime**	strength
	market	access strategy	market strategy	**target markets**	radical disruptive inventions
	market	position	market advantage	**volume production**	is not a significant advantage in relation to radical innovation
	market	position	market dominance	**dominant design paradigm**	
	market	size	market size	**small niche markets**	
	market	impact	proposition	**dominant design**	
	market	majurity	markets	**existing markets**	
	market	complexity	market environment	**environment complexities**	
	market	accessibility	market access	**Difficult to enter markets**	complex markets
	market	complexity	market	**environment complexity**	IP
	market	stability	market	**market uncertainty**	IP
	market	orientation	market	**target markets**	IP
	market	stability	market	**environment uncertainty**	
	market	complexity	market	**environment complexity**	
	market	accessibility	market	**market entry points**	
	market	stability	market	**environment uncertainty**	
	market	complexity	market	**environment complexity**	
	market	target audience	audience	***socio-cultural regimes***	
	market	adoption	market	**market place**	allegiance
	market	impact	market impact	**dominant product language**	the market impact
	market	competition	competition	**dominant languages**	competition
	market	need	market need	**market-pull**	
	market	need	market need	**user-driven innovation**	
	market	adoption	market access	**adoption rate in the market**	
	market	impact	audience	**shifts in socio-cultural regimes**	
	market	demand	market demand	**Economic and market demand**	
	market	demand	market demand	**demand [that is] part of a semantic or then-emerging discourse**	
	market	demand	market demand	**forms of demand**	economic or market demand; social meaning; and loose meaning
	market	accessibility	market access	**new market and technological opportunities**	firm size
	market	collaboration	strategic partnerships	**collaboration**	develop new markets, gain access to production and distribution networks
	market	collaboration	collaboration	**collaborative arrangements**	challenges
	market	collaboration	collaboration	**open innovation**	financial performance and market value
	market	collaboration	strategic partnerships	**relationships with partners enjoying stronger positions**	
	market	collaboration	collaboration	**collaboration**	
	market	proximity	market proximity	**Patents**	are particularly important when your business is not close to market
	market	control	market control	**competitors**	
	market	competitors	competitors	**business intention**	made clear to potential competitors
	proposition	technology	proposition	**technology aspects**	
	proposition	product languages	proposition	**product languages**	
	proposition	novelty	proposition	**invention**	
	proposition	novelty	proposition	**innovative proposition**	
	proposition	novelty	proposition	**new products**	
2	**proposition**	novelty	innovation	**product, process and service**	innovation
	proposition	life cycle	proposition	**product life cycle**	time frame
	proposition	life cycle	product life cycle	**product price**	
	proposition	characteristics	proposition	**bespoke services**	
	proposition	characteristics	proposition	**technology offer**	
	proposition	characteristics	proposition	**customised services** or **consulting firms**	
	proposition	characteristics	value proposition	**product design, engineering design, software design, organization design, business model design, market design**	
	proposition	characteristics	value proposition	**product function**	
	proposition	characteristics	value proposition	**product language**	
	proposition	characteristics	value proposition	**formal aesthetic and semantic functions**	
	proposition	development stage	product development	**development of the product**	
	proposition	impact	value proposition	**radical innovations of meaning**	
	proposition	characteristics	value proposition	**signalling and symbol functions**	
	proposition	development incentive	proposition	**design-driven innovation**	
	proposition	impact	proposition	**radical innovation**	
	proposition	impact	proposition	**breakthrough technological changes**	
	proposition	development incentive	proposition	**technology-push**	
	proposition	novelty	proposition	**breakthrough product meanings**	
	proposition	impact	proposition	**technology-push**	
	proposition	development incentive	development incentive	**technological opportunities**	
	proposition	development incentive	development incentive	**trigger a market-pull**	
	proposition	impact	proposition	**dominant design**	life-cycle
	proposition	design	proposition	**design**	aesthetic novelty

Appendix 7.6: Analysing the literature review — 3rd step: organisation of variables

