

# Attract and connect: The 22@Barcelona innovation district and the internationalisation of Barcelona business

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## ABSTRACT

*Innovation is frequently cited as the battleground of international competitiveness in the 21st century and cities are increasingly viewed as the cauldrons of innovation, enriching not only their surrounding regions but their nations as a whole. Across the globe massive renewal is taking place in our cities, fundamental shifts in the nature of work and the workplaces they host, and transformation of their output as well as their consumption. Cities compete with one another to attract not only firms and direct foreign investment, but also skilled knowledge workers to develop their social capital and capacity for innovation. But is the attraction of top talent the crucial ingredient? In this study we examine the transformation of Barcelona and its historic cotton district to become an international hub of innovation.*

**Keywords:** creative classes, urban regeneration, local development

## INTRODUCTION

Barcelona is on a quest to transform its industries and become a knowledge-intensive city. It is one of the world's most attractive cities as measured by European City Monitor in 2006 where it rated as number 1 in Europe for quality of life for employees and number 5 in Europe as city for businesses to potentially relocate to. Each year Barcelona attracts a growing resident international community, not only there for business or holiday but to set up home, find employment or start a business. Fifteen per cent of the population is from outside Spain (Ajuntament de Barcelona 2007).

Barcelona is an increasingly popular destination for the 'creative classes' (defined as highly

educated professionals and other 'creative' people), with almost 55% of members of the international community from the European Union 15 and the USA and Canada now living there educated beyond the age of 18. This is more than double the proportion of the local population so educated (22.6%) (Ajuntament de Barcelona 2007). The city is now finding, however, that attracting this talented international community is not enough on its own to stimulate its transformation to the knowledge-intensive city. Indeed, employment data is showing growth in the proportion of lower value add jobs, fuelled by growth in the construction sector and leisure services, rather than the knowledge-intensive sec-

tors (IDESCAT 2006). For members of this international community to become a significant actors in helping transform the knowledge intensity of the city, Barcelona authorities are increasingly recognising the need to connect it to the local firms and institutions.

Recognising this need, in February 2007, the City Government, the Ajuntament de Barcelona, commissioned Imperial College Business School to undertake a research project focusing on the 22@ Barcelona District of Innovation, a large scale regeneration project that is transforming almost 200 hectares of the city into a centre for the knowledge intensive industries. The Ajuntament de Barcelona tasked the research team first with understanding the extent to which the international community was currently engaged with local firms and institutions and the local community. Secondly, the team was asked to determine the attitudes of the local community, firms and organisations towards newly arrived internationals and vice versa, and finally to suggest what actions could be taken to enhance the level of engagement between these communities in line with the objectives of the regeneration programme. More specifically, the Ajuntament sought to find ways to: accelerate the transformation of the city to a 'knowledge city' (Barcelo 2007), and especially the new 22@ District so it becomes the new international heart of the city for both firms and institutions and the international workforce and harness the international community's links to firms and institutions worldwide to develop Barcelona as a global hub of innovation for knowledge-based industries and provide new international market opportunities for existing firms.

This paper describes the results of the study and demonstrates how successful urban regeneration and the corresponding transformation to a knowledge-intensive economy demands a multi-faceted approach. The paper suggests three conclusions of relevance to city policymakers concerned with securing the economic future of their cities in the new environment. The first is that reliance on one or even a small set of linked

initiatives is not enough for success in such a shift; a systemic approach is required. Secondly, it suggests more specifically that reliance on attracting international human capital as a catalyst for knowledge-intensive economic development without considering their personal needs and the needs for proper measures to connect this new population to the existing one, its firms and institutions is not likely to be successful. Proactivity is needed in making connections between key players. Thirdly, it suggests that supply-side policies alone are insufficient and need complementing with demand-side initiatives.

### **INFLUX OF HUMAN CAPITAL, INTERNATIONAL SOCIAL NETWORKS AND THEIR IMPACT ON THE LOCAL ECONOMY AND COMMUNITIES**

There is now a burgeoning literature on the importance of human capital in increasing levels of innovation in many industries and given localities. This literature covers both local attributes and amenities which attract skilled international labour to a specific locality and the extra effects that develop through international movements between places of origin and settlement that create new social and economic networks, which in turn result in new business opportunities.

