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Title: External forces and adaptive governance: The evolution of the 22@ Barcelona between regeneration and innovation

Name: Riccardo Palazzolo Henkes

Supervisor: Dr. Alberto Gianoli

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Name

Riccardo Palazzolo Henkes

Country

Italy / Spain

Supervisor:

Dr. Alberto Gianoli

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Summary

"External forces and adaptive governance: The evolution of the 22@ Barcelona between regeneration and innovation" is a research about the influence of economic, politic and technological forces on the evolution of an urban regeneration project. The research focuses on the analysis of the impact of such forces and the suitability of adaptive governance theory for the analysis of the governance system.

This research considers the main theories of Urban Regeneration, Innovation Districts and Adaptive Governance for the creation of the conceptual framework. The model is based on the influence of external forces on the achievement of pre-established targets that have been classified according to the triple transformation pursued: physical, economic and social. The adaptive governance theory has been concentrated in three main assumptions (complexity, conflict, uncertainty) and three main actions (anticipate, learn, adapt) obtained from adaptive socio-ecological systems. Thanks to the adaptability of the project, the final outcome is the result of the influence of the external forces and the consequent adaptation to such changes.

A qualitative case study approach is used to collect information and catch the evolution of the project over more the 15 years. Semi-structured interviews and secondary data have been the main sources of information used for the analysis. After considering the positive and negative aspects of the different characteristics of the transformation, this study analysed the influence of the external factors, selected due to their connection with the three main actors of the Triple Helix approach: Public, private and academic sector.

The results of this study suggest that political and economic changes have a more consistent influence in comparison of the technological aspects, mainly due the need of municipal willingness and private funding in order to materialize the transformation. The impact of technological aspect is partially influenced by the political (e.g. Smart City as a metropolitan strategy) and economic (e.g. public and private R&D and the creation of new markets) forces.

The study also indicates the importance of having a bridging organization in order to deal with a multi-level and multi-scale reality. In this reality is necessary to react to changes and adapt, being crucial the communication and participation of all the stakeholders. Especially important is to include the weak stakeholders that might not have the power or the capital to determine the implementation of the project, but are main affected and need to have a feel of ownership of the new reality is being created.

This need of adaptation suggests that further studies could focus on the cooperation among actor towards an adaptive governance system. Further research could be done expanding the system from a Triple Helix approach to a Quintuple Helix (civic, social, cognitive, public and private actors) and analysing the real issues in designing and implementing and adaptive governance system.

Keywords

Urban Regeneration, Innovation District, Adaptive Governance, External Factors, Complexity, Conflict, Uncertainty, Anticipate, Learn, Adapt, Bridging Organizations.

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Chapter 1: Introduction

1.1 Background

Many cities around the world are facing the issue to regenerate former productive areas and assets that are not anymore integrated within the city. Old factories, commercial areas or obsolete infrastructures as trains stations or ports are some of the examples of urban elements that can easily become outdated due to external factors like economic shocks, political changes or new technology. These assets and areas have an important economic and social potential since generally are located in strategic positions close to the city centre or on the waterfront, therefore restoring them is not only necessary but is an opportunity for growth. **Urban regeneration** "seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change"(Robert, P. and Sykes, H., 2000).

Besides these physical changes, cities also need to evolve and adapt to the new global economic system if they want to still be competitive. They need to be aware of their own weaknesses and strengths and work on them in order to find their place in a competitive world cities network. Investing in knowledge and innovation is the main strategy followed by most of the cities and regions, especially in developed countries, since it brings new ways of work, increase the productivity and creates new products and therefore new markets.

The approach of creating **Innovation Districts** is being adopted in many cities since it is a solution that combines the regeneration of a specific area with the creation of knowledge-based economic activities. These are districts where the public and the private sector and the universities and research institutes, work together to create synergies to obtain economic growth, social cohesion and a general improvement of the quality of life (Cosgraveab, Arbuthnotb, et al., 2013). The creation of this kind of districts aims to attract companies and high qualified employees to settle in the same area, having the urban regeneration processes as an opportunity to improve the area for the local community and at the same time adapt it for the needs of the "creative class". This creative class is attracted by places with a high quality of life and good work opportunities, determining the success and development of companies and therefore generation of wealth.(Barceló, 2005).

Urban regeneration using innovation as an element to promote economic growth seems to be a valid strategy, whose success depends on the implication of many actors and the capability to find shared solutions. If the private and the public sector are the main actors in the creation of innovation districts, the participation of the citizens and the local business is crucial since they are the ones that will be the most affected by the decision that will be taken. It is important to consider that there are many social, economic and environment implication in the regeneration of a district, therefore the governance model needs to be broad enough to consider them.