no of iterations	meta variable	sub variable	extension	label	concept	context
	assets	resources		assets	resources	business model
	assets	complementary assets	manufacturing / distribution	assets	collaborative arrangements	such as outsourcing manufacturing or distribution
	assets	integration		assets	fully integrated	assets
	assets	complementary assets		assets	third parties	assets
	assets	complementary assets		complementary assets	complementary assets	
	assets	accessibility	independence	asset control	independent asset holders	complementary assets
	assets	integration	collaboration	assets	integration	collaboration
	assets	complementary assets		complementary assets	complementary assets	control
	assets	accessibility	sales and service efforts	market access	complementary sales and service efforts	
	assets	complementary assets	strategic partnerships	complementary assets	strategic partnerships	
2	assets	complementary assets	contracting / integration	complementary assets	complementary assets	contracting or integration
	assets	complementary assets		complementary assets	access to complementary assets	IPR
	assets	control	full integration	asset control	full level of integration	independence
	assets	accessibility		asset accessibility	access to production and distribution networks	
	assets	complementary assets		complementary assets	complementary assets	concerns about loss of intellectual property
	business	development stage		development pace	start-ups	
	business	development stage		business development stage	start-ups	
	business	partners	incubator	incubator	partners	business model
	business	development stage	start-up	business development stage	start-up ventures	
	business	development stage	new, small firm	business development stage	new, small firm	
	business	scalability	scalability	businesses scalability	businesses scalability	
	finance	investors	revenue streams	investors	revenue streams	
	finance	profits	profit generation	finance	profits	theoretical optimum
	finance	profits	profit generation	finance	profit generation	
	IP	patent	benefit	IP	patent	benefit
	IP		market	IP	IP	market
	IP	open innovation	knowledge flow directions	open innovation	'inbound' and 'outbound' knowledge flows	
	IP	sharing		IP	outbound IP	
	IP	benefit	managing collaboration	IP benefit	IPR	functions as a facilitator for collaboration
	IP	benefit	managing collaboration	IP benefit	IPR	allow for setting boundaries around knowledge areas
	IP	sharing	knowledge exchange	knowledge sharing	inbound and outbound knowledge flows	
	IP	secrecy	knowledge protection	secrecy	protecting some knowledge through secrecy	
	IP	formal and informal		IP	IPR	formal and informal
	IP	novelty		IP	IPR	new and has individual character
	IP	patents	design rights	IPRs	formal IP	patents rather than design rights
	IP	scope of protection	technical aspects	IP protection scope	patents	only protect the technical aspects
	IP	scope of protection	design right	Design Right — scope	product function	excluded from design right protection
	IP	scope of protection	design right	Design Right — robustness	registered design right	can be invalidated
	IP	life-span	patent	IPR — lifespan	patent	lifespan
	IP	costs	patent	IP costs	patent	cost
	IP	scope of protection	patent	IP territories	patent	
	IP	costs	IP litigation	IP litigation costs	patent suit	cost
	IP	value	signalling effect	IP — signalling effect	intellectual property	likely to attract investors
	IP	Informal	secrecy, speed-to-market, complexity		Informal IP	secrecy, speed-to-market (lead time), and design complexity
	IP	value	defensive publications	IP — freedom to operate	defensive publications	can be used to secure a company's freedom to operate
	IP	value	copyright	IP — value	copyright	had little economic value
	IP	costs	patent	patent — costs	patent	high maintenance and enforcement costs
	IP	imitation	circumvent IP	circumvent IP	inventive steps	competitors to circumvent
	IP	secrecy	trade secret law	secrecy — strength	trade secret law	protection is weaker
	IP	secrecy	lead time and learning curve	secrecy	secrecy	lead time and learning curve advantages
	IP	benefit	large innovations	innovations — profitability	large innovations	expected profitability
	IP	benefit	patents and secrecy	IP benefit	patents and secrecy	benefits and disadvantages
	IP	formal and informal		IP — forms	IP	formal and informal
	IP	scope of protection		IP law	IP	bias against, even fear of, the visual
	IP	novelty	US design patent	IP filing process	US design patent	examination process
	IP	scope of protection	US design patent	IP — scope of protection	Design patent	aesthetic, nonfunctional elements
	IP	robustness	patent	IP strength	patent right	robustness
	IP	costs	patent	IP — costs	patent	expensive
	IP	licensing	revenues	IP — licensing	revenues through licensing	are limited
	IP	licensing	effectiveness	IP — licensing	licensing	effectiveness
	IP	litigation	frequency	patent litigation	patent litigation	frequency
	IP	licensing	revenues	IP — licensing	IPR	international sales and license revenues
	IP	suitability		IP	applicability	IPR
	IP	costs		IP	costs	IPR
	IP	life-span		IP	life-span	IPR
	IP	robustness		IP	robustness	IPR
	IP	utilisation		IP	usage	IPR
	IP	value		IP	value	IP
	IP	value	appropriation	IP	IP	value appropriation
	IP	knowledge		IP	knowledge	
	IP	strength	invent around / costs	IP strength	patents	can be "invented around" at modest cost
	IP	complexity	sequential innovation	IP	complexity	increases the potential for sequential innovation
	IP	patents		IP	patents	
	IP	patents	access to complementary assets	IP	patenting	access to complementary assets
	IP	patents		IP	patent	
2	IP			IP	IPR	
	IP		complementary assets	IP	IP	complementary assets
	market	industry sectors	access strategy	market context	design industry sectors	strategy
	market	incentives	technology-push / market-pull	market prospects	technology-push and market-pull	dichotomy
	market	customer relationships	available time	available time	customer relationships	business model
	market	position	competition	market position	competition	
	market	accessibility	market environment	market environment	appropriability regime	profits
	market	position	marketing	market position	marketing	appropriability
	market	position	manufacturing	market position	manufacturing	appropriability
	market	position	after-sales support	market position	after-sales support	appropriability
4	market	position	appropriability regimes	market position	appropriability regimes	strength
	market	position	market power	market position	market power	
	market	accessibility	market environment	market environment	business environments	complexity
	market	position	value chain	market position	market players	value chain
	market	position	appropriability	market control	Weak appropriability	market control
	market	position	tightly controlled market	market control	tightly controlled market	
	market	position	independence	market	independent businesses	
	market	orientation	targeted industry sector	market	targeted industry sector	
	market	position	appropriability regime	market control	appropriability regime	
	market	competition	market power	competition	competition	market power
3	market	position	appropriability regime	market control	appropriability regime	start-ups / IP / market control
4	market	position	appropriability regime	market control	appropriability regime	market control
	market	majurity	incremental improvements	market majurity	established industry	limited to incremental improvements
	market	impact	existing order	market impact	break the existing order	
	market	position	market power	market power	distribution of power	
	market	position	dominant design paradigm	market advantage	dominant design paradigm	new industry standards
	market	share	price	market capture	price	competition
	market	position	market power	market power	market leaders	
	market	position	appropriability regime	market position	appropriability regime	strength
	market	access strategy	targeted industry sector	market strategy	target markets	radical disruptive inventions

market	size	niche markets / size	market size	**small niche markets**		
market	impact	dominant design paradigm	proposition	**dominant design**		
market	majurity	existing order	markets	**existing markets**		
market	complexity		market environment	**environment complexities**		
market	accessibility		market access	**Difficult to enter markets**	complex markets	
market	complexity		market	**environment complexity**	IP	
market	stability		market	**market uncertainty**	IP	
market	orientation		market	**target markets**	IP	
market	stability		market	**environment uncertainty**		
market	complexity		market	**environment complexity**		
market	accessibility		market	**market entry points**		
market	stability		market	**environment uncertainty**		
market	complexity		market	**environment complexity**		
market	target audience	adoption rate	audience	***socio-cultural regimes***		
market	adoption	adoption rate	market	**market place**	allegiance	
market	impact	dominant design paradigm	market impact	**dominant product language**	the market impact	
market	competition		competition	**dominant languages**	competition	
market	need	market-pull	market need	**market-pull**		
market	need	user-driven innovation	market need	**user-driven innovation**		
market	adoption	adoption rate	market access	**adoption rate in the market**		
market	impact	adoption rate	audience	**shifts in socio-cultural regimes**		
market	demand	market-pull	market demand	**Economic and market demand**		
market	demand		market demand	**demand [that is] part of a semantic or then-emerging discourse**		
market	demand	forms	market demand	**forms of demand**	economic or market demand; social meaning; and loose meaning	
market	accessibility	new markets	market access	**new market and technological opportunities**		
market	collaboration	strategic partnerships	strategic partnerships	**collaboration**	develop new markets, gain access to production and distribution networks	
market	collaboration	challenges	collaboration	**collaborative arrangements**	challenges	
market	collaboration	open innovation	collaboration	**open innovation**	financial performance and market value	
market	collaboration	strategic partnerships	strategic partnerships	**relationships with partners enjoying stronger positions**		
market	collaboration	collaboration	collaboration	**collaboration**		
market	proximity	patent	market proximity	**Patents**	are particularly important when your business is not close to market	
market	control	competitors	market control	**competitors**		
market	competitors	objectives	competitors	**business intention**	made clear to potential competitors	
proposition	technology		proposition	**technology aspects**		
proposition	product languages		proposition	**product languages**		
proposition	novelty		proposition	**invention**		
proposition	novelty		proposition	**innovative proposition**		
proposition	novelty	novelty	proposition	**new products**		
2 **proposition**	novelty	effectiveness	innovation	**product, process and service**	innovation	
proposition	life cycle	product	proposition	**product life cycle**	time frame	
proposition	life cycle	product price	product life cycle	**product price**		
proposition	characteristics	bespoke services	proposition	**bespoke services**		
proposition	characteristics	technology	proposition	**technology offer**		
proposition	characteristics	customisation	proposition	**customised services** or **consulting firms**		
proposition	characteristics	value proposition	value proposition	**product design, engineering design, software design, organization design, business model design, market design**		
proposition	characteristics	value proposition	value proposition	**product function**		
proposition	characteristics	value proposition	value proposition	**product language**		
proposition	characteristics	value proposition	value proposition	**formal aesthetic and semantic functions**		
proposition	development stage	product development	product development	**development of the product**		
proposition	impact	radical innovation	value proposition	**radical innovations of meaning**		
proposition	characteristics	radical innovation	value proposition	**signalling and symbol functions**		
proposition	development incentive	radical innovation	proposition	**design-driven innovation**		
proposition	impact	radical innovation	proposition	**radical innovation**		
proposition	impact	radical innovation	proposition	**breakthrough technological changes**		
proposition	development incentive	technology-push	proposition	**technology-push**		
proposition	novelty	product meanings	proposition	**breakthrough product meanings**		
proposition	impact	technology-push	proposition	**technology-push**		
proposition	development incentive	opportunities	development incentive	**technological opportunities**		
proposition	development incentive	market-pull	development incentive	**trigger a market-pull**		
proposition	impact	dominant design	proposition	**dominant design**	life-cycle	
proposition	design	aesthetic novelty	proposition	**design**	aesthetic novelty	