In her work, Saxenian (2005), for example, shows that new immigrants as well as first generation US citizens from China, India and South East Asia represent around one third of employees in the high tech industries of Silicon Valley. She further suggests that the transformation of the rapidly emerging economies, especially China and India, and their skill base during the last decade has created not only an outward flow of highly trained knowledge workers to the US but has also initiated a reverse flow as many of these knowledge workers return to their home countries and towns. Their return, however, is not a reverse brain drain but evidence of what Saxenian describes as 'brain mobility'. The term 'brain mobility' refers to individuals working in one or more locations and moving seamlessly between

these, even when they are many time zones apart. In the case studied by Saxenian (2005), these skilled professionals and senior managers return 'home' part time or for a short period to establish local businesses that can supply US-based firms with goods or services or to provide other out-sourced services.

In the case of Silicon Valley we see not only an international professional community connecting and being deeply engaged with local firms but also creating the principal actors network, developing ties with their original community by leveraging their international social network. This international community's social network, which extends back into their home countries and often other countries, is an important tool for increasing the competitiveness of firms in their original locality, as well as opening up potential new international markets.

Florida (2002) suggests that these kinds of professionals, what he calls the 'creative classes', are highly mobile in emerging knowledge-based economies and will settle in places that offer desirable socio-cultural and economic environments. He argues that this movement creates a virtuous circle as firms relocate to exploit the newly available high quality human and social capital, as well as engage more closely with advanced and innovative consumers of their products and services. 'Yes, but this is necessary but insufficient, if you don't connect them, they use your city like a hotel' said one of our informants.

From a somewhat different angle, Fujita et al. (1999) also stress the importance to innovation of a heterogeneous labour force in terms of skills and backgrounds that brings diversity and suggests that unless a city and its economy are constantly supplied with such people convergence in knowledge and information will occur and innovation will diminish. Cities that do not have the diversity of skills to re-invent themselves when faced with industry, technological or marketplace changes will atrophy, lacking the human capital to generate new industries and employment and failing to attract new firms and direct investment.

Our research suggests that failure to exploit the diversity, higher levels of education and knowledge and the international social networks of a highly mobile international community that is already present in the city is likely to hold back a city's progress towards becoming a knowledge-intensive economy.

The principal finding of the research is that it is not sufficient simply to attract a highly skilled international community to live and work in a given city with the aim of encouraging greater knowledge-intensity in existing and new businesses. For the city to benefit, it is essential to capture the knowledge and economic spill-overs into local firms and institutions and do so by pro-actively engaging both local and new international communities. Our research also sought to identify the programmes a city, in this case, Barcelona, might implement to maximise the connectedness of this community and the benefits that would accrue.

## THE 22@ BARCELONA INNOVATION DISTRICT

Barcelona, the capital of Catalonia, is the second largest city of Spain in population, only exceeded by Madrid. Barcelona City Council, the *Ajuntament de Barcelona*, is the local public administration that represents, governs and administers the city's interests. It has a population of 1.6 million, and a metropolitan population of 3.3 million.

The 22@ Barcelona, District of Innovation, is located in one of the poorer districts of Barcelona, Sant Marti. In the nineteenth century, this district was the industrial hub of Barcelona and was the fifth largest cotton city in the world (Hughes 1982). With the demise of the cotton industry at the beginning of the twentieth century, the storage, weaving and dyeing yards became the home of light engineering and the printing industry. By the late nineteenth century, the district was run down and had high unemployment compared with the rest of the city. It did, however, offer an extensive area that could be developed, around 200 hectares of privately owned

land, all located within two kilometres of the city centre. In the year 2000 a regeneration plan was approved to transform this district into the new knowledge hub of the city. The regeneration programme, now in place, is designed to transform the physical infrastructure, aims to create four industry clusters that could bring together local and international industry, universities, public and private sector research centres and technology transfer programmes, including incubators for new firms, and financial support for start ups. Unusually for many such regeneration schemes, the 22@Barcelona plan includes provision for housing and social amenities.