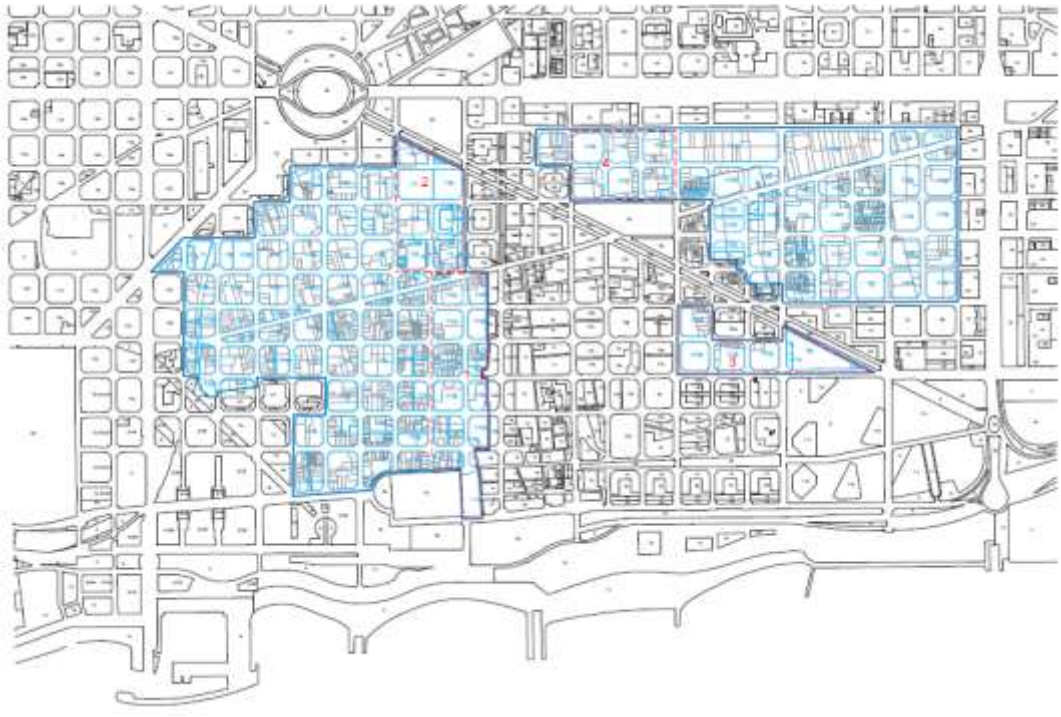
The number of actors, the impact of the decisions taken, the last of the projects and the high impact that external factors might have, show the necessity of a multilevel and multiscale governance system able to deal with complexity, conflict and uncertainty (Janssen and van der Voort, 2016). **Adaptive governance** could provide the necessary tools to analyse and then design efficient governance systems, which could reduce waste of time and money, increasing the collaboration and trust among actors. It has been used mainly in environmental and social-ecological systems, although in recent years the concept of adaptability has been used in

megaprojects analysis (Giezen, Bertolini, et al., 2015) and in relation to the continuous development of technology (Janssen and van der Voort, 2016).

Considering the situation presented, the case of Barcelona is a good example of taking into account since it is worldwide known for its regeneration strategies following the so-called "Barcelona Model". A model characterized by the use of major events (1992 Olympic Games and 2004 Universal Cultures' Forum), the design and implementation of regenerations strategies in specific parts of the city, the creation of autonomous municipal companies, and the participation of citizens in public policy making (Blanco, 2009).

At the beginning of the millennium, Barcelona had a vision of becoming a "city of knowledge" (Trullén, 2001), where the creation of the Innovation District 22@ was the main strategy to promote knowledge-based economy in the city. In the following years, the project became a model studied by many cities in the Western countries that wanted to stimulate their economies and regenerate an area of the city. The 22@ District is being considered the first Innovation District ever created.
The project started in 2000 with the approval of the *Modificación del Plan General Metropolitano (MPGM) para la renovación de las áreas industriales del Poblenou* (Modification of the Metropolitan General Plan for the renewal of the industrial areas of Poblenou). After fifteen years, it is possible to make some consideration about the development of the project and its adaptability to different external factors, being a good case of urban regeneration, cluster economy, and strong municipal leadership.

Figure 1 – Map of the 22@ district



Source: Municipality of Barcelona

In this research, the aim is to analyse the influence of external forces in the evolution of the project, considering both dimensions the regeneration and the innovation ones and paying attention to its adaptability. Being a long-term project, where political prerogatives, economic

trends, and technology evolution are key factors, it is important to analyse the elements that determine its adaptability in order to endorse them and consider them in future similar projects.

1.2 Problem statement

The creation of an Innovation District implies a strong long-term commitment of the key actors involved. It is a complex process that can take many years to be accomplished, therefore is important to be flexible and adaptive in order to respond to any possible change. There might be internal factors (change of actors, new structure of the organization, opportunities) and external factors (economic crisis, political elections, new technology) that inevitably change the context of the decision-making process, with the consequence that some assumptions and realities are not valid anymore. From a governance point of view, it is important to be adaptive in order to react to such factors with the aim of overtaking any bottleneck and keep obtaining the most desirable outcome.

The case of Barcelona is interesting since the regeneration of the Poblenou district is an ongoing project already working for fifteen years and planned to be a 20 years project, with the possibility to analyse how the city council and all the main stakeholders participate in the implementation of an evolving plan. This evolution of the project has not entirely been studied yet and many studies and assessments for the 10^{th} and 15^{th} anniversary focused mainly in the analysis of the achievements in comparison with pre-established targets. This research wants to explain the impact of different external factors with the aim of weighting them in the planning phase and reducing any possible negative impact during the implementation phase.

Considering the characteristics of an urban regeneration project by using innovation as a key element for the development of the area, the adaptive governance approach might be used to better plan and implement such kind of projects. Thus, this research might offer the opportunity to proof the validity of adaptive governance strategies in a different field than the original one.

1.3 Research objectives

This research aims to explain the influence that determinant external factors have over the development of urban regeneration projects. The development will be understood as the achievement of some goals, analysing during a timeframe of 15 years how the project evolved to achieve them.
The research will consider the role of the adaptability in this kind of projects for two main reasons:

- the first is because the assumptions of complexity, conflict, and uncertainty of adaptive governance system can be applied for urban regeneration projects;
- the second one makes reference to the few studies that apply adaptive governance beyond its original field, although the awareness of adaptation could be crucial for the success of projects of a different kind.

The elements of this research are:

- Identify the characteristics that define the complexity, conflict, and uncertainty of an Innovation District.

- Analyse the influence that specific external factors have in the development of the 22@ project.
- Analyse the adaptability of the project to these external factors during the period 2000 until 2015/2016. This timeframe includes the beginning of the project until the first year of the new municipal government.

1.4 Provisional research question(s)

The main research question of this study is the following:

To what extent did political, institutional and organizational factors explain the development of the long-term renewal project of the creation of the 22@ Innovation District in Barcelona?