Appendix 7.6: Analysing the literature review — 4th step: frequency analysis

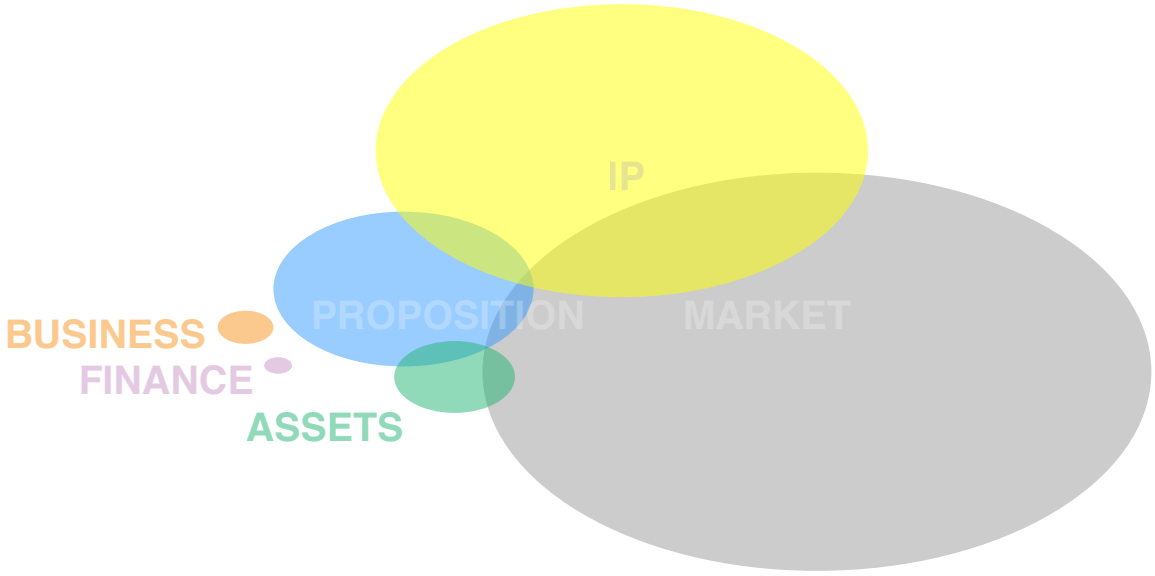
meta variable	sub variable
assets	resources
assets [2]	integration
assets [6]	complementary assets
assets [3]	accessibility
assets	control
business [4]	development stage
business	partners
business	scalability
finance	investors
finance [2]	profits
IP [5]	patent
IP [4]	
IP [3]	open innovation
IP [4]	benefit
IP [3]	secrecy
IP [3]	formal and informal
IP [2]	novelty
IP [5]	scope of protection
IP [2]	life-span
IP [5]	costs
IP [5]	value
IP	imitation
IP [3]	licensing
IP	litigation
IP	suitability
IP [3]	strength
IP	utilisation
IP	knowledge
IP	complexity
market	industry sectors
market	incentives
market	customer relationships
market [27]	position
market [7]	accessibility
market [2]	orientation
market [3]	competition
market [2]	majurity
market [2]	impact
market	share
market	size
market [4]	complexity
market [3]	stability
market	target audience
market [2]	adoption
market [2]	impact
market [2]	need
market [3]	demand
market [5]	collaboration
market	control
proposition	technology
proposition	product languages
proposition [5]	novelty
proposition [2]	life cycle
proposition [7]	characteristics
proposition	development stage
proposition [5]	impact
proposition [4]	development incentive
proposition	novelty
proposition	design

Appendix 7.6: Analysing the literature review — 5th step: summative analysis

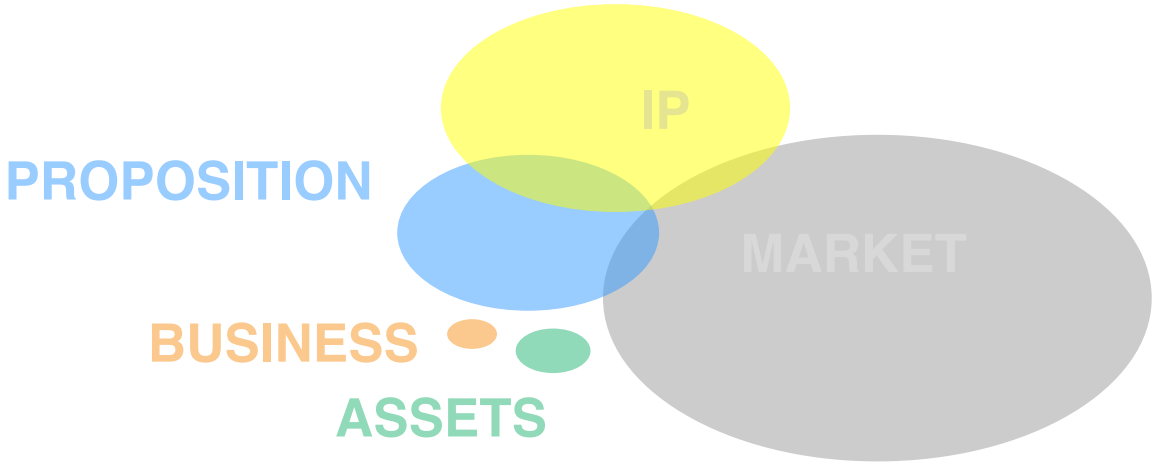
business		proposition		IP	
4	development stage	7	characteristics	5	patent
1	partners	5	novelty	5	costs
1	scalability	5	impact	5	value
		4	development incentive	5	scope of protection
		2	life cycle	4	benefit
		1	technology	4	[no specs]
		1	product languages	3	open innovation
		1	development stage	3	secrecy
		1	novelty	3	formal and informal
		1	design	3	litigation
				3	strength
				2	novelty
				2	life-span
				1	imitation
				1	litigation
				1	suitability
				1	utilisation
				1	knowledge
				1	complexity
6		**28**		**53**	
4		21		28	

finance		assets		market	
2	profits	6	complementary assets	28	position
1	investors	3	accessibility	7	accessibility
		2	integration	5	collaboration
		1	resources	4	complexity
		1	control	3	competition
				3	stability
				3	demand
				2	orientation
				2	majurity
				2	impact
				2	adoption
				2	impact
				2	need
				1	industry sectors
				1	incentives
				1	customer relationships
				1	share
				1	size
				1	target audience
				1	control
3		**13**		**72**	
0		6		44	excl. those marked red

Appendix 7.6: Analysing the literature review — diagrammatic representation



The diagram on the spread on the left corresponds to figure 54 in the thesis, the one on the opposite spread to figure 55. The emphasis of the literature is clearly different compared to the designer-entrepreneurs' combined interview responses. To mitigate bias, the identification of concepts mentioned in the literature focused on cited and paraphrased contents. Interpretative passages, and explanations which were added to those contents, were not included.