The employment target is highly ambitious - to create 100,000 jobs in the 22@ Barcelona District versus around 25,000 today. Over 900 new firms have set up there already. The 22@ Barcelona District anticipates that around 20 to 25% of the workforce in these new firms and knowledge-based industries could be from the international community, creating a demand for schooling to support an additional 5 to 10,000 children from the international community.

By the time of our study, a good deal of infrastructure has already been put in place, almost 2 million square metres of the 4 million square metres of new development planned had been built or was in progress. The District had around 180 million euros of investment in new centralised heating and air-conditioning, electricity distribution, pneumatic waste disposal, telecommunications infrastructure, including extensive dark fibre, and smart traffic management systems.

The city has taken a strategic approach to the development of this district, balancing the creation of new employment, mixed residential development including social housing, live-work spaces, relocation of universities, and the development of leisure facilities, new green spaces, and rapid transportation systems both within the district as well as between it and the rest of the city. The objective was always to exploit the centrality of this district and dramatically increase the density of employment and workspaces, rather than

see new industries develop on the edge of the city.

Barcelona and more generally Catalonia has been a leading exponent of industry clusters since the 1980's. In the 22@ District takes this to a new level with a focus on four industry clusters – ICT, Media, Bio-Medical, and Energy. Each cluster involves a dedicated locality within the 22@ District, the relocation of leading firms within those industries, research centres, university departments and their technology transfer offices, dedicated space for SMEs, as well as provision of space for start ups, incubators for new ventures, and appropriate residential and leisure amenities. Such a clustering approach, the triple helix, has been more generally exploited, but what makes Barcelona and the 22@ District unique is the proximity not only of the four clusters to the city centre, but also to one another.

The strategy for economic development of Barcelona recognises that innovation occurs not only within each of these four industry clusters, but also through interaction and collaboration between them. The physical proximity of the firms and institutions, and the physical proximity and engagement between the skilled knowledge workers within them, is expected to deliver greater innovation and the faster exploitation of that innovation both locally and internationally. What we find in Barcelona, therefore, is not only the regeneration of the physical infrastructure of the city but, in the 22@ District, the execution of a strategy that integrates, economic, physical and social regeneration with investment in economic and social programmes as much as in property development. The challenge the city recognised was how to make this not only a hub of innovation locally, for Catalonia and for Spain, but how to do this internationally, and what role the international community that was already present might play.

### **The challenges faced by the city authorities**

The goal of the city is highly ambitious: it is to make the 22@ District the city's new hub for inno-



FIGURE 1: 22@ BARCELONA, DISTRICT OF INNOVATION - SHOWN AS DARK GREY AREAS IN THE FOREGROUND

vation, especially in the knowledge intensive industries. Our research highlights five major challenges:

- The human capital was originally not aligned with the needs of industry clusters, with only 15.2% of the working age population of this district educated beyond 18 years of age (Ajuntament de Barcelona 2007)
- The incipient level of local entrepreneurship was very low as measured by the Global Entrepreneurship Monitor (2007). Adult-age participation in high-expectation entrepreneurial activity is just 0.2% in Spain, the lowest within the EU, and contrasts with observed levels in North America, Australia, Ireland, New Zealand and the United Kingdom, which range from 0.8% to 1.6%
- Venture capital funding is crucial to attracting firms and supporting start ups in industry clusters such as those developing in the 22@ District. However, early stage funding is scarce, especially under one million euros (Guillot 2006)

- Large firms, especially those headquartered in the region, are 'essential to the innovation system', (EU, 2006). However, Barcelona has historically had few large firms outside the financial services industry, with most local Spanish firms selecting Madrid as their main headquarters and international firms favouring Madrid as their main administrative centre.
- Barcelona's attractiveness to members of the international community is not reflected in its business linkages to other global cities (Taylor 2003). This analysis shows that its global connectivity is inferior to that of Stockholm, Dublin and Madrid and that its international connections to Latin America, surprisingly, lag behind Cologne, Düsseldorf and Manchester.