In order to answer the aforementioned research question, the following (provisional) sub-questions will be formulated:

- *What are the characteristics of the 22@ District that determine its complexity, uncertainty, and conflict?*
- *What is the Governance model of the 22@ Districts?*
- *Which external factors can justify the need for flexibility and adaptability*
- *What mechanisms drive adaptation?*

Independent Variable: External factors (= beyond the control of the project)
Dependent Variables: Development of the project (Project delivery)

1.5 Significance of the study

In the evolving process, parts of a city might be more marginalized than others. Cities around the world have to deal with the social cohesion and local economic development within the city. This study wants to provide information about the factors that mainly affect the regeneration of an area using the innovation as driving principle. The advanced state of the project can provide some valuable lessons for other cities that are starting or are still in an early stage of a similar project.

Beyond the direct relationship among the variables selected, this research aims to provide another perspective on the application of adaptive governance beyond its common usage. Recent studies link adaptive governance theory with technological improvements (Janssen and van der Voort, 2016) or highlight the importance of adaptive capacity in mega infrastructure projects (Giezen, Bertolini, et al., 2015). This thesis will provide an empirical analysis of the suitability of the adaptive governance approach as an instrument for the description of the evolution of urban regeneration projects. A positive result might promote the use of adaptive governance systems in another kind of urban studies.

The findings of this research might increase the awareness about adaptability and would help the planning and organization tasks, finding a balance between adaptability from one side and accountability and stability from the other side. (Janssen and van der Voort, 2016) Once complexity, conflict, and uncertainty are internalized in in the decision-making process, adaptability gains importance as facilitator characteristic. If the main actors involved agree on

the importance of this characteristic, it will be easier to reduce conflict and bottleneck situations throughout the project's development, obtaining a better performance, saving time and money and increasing the trust among actors.

1.6 Scope and limitations

This study is limited to a specific case study and the influence of external factors on its development using an adaptive governance approach. The case study is the 22@ district of Barcelona and it is a relevant case since it has been a model for many similar experiments in other cities (Katz and Wagner, 2014). The time analysed goes from the year 2000 (when the Metropolitan General Plan was modified in order to allow the regeneration of the district) until summer 2016, a year after the change of mayor, who had a political agenda drastically different in comparison to the predecessors.

The research will not consider any social aspect of the project besides some economic ones (e.g. employment) that can be considered partially social. Although one of the goals of the regeneration of urban areas is the stimulation of the social mobility, this aspect will not be covered. Self-organized initiatives will be considered as part of antagonist reaction to political decisions, further community-lead initiatives are not considered.

This research will rely mainly on qualitative information extracted from interviews, being possible that this information might be subjective or biased. This aspect will be counteracted by crosschecking the information among the different answers received. Further quantitative information will be used in order to provide more objectivity and corroborate the information obtained. Strictly related to the interviews, there is the risk that the number of interviews might not be enough, either for the short time available or the low number of actors agreeing to be interviewed.

The municipality has produced many of the documents and reports that will be taken into account as a secondary data source; hence, it is possible that the figures will be too optimistic. In order to proceed with a "triangulation of the sources", this research will consider academic papers and criticism from antagonist entities to the 22@ district, increasing the reliability of the research.

Being a single studied compared to itself during the time, any possibility to generalize the findings of this case are limited; only the conceptual framework and the adaptive governance approach might be used in other cases if the research proves its validity and relevance.

A final limitation will be the conciseness of the fieldwork, since a complex situation might need an extended data collection and the inclusion of different other variables that might also affect the development of the urban regeneration project, like for example internal factors.

Chapter 2: Literature Review / Theory

This chapter will present the main theories and concepts necessary to understand the current academic findings related to this research and the relevance of the study. It will start presenting the concept of urban regeneration and its development since the 1950s, showing the strong relationship between urban regeneration and local economic development. It will continue explaining what is an Innovation District and the importance of knowledge-based economy for such kind of projects. It follows by the explanation of adaptive governance theory, explaining the origin of ecological governance and considering recent studies. Finally, the conceptual framework of this research will be presented, showing all the connection among the previous parts presented in the chapter.

2.1 Urban regeneration

Before starting explaining the evolution of the urban regeneration phenomenon, it is necessary to explain what urban regeneration means. Under the concept of urban regeneration, many different actions can be taken into consideration, from the rehabilitation of a historic building to the economic re-development of an entire neighbourhood. The common definition accepted by many authors is the one provided by Robert (2000, p.17):

"*comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental conditions of an area that has been subject to change*."

The economic and physical aspects have been relevant since the 1950's, whereas the social and environmental criteria have gained relevance alongside the concepts of the community up to the 1970's and the importance of sustainability in the 1990's respectively. The previous definition is missing two important concepts that are used in the definition given by Adair, Barry, et all. (2007, p.223):

"the process of reversing economic, social and physical decay in our towns and cities where it has reached that stage when market forces alone will not suffice."

This definition emphasizes the decline of the area and the need of special project since the market forces are not interested without a broader support. Therefore goals, like raising the value, promoting sustainable communities and developing creative ways to attract private investment, define the urban regeneration approach of the last decade (Adair, Berry, et al., 2007).

2.1.1 Evolution urban regeneration (1950' – Present day)

The idea of urban regeneration has been used in urban development in the last 50 years, although during the time has changed the name, showing different approaches according to the needs of the different times.

After the II World War, most of the main European cities were partially destroyed and had to deal with a national reconstruction and economic reconversion from war production. Under the name of "urban reconstruction", we have the wartime repairing projects Government-led with the support of the local authorities and mainly financed by the public sector.
In the 1960's there is still a continuation of the previous approach, called "urban revitalization", where the private investments and the welfare are gaining relevance, as part of the learning process with earlier experiences. In fact, the slum clearance and the growth of the peripheral

part of the cities generate social tension and destabilized in the city's structure. It is worthy to mention the regional component present in this period since it starts to understand the importance of the surrounding area for the economic development of the city.
In the 1970'the renewal approach is characterized by a starting practice of renewal of older urban areas and therefore more attention is given to existing neighbourhoods. An increase of decentralized powers, a continuous growing of the private sector involvement due to the starting of financial local constraints and the consideration of environmental factors characterize this period.
In the 1980's new schemes are being used in urban redevelopment, where flagships projects and a strong partnership between public and private sector are forged.
Finally, in the 1990's the urban regeneration takes the principles and characteristics of nowadays, where an integrated approach and the sustainability influence the structure and the objectives of the projects.