IP
PROPOSITION
MARKET
BUSINESS
ASSETS

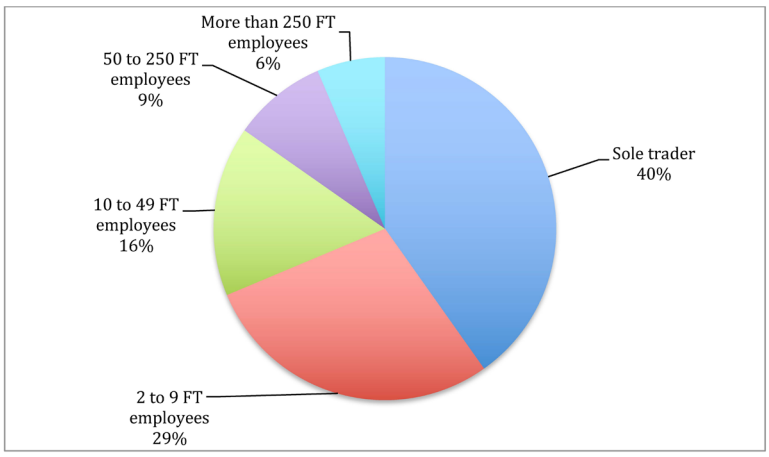
15.8. Appendix 8: Findings from a design right infringement survey

The following information was extracted from Hillner's paper (2017a) entitled as 'Design IP legislation in the UK — an opportunity to innovate?' which was presented at the first Design Management Academy Conference held at Hong Kong Polytechnic University in 2017. The image explanations in this section are text extracts from the original paper.

Value	Percent	Count
Advertising and Marketing	**4.36**	**23**
Interior Design and Architecture	**3.22**	**17**
Crafts	**6.44**	**34**
Product / Industrial Design	**54.73**	**288**
Furniture Design	**4.17**	**22**
Graphic Design	**1.52**	**8**
Fashion Design	**3.41**	**18**
Film, TV, Video, Radio and Photography	**0.38**	**2**
IT, Software and Computer Services	**1.14**	**6**
Publishing	**0.57**	**3**
Museums, Galleries and Libraries	**0.00**	**0**
Music, Performing and Visual Arts	**0.76**	**4**
Service Design	**0.95**	**5**
Other	**18.37**	**97**
	Total	527

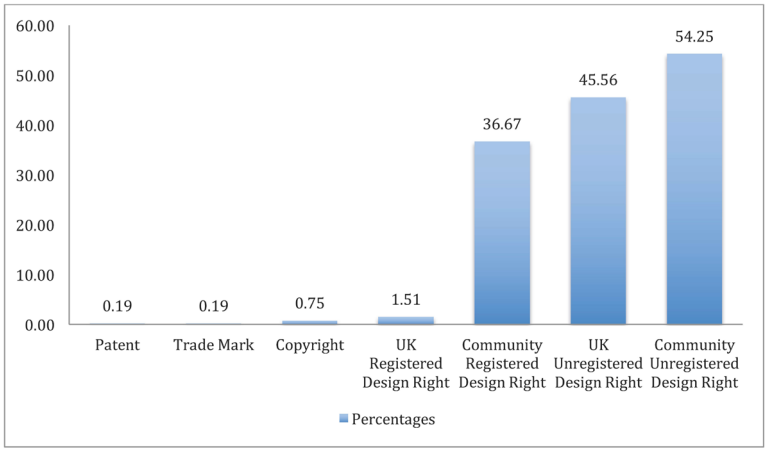
appendix 8, infographic 1:

'Registered design rights are most commonly used in the field of product design. Copyright protection is more commonly used in the field of entertainment industries and in the publishing sector. Some areas of design may be more difficult to protect than others. The relatively high number of responses to others suggests that the use of registered design rights is wide spread across industry sectors in the UK.' (Hillner, 2017a)



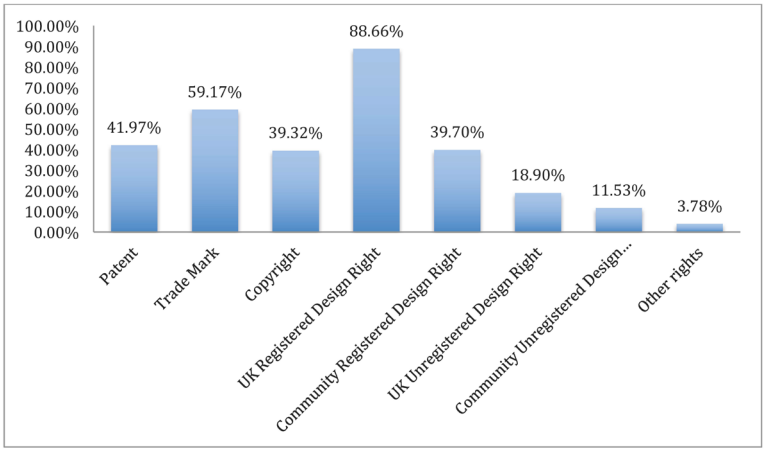
appendix 8, infographic 2:

'The smaller the firm, the more common is the use of registered design rights. It has to be said that in terms of numbers, smaller firms and sole traders dominate the design industry in the UK. There are only few medium and large corporations by comparison. So the distribution of registered design rights is vaguely proportionate to the number of small, respectively large design businesses in the UK. The filing costs which are low by comparison to patents, for example, attract businesses of all scales.' (Hillner, 2017a)



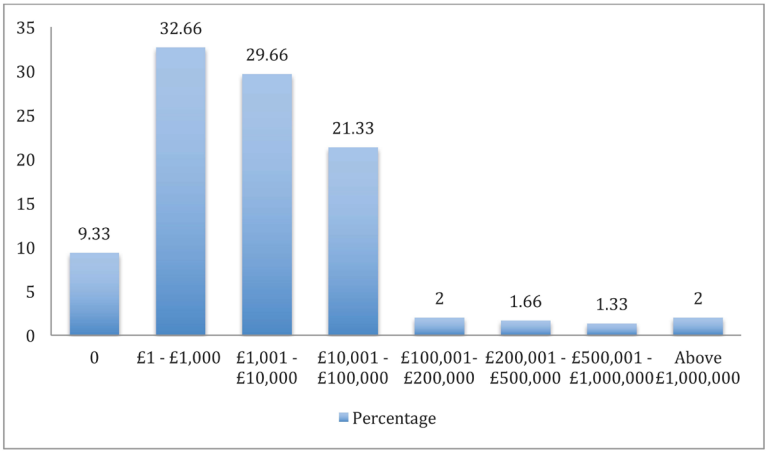
appendix 8, infographic 3:

'This question provides some insight with respect to the low number of EU registered design rights amongst UK-based firms and individuals. A high percentage, over one third, do not know that a EU registered design right (formerly: Community Registered Design Right) exists. The awareness for UK registered design rights is very high on the other hand: 98.49%.' (Hillner, 2017a)



appendix 8, infographic 4

'Registering design rights in the UK is far more common amongst UK-based firms and individuals, than to register EU-wide. […] The fact that 468 out of 529 respondents owned a UK registered design right and 210 a EU registered design right, makes it clear that some respondents filed for both, though not necessarily for the same design.' (Hillner, 2017a)



appendix 8, infographic 5: Investment in IP

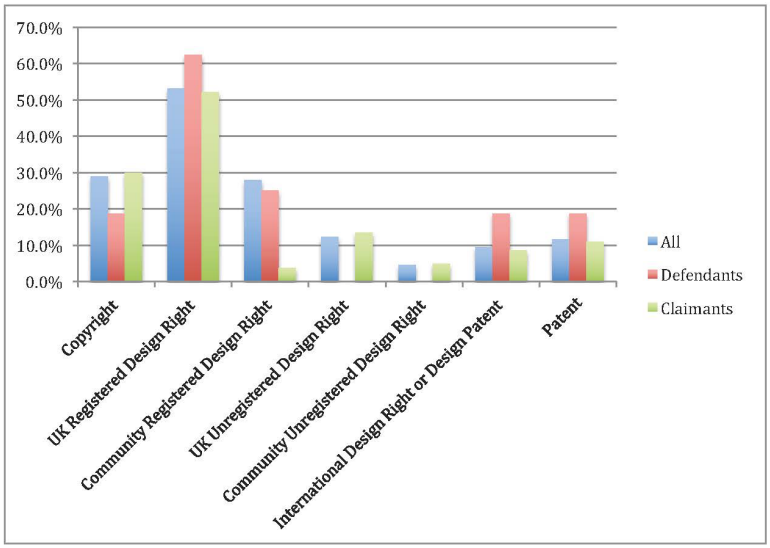
'Here respondents were asked how much they spend each year on IP acquisition and maintenance. […] Only 300 respondents could answer this question. Some 42% of respondents ticked 'Don't know'. Judging by the other responses, it is clear that investment in IP is modest amongst the owners of registered design rights with almost a third spending less than £1,000 and just under 30% spending between £1,001 and £10,000 per year. A very small number of respondents invest significant sums of £500K or more. These candidates supposedly hold large IP portfolios with patents included."
(Hillner, 2017a)

	Yes		No		Don't know	
(1) Copyright	**13.4%**	**71**	**83.4%**	**441**	**3.2%**	**17**
(2) UK Registered Design Right	**21.4%**	**113**	**74.9%**	**396**	**3.6%**	**19**
(3) Community Registered Design Right	**12.3%**	**65**	**83.0%**	**439**	**4.7%**	**25**
(4) UK Unregistered Design Right	**7.6%**	**40**	**87.0%**	**460**	**5.3%**	**28**
(5) Community Unregistered Design Right	**3.0%**	**16**	**90.9%**	**481**	**85.6%**	**31**
(6) International (Non-UK / Community) Design Right or Design Patent	**9.5%**	**50**	**85.6%**	**453**	**4.9%**	**26**

appendix 8, infographic 6: This question was asked to identify the number of respondents in disputes related to design-related rights. Here multiple options were allowed.

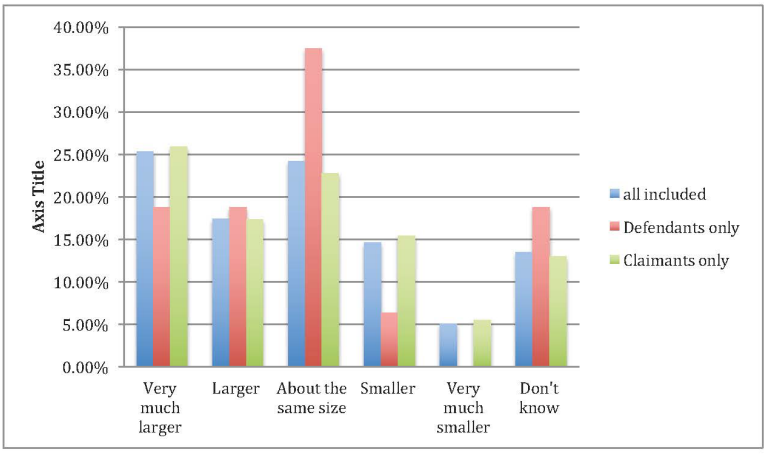
'The fact that there is a higher level of frequency of UK registered design rights (113) as opposed to EU registered design rights (65) should not surprise since twice as many respondents own a UK registered design rights as opposed to a EU registered design right (see infographic 4).' (Hillner, 2017a)

'170 respondents had been involved in disputes surrounding design right and / or copyright infringement within the EU/UK. 80% of those respondents were claimants (saw their rights as infringed), only 5.9% of respondents were defendants (had been alleged to have infringed the rights of others). 14.1% of respondents had been both claimants and defendants in the past. Only 49 respondents were involved in disputes over international design rights / design patent. The proportion between claimants (81.6%) and defendants (6.1%) is very similar with 12.2% of respondents having been both claimant and defendant. It is unsurprising that claimants are more likely to respond to a survey, since people are inevitably reluctant to admit having been accused of infringing the IP of others.' (Hillner, 2017a)



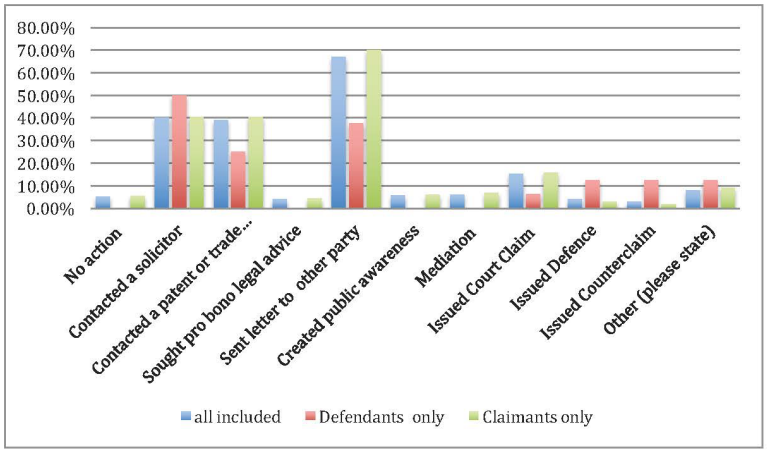
appendix 8, infographic 7:

'The data is fairly coherent between defendants and claimants with the exception of EU registered design right (Community Registered Design Rights). UK Registered Design Rights (UK RD) dominate the disputes. But this may be due to the fact that more than twice as many respondents invest in UK Registered Design Rights than in CRDs [see infographic 4]. The low outcome with respect to Unregistered Design Rights is not surprising given that around half of the respondents are unaware that such rights exist [see infographic 3].' (Hillner, 2017a)



appendix 8, infographic 8: This question addressed the sizes of opposing companies. Respondents were asked to assess the business size of the (main) opposing party in relation to their own company.