In summary, while Barcelona is highly attractive to the international community at the level of both individuals and firms, this does not translate into the same level of international

engagement and interaction with major firms and institutions as occurs in other global cities. Further, some of the key enablers recognised by international research for innovation and transformation, including attitudes towards entrepreneurship, the availability and access to venture capital, the presence of large firms in the local industrial landscape, and strong and established international business connections, are weaker in Barcelona and Spain in general.

While these represent some of the challenges the city faces, it also has the opportunity to build on past experience and some significant assets. For instance, Barcelona has been and continues to be a leader in undertaking public sector-led initiatives for economic transformation, including pioneering industry clusters and the establishment of Spain's first Science Park which is now serving as a role model to other regions in Spain (Reichert 2006). There is also a significant international community already present in Barcelona and in the 22@ District, representing 13.1 per cent of the population in Sant Marti; this community is highly educated and has the potential to raise the skill base of the district, as well as improve the relatively low level of local entrepreneurship activity.

## THE STUDY

The study whose results are reported here included use of existing data on international comparisons of entrepreneurship, urban clusters, transformation to the knowledge economy, and local demographic and economic indicators. We particularly included data from studies of other cities in Europe and North America, including Geneva, Otaniemi/Espoo, Austin and Montreal.

Second, thirty two face-to-face interviews were carried out between February and April 2007 with leading members of the international community, local institutions and local firms with a high degree of international engagement. The interviewees included members of nine different nationalities, self-employed and freelance professionals, local and international entrepreneurs, TV

and press journalists, middle and executive management in international companies, local and international business and academic institutions, human resource (HR) directors from international firms, relocation companies and members of the 22@ District Executive team. The interviews covered a number of areas critical to understanding the extent to which the international community was already engaged with local firms, institutions and the community, and the reasons that inhibited greater engagement.

Third, an on-line survey, conducted in March and April 2007, targeted 287 influential members of the international community. The response rate was over 40 per cent (124 respondents). Names of people to be included in the survey names were supplied by international firms, relocation agencies, entrepreneur organisations, local economic development groups, the 22@ District, and through personal contacts and individual recommendations. While by no means a scientifically selected group, the survey's respondents seem to represent a valid cross section of the target communities that Barcelona is trying to reach and engage with, as confirmed by discussions with the 22@District Marketing and Business Development Group.

We used cognitive cluster analysis on comments from the interviews and the survey to determine key themes and issues raised. These key themes were then validated in a workshop with 12 members of the international community and members of the Ajuntament. A focus group then verified findings and brainstormed ideas for increasing engagement between local and international newcomers. Finally, the findings were subjected to a review with the Ajuntament and a prioritisation workshop with members of the Executive team for the 22@ Barcelona District.

The sections below present the main findings from both the interviews and the survey. These overlapped considerably, with the survey responses adding issues with communications in terms of local knowledge about the scale, scope and

opportunities offered by the 22@District and the level resourcing of the project team charged with the economic and social development of the 22@District.

The topic most relevant here related to the general barriers to engagement, seen both from a business-to-business perspective and from the perspective of those seeking employment with local firms. Responses covered both work and personal issues: *Employment opportunities and pay levels*: the lack of major national and international firms headquartered in Barcelona limit career opportunities and pay levels within local firms are perceived as being low by international standards; *Language in the work environment*: the working language is overwhelmingly Catalan, as is the language for social exchange within business. This language dominance extends to the internet and the web presence of many firms and to their intranet. The international community is ready to invest in learning Spanish as this investment can be exploited elsewhere in Spain but willingness to learn Catalan is much lower and even members of the Spanish community perceive a glass ceiling beyond which even Catalan speakers who are fluent but for whom Catalan is the second language are unable to progress; *Work Culture and organisation*: the dominant work culture is perceived to be very hierarchical, with decision-making almost exclusively executed by the CEO, proprietor or senior divisional heads of a business. Similarly, access to these executives was reported as being difficult both from both within the firms or institutions as well as from outside; *Openness to new ideas and risk*: local firms were perceived as being unwilling to share information, jointly progress new ideas or take the risk of being an early adopter, say, of new technologies, practices or business models.