Table 1 – Evolution urban regeneration policies

Period Policy type	1950s Reconstruction	1960s Revitalisation	1970s Renewall	1980s Redevelopment	1990s Regeneration	2000s Regeneration 2.0
Major strategies and orietation	Reconstruction and extension of older areas	Suburban and peripheral growth	Focus on in-situ renewall and neighbourhood schemes	Development and Redevelopment schemes; flagship projects	Comprehensive form of policy and integrated treatments	Projects with specific specialized approach
Key actors	National and local government; private sector and developers	Greater balance between public and private sector	Growing role of private sector	Growth of partnerships	Partnership the dominant approach	Partnership is stil the dominant approach
Spatial level of activity	Local and site leves	Regional level	Regioanl and local level	On site and local level	Strategic perspective; growth of regional activity	City-wide development plans
Economic focus	Public sector investment	Growing influence of private investments	Resource constraint in public sector and growth of private investments	Private sector dominant	Greater balance between public, private and voluntary funding	New inward private investors
Social content	Improvement of housing	Social and welfare improvement	Community-based action	Community self-help with very selective support	Emphasis on the role of community	Compact city approach
Physical emphasis	Replacement of inner areas and peripheral development	Continuation from 1950s with parallel rehabilitation	More extensive renewall of older urban areas	Major schemes of replacement; "flaships schemes"	More modest than 1980s; heritage and retention	Schemes of infrastructure investment
Environmental approach	Landscaping and some greening	Selective improvements	Environmental improvements	Growth of concern for wider approach to environment	Introduction of idea of environmental sustainability	Environmenat sustainability accepted

Source: adapted from Porter (2000)

Table 1 summarizes the different approaches aforementioned, although it is necessary to be aware that different countries might have experimented some of the approaches for a different period and in different times.

It can be highlighted how the private sector and community involvement, together with the environmental focus and a more integrated system have grown during the time, characterizing

the urban regeneration approach of the last decades. The strong private involvement has generated a shift from the traditional approach to a more profit-oriented project (Granger, 2010). The private sector is willing to invest in urban regeneration project where there are a competitive risk return and a manageable risk (Huston, Rahimzad, et al., 2015).

Back in 1992, Mackintosh identified three main theoretical models of partnership (Mackintosh, 1992):

1. The synergy model implies the combination of resources, knowledge, and know-how, achieving more together than separated.
2. The budget enlargement model means that working together simply will bring additional funds
3. The transformational model suggests that working together will by important since the partners will be exposed to different ways of working.

The cooperation with the private sector can bring not only tangible benefits but especially the intangible are the ones that create the additional value of such collaborations.

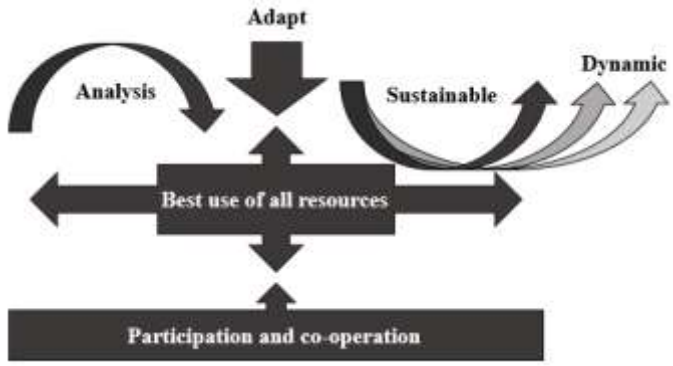
2.1.2 Urban regeneration principles and approaches

After having clear the evolution of urban regeneration and having shown the main aspects that have characterized its development, it is necessary to know better its aspects, principles, and criticism.
Similar to the three pillars of sustainability, the four major aspects affected are the economic, the social, the environmental and the physical (Roberts, 2000). There are two main conclusions from these four elements: the strong relationship between urban regeneration and sustainability and the relevance of the physical modification related to obsolescence, land, and property.

The main principles that should guide any urban regeneration project are the following according to Roberts (2000) and visualized in Figure 2:

- be based upon an analysis of the status of the urban area;
- adapt to the physical, social, economic and environmental condition of an urban area;
- ensure that the strategy and the implementation follow a sustainable development;
- make the best possible use of natural, economic, human and other resources;
- ensure consensus through participation and co-operation of all stakeholders;
- adapt the strategy adopted to the new situations of a dynamic reality

Figure 2 - Urban regeneration principles



Source: author compilation

The nature of the project will change the complexity of the project, although is important to consider the aforementioned principles before planning and implementing any proposal.

To conclude this overview about urban regeneration, it is relevant to mention the different approaches adopted, which are applied depending on the pre-existing condition or the final goal (Colantonio, Dixon, et al., 2009):

- **the property-led physical approach**, where a project is expected to have multiplier effects in the local economy (e.g. shopping mall)
- **the business-driven approach**, where the importance of activates, exploits or makes real a potential market of a particular area
- **urban form and design perspective**, where the importance of the relationship between sustainable development and urban form is highlighted
- **cultural industries approach**, where creativity and cultural media industries are the drivers of regeneration
- **health and well-being perspective**, which highlights the effects that well-designed spaces can have on citizens health and liveability
- **community-based, social economy approach**, which highlights the importance of local communities involvement and the development of social capital networks

The approaches mentioned are indicative and non-exclusive, having the possibility to combine more than one approach in the same project.

2.1.3 Regeneration and Social Sustainability

One of the main categories used to assess the impact of urban regeneration processes is the social aspect, being the local community the key actor. The experience in the last decades shows the relevance of citizens' participation in the decision-making process (Hull, 2000) as a way to obtain greater legitimacy, transparency, effectiveness, commitment and ownership (The Tavistock Institute, 2005). The integrated approach adopted in the last decades emphasize the importance of environmental, social and cultural elements, where local contributions are highly considered since are the ones who will be affected and determine the success or failure of the project.