'The first two sets of bars are unsurprisingly similar. This is because over 90% of respondents are claimants. In relation to patents, Weatherall et al. claimed "Larger firms are disproportionately represented in listed cases, while SMEs and micro firms are rarely litigants." (Greenhalgh et al, 2010, p.3). The data collected here does not suggest that this hypothesis can be transferred to design rights. The only discrepancy between defendants and claimants is that a higher proportion of defendants are confronted with similarly sized companies than the other way round.' (Hillner, 2017a)



appendix 8, infographic 9:

'Very few design right owners (only 5%) who are aware of a potential infringement situation choose to do nothing. A high percentage seek legal advice (solicitor: 40.2%, Contacted a patent or trade mark attorney: 39.1%) and send an infringement letter (67.0%). Only 16% of claimants issued a court claim. 12.5% of defendants issued a defence, and the same percentage issued a counter claim. However, the low response rate amongst defendants means that the defendants figures are not statistically representative.' (Hillner, 2017a)

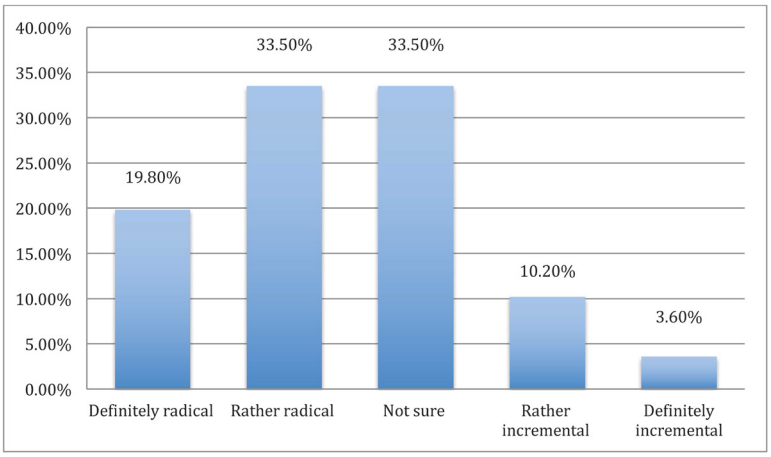
The following questions were directed to multiple incidents of infringement if respondents had experienced more than one dispute surrounding design right infringement:

appendix 8, infographic 10:

'Design Right enforcement is thought to be similarly costly compared to patent enforcement. The figures do not support this assumption at first sight. Cross tabulating the data with the previous question regarding the outcome reveals that those who paid nothing left no comments or very few with respect to satisfaction. 18 out of those who spent less than £1,000 did not take legal action. Either they gave in, or settled amicably. Some of them did not respond to this question. 9 out of the 37 who spent £5,000-£20,000 stated that "Potential gains didn't justify the cost" in the previous question. The same applied to seven from the group who spent £20K-100K. The respondent who ticked over £1m had the court judgement in his / her favour, and was 'reasonably content' with both the outcome and the process.' (Hillner, 2017a)

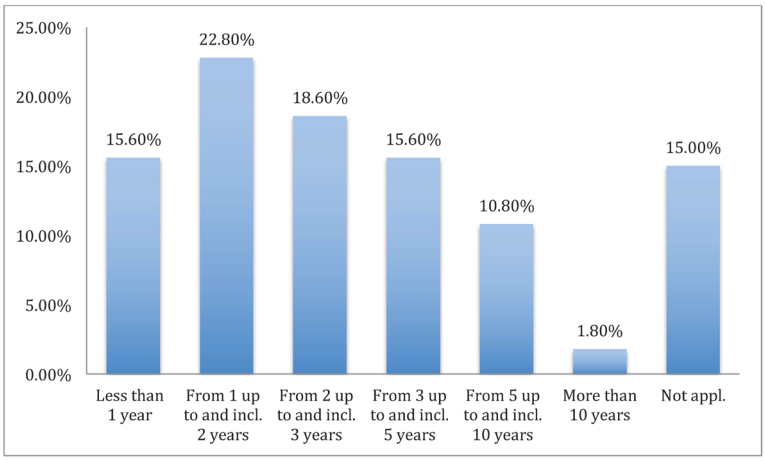
'The one who ticked £500K - £1m had the judgement in favour of the other party. They were "extremely disappointed" with both the outcome and the process.' (Hillner, 2017a)

'One of the two who sent £100K - £500K, received a court judgement in his / her favour and was "reasonably content" with both the outcome and the process. The other of those two stated that "Potential gains didn't justify the cost".' (Hillner, 2017a)



appendix 8, infographic 11:

'Very few design right stakeholders perceive their designs as incrementally innovative. If design is directly linked to innovation and economic growth, then weaknesses in the IP framework will have an adverse effect on the UK economy. It has to be noted here that a novelty attribute is a prerequisite for a registered design right. Although the novelty is not examined upon filing, designers who are aware of this requirement will refrain from registering a design right since they know that they will not be able to enforce it.' (Hillner, 2017a)



appendix 8, infographic 12:

'This set of responses shows that the chance for design rights to be infringed diminishes over time. This may be because the value of design depends on the product life cycle. The closer to the end, the lower will be the cumulative value that can be appropriated from a design. The risk of infringement is lower in the first than in the 2nd and 3rd year. It appears that infringers wait until proof of market has been established.' (Hillner, 2017a)

How designers rate the design right system in the UK

IP robustness was here defined as the level of protection offered by the type of right, and respondents were asked to rate it on a scale from 1 to 5, one being least robust and five being the most robust. 526 responses to this question provided a very credible set of data.

	1		2		3		4		5		Don't know	
Registered Design Right	**7.4%**	39	**14.1%**	74	**24.3%**	128	**18.4%**	97	**16.2%**	85	**19.6%**	103
Unregistered Design Right	**21.3%**	112	**17.5%**	92	**8.4%**	44	**1.3%**	7	**2.5%**	13	**49.0%**	258
Copyright	**8.8%**	47	**10.3%**	54	**19.8%**	104	**15.4%**	81	**14.6%**	77	**31.0%**	163
Trade mark	**3.6%**	19	**4.6%**	24	**12.5%**	66	**26.6%**	140	**28.1%**	147	**24.7%**	130
Patent	**5.7%**	30	**2.7%**	14	**8.6%**	45	**16.7%**	88	**38.2%**	201	**28.1%**	148