Some adverse comments were focused on the assistance available to new or oncoming business. These included: *Investment Environment*: local financial institutions are willing to invest where there are physical assets but seem uninterested where the assets are primarily intellectual.

Venture capital funds are scarce, especially for small projects which impedes the growth of many small firms; *Procurement Practices*: Barcelona was not seen to be fully exploiting large scale public procurement to encourage innovation or attract new foreign direct investment. Using the example of the energy sector, it seems that where other public authorities in Spain are ready to negotiate with international firms to ensure they invest locally in building manufacturing, R&D or service delivery capabilities when large scale public procurement tenders are let. This practice is seen as more likely to ensure that public expenditure going to these firms turns into local jobs and a stimulus to the local economy. It is reported that Catalunya does not follow this practice; and *Local Economic Development Institutions*: Barcelona's local business institutions, including the Chambers of Commerce, CIDEM, ACI and COPCA, are charged with helping international as well as local businesses develop in the region as well as in developing international ties but our study suggested that these are perceived as overlapping in their roles and responsibilities, slow to respond to international firms and individual entrepreneurs, to lack detailed knowledge of important high technology growth industries, to provide content on their websites exclusively in Catalan (initial pages may be in Spanish and Catalan but detailed process and procedural guides were only in Catalan) and to have limited capacity in terms of funding and investment.

These perceived barriers to business and hence to the role for which many expatriates were in Barcelona, were exemplified by the following comments:

- 'Local businesses are not so open and with a very parochial vision. For a firm in Girona to sell to Madrid is a breakthrough, to sell to China is inconceivable'.
- 'And the culture is risk averse: fail and you are dead. But sadly this is confirmed by the attitudes of young people in a recent poll where 50% wanted to work as a public employee'.

- ‘The local support functions CIDEM/ACI/ Barcelona Activa etc lack critical mass .....they are just a “Petty Cash Dispenser” and in general there is not enough wisdom by VC community”’.
- ‘It’s easier to meet the #3 person in Google Worldwide than the General Manager of Telefonica in Girona’.

Some responses were specific to 22@ and covered both business and personal issues, including *lack of brand visibility*; ‘Everyone’s heard about it but not what it offers or stands for’ and ‘lack of clarity of what the 22@ Business Development group do (sic)’ versus other agencies, *lack of effective international marketing*: ‘It needs presence, strong presence at major international property events or you’re out-marketed and international investors and developers go elsewhere’, *Amenities*: ‘You pay premium prices today, but the amenities won’t be there for some years’ and ‘It needs more 24hr facilities, places open late which are still buzzing and wireless in the main public areas...so you can work anywhere’, *rents*: ‘We’re a growing company but being asked to sign up for a minimum of 5 years in one unit when we might out grow it and need to move to another within 2 years within 22@, is unrealistic’ and *schools*: international people start first by looking at the schools, and the international ones are all in Zona Alta’.

### **Who constitutes the 22@ international community? and how do they feel once there?**

Respondents to the on-line survey were predominantly executives, managers or proprietor/entrepreneurs. Managers made up 30%, executives 8% proprietor/entrepreneurs 23% and professionals 21%. They were involved in Financial Services (19%), Creative Industries (architecture, design, TV, media, advertising) (19%), Information Technology (11.5%), Manufacturing and Distribution (10%), Life Sciences (5%) and Energy (4%). The age range was biased towards the 31 to

40 age group, which represented nearly half (47%), and the 41 to 50 age group who made up one third of respondents. In terms of backgrounds, the range was extensive, with 59 different cities with which they stated that they have strong or very strong professional contacts that could benefit local firms or institution

They had arrived in Barcelona by diverse routes – more than a third had been brought by their company (36%) while a further third had decided they wanted the Barcelona lifestyle and came seeking work or just to live (32%). Once there, they had mixed feelings and as a group were seeking far greater engagement both socially and with local firms and institutions; only 32.3% stated they felt integrated to a great or very great extent at a social level, while more than half wanted to integrate to a greater or very much greater extent.