The concept of social sustainability has been used mainly in Europe in EU policies as way to create an equal society, with a strong commitment to enhancing education, especially related to 'knowledge-intensive' economy; create 'more and better jobs'; modernising social protection, promote equality; and counter poverty and social exclusion (Colantonio, Dixon, et al., 2009). In order to realize the importance of sustainability in urban regeneration, these are ten social dimensions and policy areas identified by Colantoni, Dixon, et al.,(2009):

- Demographic change (ageing, migration, and mobility);
- Education and skills;
- Employment;
- Health and safety;
- Housing and environmental health;
- Identity, sense of place and culture;
- Participation, empowerment, and access;
- Social capital;
- Social mixing and cohesion; and,
- Well-being, happiness, and quality of life.

The positive consequences of urban regeneration are more evident since are linked with physical improvements and economic development, although there are negative ones that influence more the social and environmental aspect (Lovering, 2007). It is discussed the effectiveness of urban regeneration projects in solving social problems, the last of their impact and gentrification phenomenon (Granger, 2010). In the last decade, the different social consequences of urban regeneration have been studied, for instance, problems related to gentrification, residential displacement, and restructuring (Scarpaci, 2000), or the increase of exclusion and destruction of communities (Gosling, 2008).

2.1.4 Economic aspects of urban regeneration

To understand the urban regeneration approach from the last decade, it is important the awareness on cities as the centre of economic growth in a global network. The competitiveness and improvement of their performance are related to urban characteristics such as governance, mobility, health, business or people (Wall, Stavropoulos, et al., 2015).

This competitiveness has a double effect in urban regeneration: in one hand, it acts as stimulant for local government to improve their conditions and attractiveness, becoming crucial the branding of cities in order to gain visibility; on the other hand, it emphasizes a more business-oriented approach to regeneration projects, where the economic aspect overshadows the social and environmental ones (Paddison, 1993). Therefore it is necessary to maintain a balance between the goals of maximizing economic development and minimising social and environmental deprivation (Couch, Sykes, et al., 2011).

Already in the 1980s, Harvey (1989) mentioned the importance of cities and the active role played by local governments in stimulating economic development, going from a managerial approach, based on service provision, to a more entrepreneurial one, with the objective of stimulating growth. In fact, cities find themselves in a global network where they compete to attract the necessary investments/business to keep growing and not decay. The partnership between private and public sector is, therefore, crucial for any project.

The partnership between local government and the private sector in urban regeneration projects started to gain relevance after the crisis in 1973, where the local governments worked together with small firms to promote the area and attract investment (Harvey, 1989). The financial constraints created a need for the local governments and an opportunity for the private sector, with a collaboration that went from the service provision to the organisation of big events, including as well urban regeneration projects.
The main business opportunity in urban regeneration projects is real estate, either residential or commercial. In big projects where an overall improvement in the area is expected, there is another revenue source for the developers coming from the rising value of the properties.

The issue of appropriate investment vehicles in Private-Public Partnership depends on many factors, although some common phases can be identified in regeneration processes that might suggest the most suitable vehicle structure. According to Adair, Barry, et all. (2007), there are three phases of regeneration, which different activities and characteristics from a financial point of view.

Table 2 – Regenerations phases

Regeneration Phase	Main activity	Characteristics	
Remediation/ Infrastructure (1 to 5+ years)	- Site assembly - Site remediation - Freeing-up development potential through infrastructure	- High cost - High risk - Potential for high return	- Major uncertainty over end value - Low liquidity and transparency - Medium timeframe
Development (2 to 3 years per phase)	- Construction of the property asset - Letting of the property tenants	- Debt financed - High risk especially at early stage - Potentially high return - Lack of income stream	- Uncertain capital values - Low liquidity and transparency - Short-medium timeframe
Investment (5+ years until redevelopment of asset)	- Sale of occupied property asset into the established investment market - Holding of developed property	- Secure revenue streams - Capital value growth - Lower risk - Return above bonds	- Diversification benefits - Liquidity and transparency dependent on vehicle structure - Medium/long timeframe

Source: adapted from Adair, Barry, et all. (2007)

The above table shows how the risks, costs, benefits, and uncertainty are evolving during urban regeneration projects. The private sector is willing to invest in this kind of projects for the strict relationship between the investment and the expected return: major investment, major risks and therefore major return. The ways to obtain a benefit from the regeneration of an area focus in investments that can be "hard" (buildings, precincts, facilities, technology and logistics) or "soft" (job creation, health programs, education and skills training, cultural activity, service provision) (Huston, Rahimzad, et al., 2015).

2.2 Innovation District

Innovation district is a complex urban model that tries to give a solution to cities that are trying to increase their regional/global competitiveness in specific sectors. A good definition of innovation district is the one adopted by the Brookings Institution (Katz and Wagner, 2014):

"*…geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically wired and offer mixed-use housing, office, and retail.*"

The definition directly shows the link between business activities, economic development, urban planning, and innovation.

2.2.1 Theoretical background: Industrial District and Flexible Specialization

The concept of Innovation District is the evolution of the concept of Industrial District created by Alfred Marshall in 1920s and re-studied by Giacomo Becattini in the 1970s and the concept of flexible specialization from Piore and Sabel. Both theories were taken into account during the preparation of the 22@ plan.

According to Marshall, an industrial district means an area different firms have decided to concentrate (Belussi and Caldari, 2009). The industrial district of Marshall comes from the theory of localization economy, where industrial activities locate in a specific area obtaining specific advantages of this decision. In the book "Principles of Economics" (2009), Marshall mentions the main advantages of firm's concentration:

- Hereditary skills: people share skills and ideas, generating a transferable know-how

- The growth of subsidiary trades: companies locates close increasing their chance to trade with neighbours (supplies, machinery, complementary tasks…)
- The use of highly specialised machinery: a high specialization allows to work for many other companies (e.g. specific supplies for many different companies)
- The local market for special skill: people with specific skills are attracted by this industries concentration due to the higher chances to find a job.