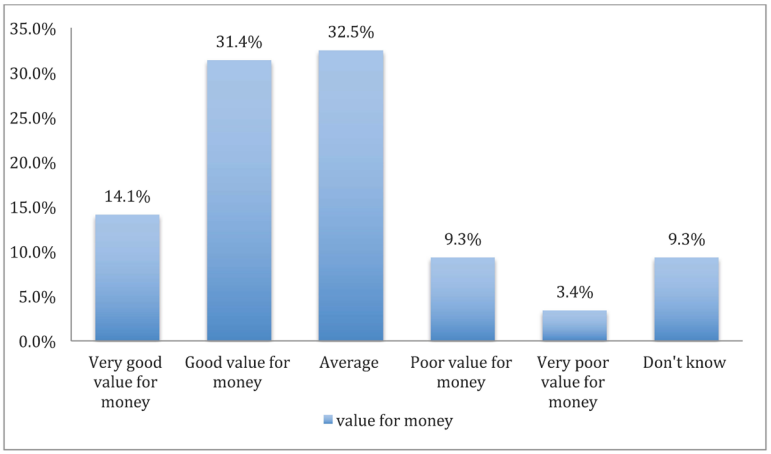
appendix 8, infographic 13:

‘Unregistered Design Rights are perceived as the least robust form of IP. Registered Design Rights are perceived as more robust by comparison, but less robust than trade mark and patent. The latter received the highest scores with respect to robustness. Copyright is perceived as significantly more robust than Unregistered Design Rights. However, the scores here are difficult to compare to those of Registered Design Rights due to the high number of respondents (31%) who ticked “Don’t know”.’ (Hillner, 2017a)

	1		2		3		4		5		Don't know	
Registered Design Rights	**10.6%**	56	**12.0%**	63	**24.0%**	123	**20.0%**	104	**14.6%**	77	**19.6%**	103
Unregistered Design Rights	**22.4%**	118	**13.5%**	71	**11.4%**	60	**1.9%**	10	**1.7%**	9	**49.0%**	258

appendix 8, infographic 14:

‘The respondents were asked to rate their level of confidence in both unregistered and registered design rights on a scale from 1 to 5, with one reflecting very low confidence and five very high confidence. Confidence in Unregistered Design Rights is very low by comparison to Registered Design Rights. Almost half of the respondents are unable to express a point of view, and almost half of the rest gave it the lowest rating. It is likely that Unregistered Design Rights are not sufficiently understood by Design Right stakeholders. Confidence in Registered Design Rights is slightly above average. Confidence in Unregistered Design Rights could be enhanced if this form of IP were to be converted into a 3D copyright.’ (Hillner, 2017a)



appendix 8, infographic 15: respondents were asked to rate registered design rights with respect to value for money.

'Despite limited confidence respondents feel relatively positive about the costs involved in registering Designs. The question does not cover the costs involved in litigating infringement. The fact that the ratings are fairly positive with an average mean of 3.48 (between "Average" and "Good Value for Money") suggests that design right owners appreciate the low registration costs despite the fact that their confidence in this form of IP is very limited.' (Hillner, 2017a)

15.9. Appendix 9: List of interviews

The range of interviews comprises *case study interviews* and *expert interviews*. The latter helped to critically interrogate the data obtained through the former. The interview with Sebastian Conran started out as an expert interview, but subsequently became a case study in its own rights. E-mails and e-mail trails helped to clarify specific queries in relation to individual case studies. For example, Laura Breen from Magmatic Limited could help to clarify approximately when the first copy of Trunki entered the market, which could be compared to the statistical data gathered during the design right infringment survey. The list on the following pages is organised in chronological order.

date	interview partner	duration	form	location	transcription	intention	outcome
06/11/2012	**Paul Thomas** Cupris	90 min approx.	in person (case study interview)	InnovationRCA, London	complete	Grounded Theory data gathering	preliminary insights
08/11/2012	**J. Paul Neeley** Yossarian Lives!	42m	phone (case study interview)	RCA Kensington, London	complete	Grounded Theory data gathering	preliminary insights
20/11/2012	**Thomas Hoehn** Imperial College	22m	in person (expert interview)	Imperial College Business School	complete	contextual data gathering	insights into forms & managem. of IP
07/12/2012	**Mathew Holloway**, Arctica	22m	phone (case study interview)	N/A	complete	Grounded Theory data gathering	preliminary insights
18/01/2013	**Roland Lamb** Roli	41m	in person (case study interview)	Roli Labs, London Shoreditch	complete	Grounded Theory data gathering	preliminary insights
15/03/2013	**Mathew Holloway**, Arctica	N/A	e-mail exchange (case study)	N/A	N/A	data verification	preliminary insights
16/05/2013	**Nick Coutts** InnovationRCA	61m	in person (expert interview)	RCA, Dana Centre, London	partial	contextual data gathering	value networks, innovation cylces
23/05/2013	**Expert 1** Venture Capitalist UCL	55m	in person (expert interview)	a café at London Old Street	partial	contextual data gathering	vc funding, IP and signalling effects
24/05/2013	**Expert 2** Imperial College Business School	64m	in person (expert interview)	Skype	partial (almost complete)	contextual data gathering	market conditions and prospects

date	interview partner	duration	form	location	transcription	intention	outcome
17/05/13	**Denis Anscomb**	52m	in person (case study interview)	InnovationRCA, London	complete	Grounded Theory data gathering	preliminary insights
18/06/2013	**Peter Brewin** Concrete Canvas	32m	phone (case study interview)	N/A	complete	Grounded Theory data gathering	preliminary insights
03/07/13	**Sheraz Arif** Squease	70m	in person (case study interview)	a café, Liverpoo; Street, London	complete	Grounded Theory data gathering	preliminary insights
04/07/13	**Gregory Ebbs** Robofold	62m	in person (case study interview)	InnovationRCA, London	complete	Grounded Theory data gathering	preliminary insights
28/11/13	**Expert 3** Cambridge Enterprise	50m	phone (expert interview)	N/A	complete	contextual data gathering	verifying case study data, incubator managem.
18/12/2013	**John Hutton** Cupris	30-40m (precise duration unknown)	in person (case study interview)	InnovationRCA, London	partial (recording device failed)	Grounded Theory data gathering	data follow-up — developm strategy
18/12/2013	**Adam Sutcliffe** Orbel	28m	in person (case study interview)	InnovationRCA, London	complete	Grounded Theory data gathering	preliminary insights
21/02/14	**Sebastian Conran** Conran Associates	1hr 15m	in person (case study interview)	Studio of Conran Associates, London	complete	discussion of Any-wayUp cup design	commercial value of design services

date	interview partner	duration	form	location	transcription	intention	outcome
18/03/14	**Expert 4** Blue Pencil Media	1hr 24m	in person (expert interview)	British Library, London	complete	contextual data gathering	discussion of forms of IP
07/05/14	**Mandy Haberman**	1hr 45m	in person (case study interview)	a cafe, Central London	complete	verify significance and benefits of IP	insight into IP litigation
01/07/14	**Expert 5** IP Solicitor	23m	phone (expert interview)	N/A	complete	verify information gathered around AnywayUp Cup and Trunki	insight into robustness of IP, incl. design rights, 3D trademarks
08/07/14	**Dids Macdonald, OBE** ACID	32m	phone	N/A	complete	contextual data gathering	ratios: utilisation of patent versus design protection
06/09/14 - 15/10/14	**Professor Richard Buchanan,** Case Western University	N/A	e-mail correspondences	N/A	N/A	discussion of conference paper	insight into publication prospects
10/11/14	**Expert 6** Venture Capitalist	35m	Skype (expert interview)	N/A	complete	contextual data gathering	vc funding, IP and signalling effects
18/11/14	**Matthew Rappaport** IP Checkups	49m	Skype (expert interview)	N/A	partial	contextual data gathering	IP strategies in relation to patents and design rights