As part of assessing their degree of engagement with firms in the area, respondents were asked how important local and international firms are in terms of being a source of new ideas and knowledge, as a market for their goods and services, or bringing value as partners or suppliers to their customers. In each case, the local firms were markedly lower than international firms. When asked, for example, ‘How important are local and international firms to you as clients, suppliers and partners, as well as in the innovation process?’, they responded that international firms were overwhelmingly more important to them, as shown in Figure 2.

The contacts they have are largely via social (82%) or professional networks (52%) and the internet (55%) or through schools (39%). The key barriers to connecting with the business community are, as before, language, workplace culture, and openness to new ideas. Respondents were seeking help at both personal (schools and housing) and business level. At a personal level, people were concerned about housing and schools. While a ‘landings’ programme exists, it is still under development. Respondents would also like help with personal and vehicle registration,



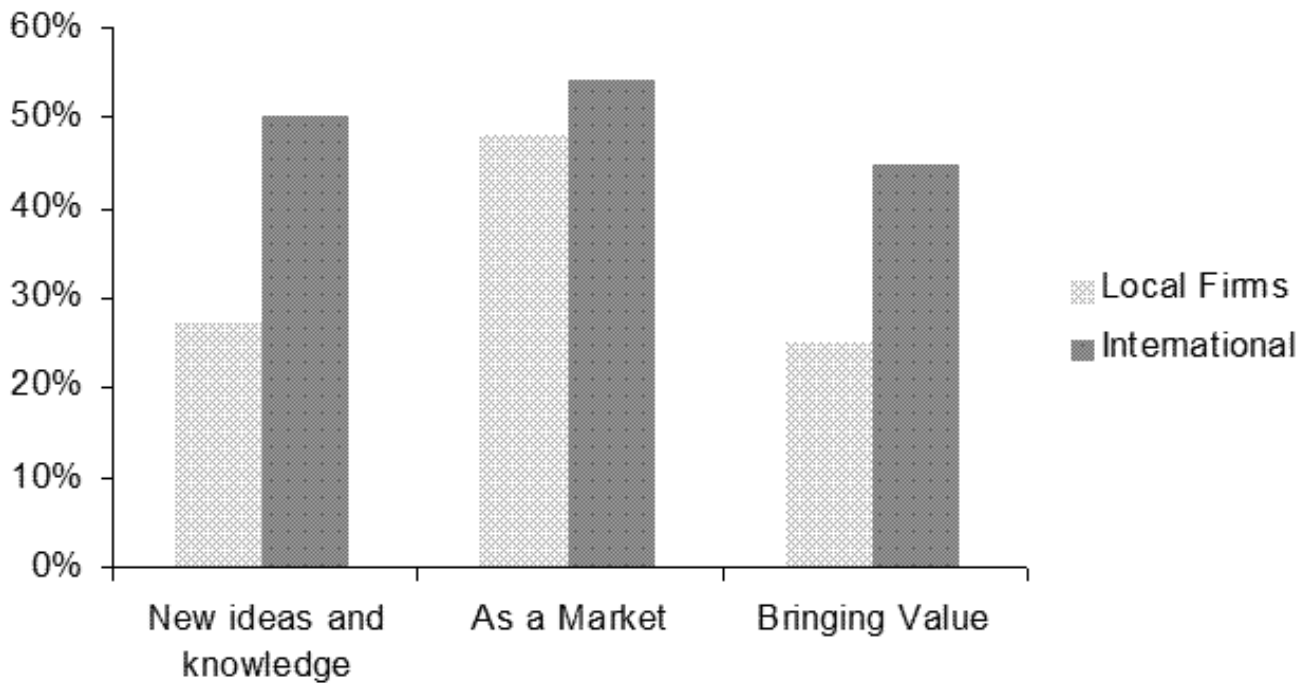


FIGURE 2: ATTRIBUTES ASSOCIATED WITH 22@ DISTRICT

immigration and household goods importation paperwork, health care assistance, preferably in languages other than Catalan.