There are other reasons that promote the concentration of conglomerates, like the need of the manufacturers to be close to the resources they use or the presence of a town/city that can provide workers with the necessary skills (Belussi and Caldari, 2009). The concentration of companies and workers that need each other generates what Marshall calls "special atmosphere", that can be interpreted as the positive externalities of such synergy. In this special atmosphere, there is a situation of competition-cooperation, where companies compete and make the district competitive, finding in the cooperation an element that increase competitiveness and being part of the same network (Marshall, 2009).

Giacomo Becattini re-discovers the theory of industrial districts in 1979, which defines industrial districts as (Pyke, Becattini, et al., 1990):

> "…socio-territorial entity, which is characterized by the active presence of both a community of people and a population of firms in a naturally and historically bounded area. In the district, unlike in other environments, such as the manufacturing towns, community and firms tend to merge"

Becattini emphasizes the importance of rapid change of products and a general flexibility of production and labour forces in order to be competitive and able to adapt the market's requests. Such flexibility is represented by the decision to internalize or externalize a process and the presence of medium-small companies to cooperate with. In fact, the creation of a network of companies generates the strength of an industrial district.

The model of flexible specialization is based on the idea that production should be responsive and flexible to the changes of the environment (Skorstad, 1991). The changes in the environments are composed of the changes of demands, which is related to the innovation in technology, which generates new products and markets. This concept is strictly related to the concept of the industrial district since the cooperation and the creation of a network are elements that facilitate flexibility in production. The flexibility of production also requires the flexibility of the labour forces, therefore it is important to have high-qualified workers that can easily re-convert in a new task. In this new scenario, flexibility and knowledge are the key concepts, where the market is constantly changing and the workers need to be prepared to the changes or even create them a new market.
The idea of Innovation District comes from the highlighted points: Concentration of companies, network, flexibility, and technology.

In the 22@ case study, the principle of concentration of activities is still valid, although it supports a broader diversity of sectors since it focused on the processes (knowledge-intensive activities, a high degree of technology…) and not in the final outcome. Based on the knowledge-based economy, innovation and technology are crucial aspects that determine flexible specialization and high responsiveness to the market trends (e.g. smart technology, smartphones, and apps…).

2.2.2 Driving forces and assets

The dynamic behind the creation of innovation districts consists in altering the location preferences of people and firms reconsidering the relationship between economy shaping, placemaking and social networking (Katz and Bradley, 2013). It is useful to mention the objective that cities are pursuing when creating innovation districts (Morisson, 2015):

1. Develop or redevelop a part of the city
2. Attract, create or retain skilled individuals and innovative companies
3. Become or remain an innovation hub

There are examples of innovation districts mainly in the United States but also in European cities:

- Barcelona (22@ - 2000): it can be considered the first innovation district created. It is based on the urban regeneration of a former industrial district, pursuing a triple physical, economic and social transformation.
- Manchester (Corridor – 2007): aims to create a cosmopolitan hub able to attract talented people to live and do business (Corridor Manchester, 2007).
- Boston (Boston Innovation District – 2010): based on the success of the 22@ mayor Menino decided to redevelop the South Boston Waterfront. The project wants to promote collaboration, provide public space and programming, and develop a 24-hour neighbourhood (National League of Cities, 2015).
- London (TechCity – 2010): the main goal is to accelerate the growth of the digital economy in the city (TechCity UK, 2016).
- Medellin (Distrito de Innovación - 2012): inspired in the 22@, it pursues the triple transformation of four districts and wants to become the innovation capital of Latin America (Ruta N Medellín, 2016).
- Montreal (Quartier de l'Innovation – 2013): Aims to attract four different segments of the creative society: industrial segment, research segments, education segment and cultural segment (Quartier de l'innovation de Montréal, 2016).
- Rotterdam (Stadshavens - 2015): large spaces available in at the RDM Rotterdam due to the relocation of port operation to the west. It aims to create an innovation ecosystem for the smart manufacturing industry (Stadshavens Rotterdam, 2015).

These are only some of the innovation districts that have been promoted in different cities worldwide, showing the validity of the idea behind since similar project are being proposed in the las 5 years.

The rise of innovation districts is an evolution of the industrial districts of the beginning of the 20th century and the industrial parks of the 1950s. The first ones were already characterized by the importance of the location of complementary industries for the generation of synergies within the city (Muller and Groves, 1979), whereas the second ones were born mainly outside the urban areas with the goal of increasing the commercialization of university research (Russell and Moss, 1989). The characteristic of the innovation districts as the evolution of the previous concentration of economic development is characterized by a mixed land use beyond the economic aspect that tries to pursue a lasting environmental, social, and infrastructural impact (Katz and Wagner, 2014).

Innovation districts are characterized by three different kinds of assets (Katz and Wagner, 2014):

- Economic assets: Firms, institutions, and organizations that support an innovative environment
- Physical assets: Public and private owned spaces and buildings and other infrastructures that stimulate connectivity and innovation
- Networking assets: relationships between actors that facilitate the spread of ideas and the generation of synergies.

Any innovation district has to stimulate the three kinds of assets, otherwise, the district cannot sustainably pursue its goals. It is necessary to have actors willing to innovate, in a facilitative environment and with the possibility to connect to other actors.
Three driving forces identified by Katz and Wagner (2014) explain the strong relationship between economic development and urban planning:

1. The evolution of economy and technology is increasing the importance of density and proximity
2. The economy oriented to innovation is changing firm location, building and general spaces needed
3. Demographic and household dynamics are increasing the demand for more walkable districts with intermixed housing, work, and amenities

According to different interviews realized by the Brookings Institute to main actors involved in innovation district projects (Katz and Wagner, 2014), there are some key concepts that explain the success of such kind of initiatives. One of the most relevant is the collaborative leadership network, where the mayor of the city and other "facilitators" engage many different actors in the decision-making process (Silvia, 2011).
Setting a vision, which considers the competitive advantages of the city and is used to attract investors is another recognised element (Paddison, 1993). Another important element is the creation of a system able to attract, retain and grow talent that promotes innovation together with an extended use of technology. Finally, and linked with the previous urban regeneration parts, the promotion of inclusive growth is another relevant aspect since it pursues the distribution of the benefits obtained via innovation and knowledge (George, McGahan, et al., 2012).