date	interview partner	duration	form	location	transcription	intention	outcome
07/01/15 – 12/01/15	**Mandy Haberman, Ruth Soetendorp,** IPAN	N/A	e-mail correspondences	N/A	N/A	contextual data gathering	insight into IP litigation
05/11/15	**Prof. Alexander Manu**, OCAD University	10m approx.	conversation	IASDR gala dinner, Brisbane	N/A	verification of significance of IP	relevance of study confirmed
11/11/15	**Expert 7** Centre for Commercial Law Studies	N/A	e-mail	N/A	N/A	feedback on questionnaire design	insight into intentional infringement
12/07/16	**Robert Law, Laura Breen** Magmatic Ltd	1hr 45m approx. (last 15m not captured)	in person (case study interview)	Trunki Office in Bristol	complete (except last 15m)	Grounded Theory data gathering	implications of legal disupte with competitor
20/07/2016	**Mandy Haberman, Ruth Soetendorp,** IP Awareness Network (IPAN)	N/A	e-mail correspondence	N/A	N/A	contextual data gathering	IP awareness amongst UK IP stakeholders
30/06/17	**Sebastian Conran** Conran Associates	1hr 9m	in person (case study interview)	Studio of Conran Associates, London	complete	Grounded Theory data gathering	insight into triangulation of innovations
30/06/17	**J.Paul Neeley** Yossarian Lives	10m approx.	conversation	RCA, Darwin Bldg., London	N/A	business development update	progress verification

date	interview partner	duration	form	location	transcription	intention	outcome
26/10/2017	**Laura Breen** Magmatic Ltd	N/A	e-mail correspondence	N/A	N/A	data verification	duration between product launch and infringement
16/03/2018	**Andy Brand** Squease	10m approx.	conversation	Singapore	N/A	business development update	progress verification
05/09/2018	**Sheraz Arif** Squease	49m	Skype (case study interview)	N/A	full	business development update	progress verification
06/09/2018	**Denis Anscomb** KwickScreen	40m	Skype (case study interview)	N/A	partial	business development update	progress verification
07/09/2018	**Paul Thomas** Cupris	43m	Skype (case study interview)	N/A	partial	business development update	progress verification
16/11/2018	**Adam Sutcliffe** Orbel	41m	Skype (case study interview)	N/A	partial	business development update	progress verification

15.10. Appendix 10: Publications from the PhD study

The list below shows the range of peer-reviewed conference papers which have emerged from this PhD study. They are also listed on the left-hand side of the diagram shown in Figure 16 (section 4). The paper published in 2014 (Hillner, 2014) triggered a conversation and an email correspondence with the DMI keynote speaker, as explained in section 4. The third paper published in 2015 (Hillner, 2015b) related to the IASDR conference mentioned in the same section. Both correspondences are listed in appendix 9. The first paper published in 2017 (Hillner, 2017a) provided the data discussed in section 8, as well as the diagrams shown in appendix 8.

In comparison, the range of papers reveals a degree of incoherence in the use of terminologies, in particular the earlier publications. Through growing the available knowledge base, significant words such as copying, infringement, etc. could be used in this thesis with a greater degree of clarity and consistency by comparison to some of the papers. For example, having used the term *deliberate infringement* in reference to the Intellectual Property Act 2014 during a presentation to the UK IPO's Research Expert Advisory Group (REAG) in July 2015, I was subsequenty told by one of REAG's members that the correct term was *intentional infringement*. The Intellectual Property Act 2014 introduced criminal sanctions to the *intentional creation of identical copies* of registered designs. An email correspondence with Expert 7, an IP attorney — listed in appendix 9 — encouraged me to limit the use of the term *copying* to the context of intentional infringement.

Hillner, M. (2013) On IP and secrecy — The relevance of IP to design-led start-up businesses, International Association of Societies of Design Research (IASDR), Tokyo, Japan: Shibaura Institute of Technology; referred to as 'IASDR conference paper, Tokyo' in Figure 16

Hillner, M., de Leon, N. (2013) On IP and secrecy — Management for Innovation, IDEMI 2013 (3rd Conference on Integration of Design, Engineering & Management for Innovation), Porto, Portugal: Faculdade de Engenharia da Universidade do Porto (FEUP); referred to as 'IDEMI conference paper, Porto' in Figure 16

Hillner, M. (2013) IP, an interesting phenomenon, The relevance of patents for the design-led start-up business, Tsinghua International Design Management Symposium. Shenzhen, China: Futian Conference Centre (TIDMS); referred to as 'IEEE conference paper, Shenzen' in Figure 16

Hillner, M., de Leon, N., Sun, Q. (2014) IP Management in Response to Changing Conditions, 19th DMI: Academic Design Management Conference, Design Management in an Era of Disruption, London, UK: London College of Fashion; referred to as 'DMI conference paper, London' in Figure 16

Hillner, M., Haberman, M., Soetendorp, R. (2015) Innovation and academia —IPR ownership in the UK 17th International Conference on Engineering and product Design Education, Loughborough, UK: Loughborough University; referred to as 'EPDE conference papers, Loughborough' in Figure 16

Hillner, M. (2015a) technology and form — design rights versus patents 17th International Conference on Engineering and product Design Education, Loughborough, UK: Loughborough University; referred to as 'EPDE conference papers, Loughborough' in Figure 16

Hillner, M. (2015b) Design IP — a blessing or a burden IASDR (International Association of Societies of Design Research) Interplay, Brisbane, Australia: Queensland University of Technology; referred to as 'IASDR conference paper, Brisbane' in Figure 16

Hillner, M. (2016) Innovation and IP — what works and what doesn't, The ISPIM Innovation Summit, Kuala Lumpur, Malaysia, 2016; referred to as 'ISPIM conference paper, Kuala Lumpur' in Figure 16

Hillner, M (2017a) Design IP legislation in the UK — an opportunity to innovate? Design Management Academy Conference, Hong Kong, 2017; referred to as 'DMA conference papers, Hong Kong' in Figure 16

Hillner, M (2017b) Managing Design IP in the UK — does the end justify the means? Design Management Academy Conference, Hong Kong, 2017; referred to as 'DMA conference papers, Hong Kong' in Figure 16

Hillner, M (2018) managing innovation — business development model for design-led startups DMI Academic Design Management Conference, Ravensbourne, London, UK; referred to as 'DMI conference papers, London', in Figure 16

Hillner, M (2018) Design Thinking —A Buzz Word or the Holy Grail in Design? E&PDE 2018, The 20th International Conference on Engineering and product Design Education, London, UK; referred to as 'EPDE conference paper, London' in Figure 16