At a business level, assistance programmes available and help in finding clients and partners were especially important, far outweighing search for offices.

More positively, there was strong awareness of the 22@District brand, although not what it means and some commented that they felt it was just a real estate programme. Almost half were familiar with the 22@ District and its key initiatives and programmes. Half of those responding who said they were familiar with the 22@District stated that they were personally attracted to work or live there. The major areas of concern were the lack of centrality, amenities, and transportation.

## DISCUSSION: IMPLICATIONS OF THE FINDINGS OF THE STUDY

Members of the international community already resident in Barcelona are ready to play their part in the grand scheme for 22@; they are not only seeking greater engagement but are ready to become partners in this integration and engagement process. In spite of a substantial

communication effort by the Ajuntament de Barcelona, however, there is still only modest awareness and little knowledge among members of the international community of the city's flagship programmes, those aiming at transforming at least part of the city into a knowledge-intensive economy and of the importance of the 22@ District within this goal. This lack of understanding extends to both the private and business community. In terms of engagement, the international community does not see the city or the 22@District as proactively engaging with them and sees itself as facing challenges in engaging through difficulties with language, work culture, and openness.

In relation to 22@ itself, the major areas of concern emerging from our study focus especially around the strategy of developing knowledge-based industry clusters in the 22@ District, around its perceived centrality and about the current level of amenities, transport environment, education and housing. At a business level firms need help in improving their linkages and contacts with local firms, both as potential clients and partners. They see a substantial overlap between the different agencies aiming to promote economic development and

are concerned about the quality and responsiveness of these local agencies. They see the amounts of funding these agencies manage as modest. Finance and access to venture capital are not aligned with the goals of developing 100,000 jobs in this district and growing a substantial number of start-up companies. And while other nations and regions within Spain are using public procurement and demand side incentives to support local industry, new start ups and attract international firms, Catalunya is not doing this and the 22@ District and the transformation strategy will be impacted.

### Policy actions

The vision for the 22@ District included both business and personal elements, such as housing and social amenities, in a specific attempt to provide an environment in which the 'creative classes' would feel at home and would have maximum opportunities to interact both with other nationalities and local residents and business people. Our study suggests that, despite careful thought, some important personal elements were given insufficient attention, especially for the sizeable and influential international community, and hence the data gathered suggest some lessons for other cities seeking the now near-universal goal of developing 'city knowledge economies'. The plan subsequently developed for the 22@ District is unusual in that, among other approaches, it now specifically targets international professionals as stimulants for local economic activity and as enablers for local businesses to enter new international markets and raise both their skill levels and profiles.

*International Education:* One of the major issues identified was primary and secondary school education. The attraction of the District to both live and work will depend on the availability of suitable education, especially for the international community arriving in the city. 'Education' as an issue had several aspects. The level of English and other foreign languages spoken in the city is modest and there is a need to strengthen and extend English language training in schools and colleges and through associations, perhaps, given the histo-

ry and context of Catalunya, even developing trilingualism in some fields. There is also a pressing need to extend the availability of international schooling - existing international schools are not easy to get to from 22@ and do not have either sufficient capacity today or the ability to grow. The importance of the issue of schools was summed up by several comments that this is the first thing that people ask before deciding where to live or even if to move to the city. The availability of such schools or the facility of existing local schools to cater for the international community will be a crucial component in attracting the skilled international workforce targeted.

Secondly here, *engaging on a business to business basis* was to be at the heart of the regeneration plan. In the event, the city and specifically the 22@ District needs to build more effective networking programmes - matchmaking events, Agoras, business breakfasts - and enhance the underpinning ICT services and infrastructure. Here again, language and connection are key: new ICT infrastructure should include the provision of a Portal with much more extensive business services rather than information and be multilingual throughout. The need to be able to easily meet with firms on their premises or in neutral third party locations would be enhanced by extending the current WiFi pilot to give ubiquitous internet access, especially within the 22@ Barcelona District. Resources that can mediate between these local agencies and international companies in the short term, while on a longer term basis rationalising the programmes they offer and enhancing their support in languages other than Catalan, are essential supports for connection.