The Brookings Institute also provide three different models of the creation of innovation district, according to the interview already mentioned in the previous paragraph. The approaches mentioned are top-down strategic with specific goals, although there might be a bottom-up model that can be identified through empirical observations and particular case studies (Cosgrave, Arbuthnot, et al., 2013).

1. "Anchor plus": a large area with mixed land used surrounds a major anchor institution where different companies and entrepreneurs are involved in the generation of innovation.
2. "Re-imagined urban areas": a former industrial area is transformed physically and economically to promote an innovative growth.
3. "Urbanized science parks": isolated innovation centres are urbanized by the addition of housing and new activities, incrementing the densification and the attractiveness of the area for investors and employees.
4. "Organic generation": small and medium companies locate in the same area and create gradually a network, which is recognized as innovation district at a later stage.

The case study of the 22@ follows the second strategy, adding the social transformation to the physical and economic one. As an example of the fourth strategy, the most famous example is the TechCity of London. A creative artist community appeared in the area in 1970 due the high availability of empty spaces, this community attracted creative businesses in the fields of design, advertising, architecture, and photography. In the 1990s, this creative activity started experimenting with digital technology, emerging a technology cluster in the area. After the crisis "of the dot.com", the area kept a strong design and artistic community, who started new digital activities in the middle of the 2000 and a few years later many tech start-ups appeared in the area (Jackson, 2014). By the end of 2010, UK Prime Minister David Cameron stated the following, recognising the potential of the future TechCity (British Prime Minister's Office, 2010):

> *"And our ambition is to bring together the creativity and energy of Shoreditch and the incredible possibilities of the Olympic Park to help make East London one of the world's great technology centres"*

The creation of an Innovation District can follow different strategies, but most of the times there is a mix of strategies due to the conditions of the area and its potential. For example, Companies that are located in a former industrial area might promote its regeneration, having, therefore, anchor companies aimed to reimagine an urban area.

2.2.2 Actors, cluster, knowledge, technology, and creativity

There are four key elements characterizing innovation projects in the regeneration of urban areas and that have been mentioned early without the sufficient emphasis.

The first one to be mentioned should be the main actors that implicated in the creation of innovation districts: public sector, private sector, and universities constitute the so-called Triple Helix approach (Etzkowitz and Leydesdorff, 2000). This governance concept has evolved in the last years, going from the first model, which defined institutionally the three helices, to the third model, which pays more attention to the creation of hybrid organizations. Each actor can be the leader in the creation of the innovation district, depending on the opportunities, the context and the support can gather. Beyond this model, there is an additional model called Quadruple Helix approach that adds the user of innovation as a fourth element (Arnkil, Järvensivu, et al., 2010).

A second element is the role played by economic clusters. Considering the neighbourhood dimension, the amount of companies that move to the district increase the concentration of firms and generates positive externalities. Usually, the municipalities promote the installation of companies of specific sectors that can generate synergies and improve the competitiveness of the city. In addition to the private sector, the universities and research centres are important actors that generate innovation and strategically locate themselves in the cluster in order to participate in a win-win situation. From one side, the companies can benefit and commercialize the outcome of the research that will increase their competitiveness; on the other side, universities/research centres can better know the needs of the market labour, obtain valuable information depending on the field of research and obtain investments from the private sector (Cosgrave, Arbuthnot, et al., 2013).

The third element is linked with the way to generate economic development. In order to have innovation, it is important to invest in research and knowledge, being the so-called knowledge-

based economy the natural option. Following the strategy of flexible specialization (Van Dijk, 1995), this economy is characterized by the key role played by the labour force and the technology as principal assets, which allow them to grow and better adapt to changes (Morisson, 2015).

The fourth element is the role played by the technology. The technological sector in innovation districts stimulates both the knowledge (with universities and research institutes) and the technology, with concepts like Living Lab or Smart City, which emphasize the importance of information as a valuable economic asset. In fact, sensors and Big Data are being mainly tested in innovation districts, used as a pilot test for many products that could be potentially commercialized (Cosgrave, Arbuthnot, et al., 2013).

A final important element to highlight is the role that the creative class plays in the creation of innovation districts. In fact, besides all the necessary strategies to attract firms, the attraction of talented workers is also crucial. This "class" is attracted by the high standard of quality of life; therefore, an innovation district is the solution to create the best environment for skilled workers and competitive companies (Hughey, 2003, Florida, 2004).

2.3 Adaptive Governance

Adaptive governance is a concept usually applied in environmental and social-ecological systems. Starting from the assumption that the world is constantly changing and the knowledge is incomplete, environmental governance tries to respond to social, institutional and ecological changes (Lemos and Agrawal, 2006). Although some principles have already been applied in studies related mega infrastructures (Giezen, Bertolini, et al., 2015) and technology (Janssen and van der Voort, 2016), the literature about it is not extended. Adaptive governance could be defined as following (Janssen and van der Voort, 2016):

"Adaptive governance is an approach that is often used for dealing with complex societal issues in which there are many stakeholders with diverging interests and uncertainty about the actions to be taken."

This definition highlights how this governance system aims to deal with complexity, uncertainty, and conflict. The definition from the Stockholm Resilience Centre highlights aspects like promoting innovation and experimentation and supporting cross-scale institutional linkages (2015). The idea of increasing adaptability means at the same time a reduction of stability and accountability since the decision-making process and the institutional arrangements are drastically affected. The challenge is, in fact, to find the right balance through the so-called ambidextrous strategies (Janssen and van der Voort, 2016).

2.3.1 Theoretical background: Scales and levels

The need of new governance approaches comes from "the multi-level and multi-scale character of today's problems and today's politics" (Termeer, Dewulf, et al., 2010). Nowadays problems are not limited to boundaries that can easily be controlled, for instance, climate change is an issue that has an impact in the present and in the future, which causes and consequences are difficult to control and foresee.