The above issues are relatively easy to solve. Enhancing the economic development programmes is more complex and constitutes a major challenge to all organisations thinking along local economic transformation lines. Over the last few decades, Barcelona has been a leader in terms of 'supply side' initiatives to drive economic development and this has been evident since the '92 Olympics, as the City Authorities and the Catalan

Government have invested in universities, research centres, infrastructure and offered economic and fiscal incentives. However as noted earlier, views gathered in this study suggest that the supply side approach may need to be balanced with more on the 'demand side', using public procurement practices and competitions that encourage consortia between local and international firms, thereby more directly encouraging spillovers of knowledge and the development of social networks and expertise. Across all of Europe, particularly since the Lisbon Accord, cities are encouraging the formation of industry clusters on their periphery or as urban industry clusters in regenerated districts within the city itself. Most have targeted clusters to those on which Barcelona focuses: ICT, bio-medical, digital media and renewable energy. There is thus considerable competition in these fields internationally. Barcelona may be assisted by the fact that it has an almost unique differentiator in that the 22@ Barcelona District offers a dense and well connected urban environment where such clusters would be packed together. This creates the opportunity to differentiate its industry clusters through cross-sector innovation, not just excellence within each industry 'pillar'.

*Introducing Demand-Side Initiatives:* The approach taken so far is consistent with the development models suggested by Fujita et al. (1999), and mentioned earlier in this paper, which suggest how diversity can be or is driving innovation. But taking this approach in turn requires explicit management of the spaces and provision of special amenities to encourage cross-sector innovation. Innovation can also be encouraged through 'demand-side' initiatives that seek cross-sector collaboration. These initiatives could include, for instance, leading edge electronic healthcare delivery and telemedicine that involves digital media, ICT, bio-medical engineering and life sciences or devising new pedagogical models for education delivery that involve all of these clusters. Both of these are areas where the city already has demonstrated academic, research and industry leadership and there is substantial public sector expenditure.

## CONCLUSIONS

Barcelona's attraction for the creative classes is evident from many different market research studies. This is evidenced by the education and population data that demonstrates that not only are skilled members of the international community attracted to Barcelona but they are also already present in substantial numbers. The City authorities were concerned, however, that this important asset in terms of available human capital was under-utilised and that increasing the extent of its engagement with local firms and institutions and, at a social level, with the local community would greatly enhance the city's development as it transforms itself into a more knowledge-intensive environment.

The research and analysis we have undertaken support this view and indicate that cities that not only can *attract* but are proactive in *engaging and connecting* the international community with local firms and institutions are more likely to prosper in a highly competitive knowledge-intensive, networked economy.

The research reported here shows that the international community in Barcelona is itself seeking greater engagement and that the barriers for such engagement need to be pro-actively addressed. It requires much more in policy terms than just developing a city's amenities and attracting the creative classes. As Barcelona has experienced it at least, the jobs that have been created under the attraction policy tend to be in the construction sector and retail and leisure services, not the knowledge economy. The driver for this is paradoxically the desire of a well-educated, mobile international community for high quality housing and services to support the lifestyles that attracted them to the city in the first place. And with economic incentives to relocate, such as payment of lower taxes than in their home countries, their contribution to the public sector may be proportionately much lower than that of local citizens. For a city to benefit from its new arrivals, however skilled, it must be pro-active in first fully engaging them if it is later to exploit their capacity for innovation, knowledge transfer, and

access to extended international social networks, all of which are viewed as crucial to Barcelona's future.

While diversity in the work force and a constant supply of highly skilled people are important to maintaining or enhancing the innovative capacity of a city and avoiding a convergence in knowledge and information, success depends on the city's ability to understand the nature of its new asset and actively promote and use its skills.

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## BIOTECHNOLOGY AND TELECOMMUNICATIONS Conditions and processes for emerging technologies

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