Termeer, Dewulf et al define scales as "spatial, temporal, quantitative, or analytical dimensions used to measure and study any phenomenon", with the addition of new scales analyzed in recent

studies like jurisdictional, networks, management and knowledge scales. These scales allow the diffusion of adaptive governance principles in different fields than the original one. The same authors define levels as "the units of analysis that are located at different positions on scale", being the hierarchical system the most common way to organize levels.

Differently, from a monocentric or multilevel governance[1], adaptive governance considers the complexity if a situation where many levels and scales are related to each other, being necessary and approach which enhances the fit between important scales and creates better links among levels (Termeer, Dewulf, et al., 2010).
The interactions considered by adaptive governance approaches are the cross-level and cross-scale interactions. As the name indicates, the cross-level interaction refers to interactions among levels in the same scale (e.g. national and regional level), whereas the second one refers to interactions among different scales (e.g. ecological and jurisdictional scales).

2.3.2 Ecological Governance

To understand the suitability of adaptive governance for the purpose of this thesis, it is important to understand the principles and characteristics of the theory.
Ecological governance adopts the visions of organizations as living systems (Robertson and Choi, 2010) which have to deal with ecological problems that are "complex, non-reducible, variable, uncertain, spontaneous, and collective in nature" (Lundqvist, 2004). Ecological and social aspects are considered in order to create a resilient system, which highlights the need for flexibility, learning and knowledge generation in responding to environmental changes .
There are four important factors in ecological governance systems (Folke, Colding, et al., 2003):

- Learning to live with change and uncertainty
- Combining different types of knowledge for learning
- Creating opportunity for self-organization toward social-ecological resilience
- Nurturing sources for renewal and organization

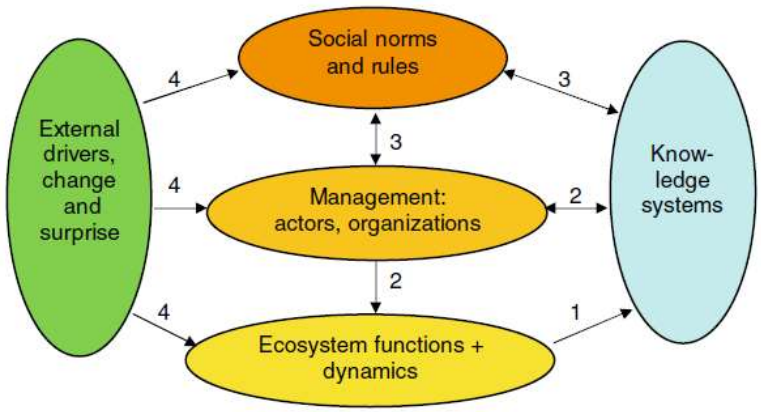
The concept of learning is also relevant for adaptive governance since it is important to analyse and understand how the system works and how it can change before deciding any adaptive strategy. In ecological governance, the change and uncertainty come from the eco-systems, being, therefore, useful to analyse problems like climate change, pollution, droughts and floods and general threats to the biodiversity (Termeer, Dewulf, et al., 2010).

Another important element is bridging organizations play an important role in the reduction of conflict and increasing the cooperation among different actors in situations of cross-scale and cross-level interactions (Folke, Hahn, et al., 2005). These organizations are flexible and important in multilevel governance systems, where responsibilities and duties might be shared among different actors, like government agencies, NGOs, communities, etc. The situations considered are not only cross-scale and cross-level but are also dynamic, where crisis are opportunities to transform into something desired (Folke, Hahn, et al., 2005).

[1] Monocentric governance is mainly focused on jurisdictional scale and national domain, which a high concentration of power and control. Multilevel governance recognize the interdependence of different levels, e.g. regional, national and international level.

A well-functioning multilevel and cross-scale governance aware of the dynamics of the system has to develop the ability to deal with external perturbations and surprise (Folke, Hahn, et al., 2005). Indeed, there are external factors that drastically change the assumptions of the system, therefore is important to create resilient systems.

Figure 3 – Differences in time at difference level of governance



Source: Hahn, Olsson, et al., 2006

The conceptual model shown in Fig.3 shows the main points of a social-ecological system explained, the arrows and the numbers show the different interaction (Hahn, Olsson, et al., 2006):

1. Building knowledge and understanding of resource and ecosystem dynamics
2. Feeding ecological knowledge into adaptive management practices
3. Supporting flexible institutions and multilevel governance systems
4. Dealing with external drivers, change, and surprise

These four steps illustrate the importance of learning within the social-ecological system in order to react to external drivers, implying the necessity of adaptability.

2.3.3 Complex Adaptive systems

Complex adaptive system (CAS) is a concept that can help to legitimize the use of adaptive governance theory from the original ecological field to other fields. CAS has been defined as "… dynamic systems able to adapt in and evolve with a changing environment" (Chan, S., 2001 p.2).

According to Holland (1992), three elements characterized CAS:

- Evolution: In order to evolve is important to learn about the context and adapt to it. Such characteristics are also the foundation of a CAS, which assumes the existence of different ways to interaction with the context and different way of adaptation.
- Aggregate behaviour: This concept can be exemplified with the generation of positive externalities and synergies due the aggregation and collaboration of actors. CAS theory aims to understand and control such aggregate value, being relevant to understand how this value is generated.
- Anticipation: To increase the complexity of these systems, there is the ability to anticipate, having parts or elements (depending on the system) that develop rules in order to anticipate consequences of certain decisions.

These elements reflect the crucial actions for adaptive governance systems analysed in this research and mentioned by Janssen and van der Voort (2016): anticipate, learn and adapt. These elements are therefore the key aspects that determine the complexity of a CAS, a system that evolves and can be considered an organic-like structure that grows (Dooley, 1997).

The awareness of a dynamic reality justifies the need of revising the interactions and the aggregate situation where every actor changes according to the others, which at the same time change according to this last change, having a non-linear dynamic system (Lansing, 2003). CAS are not looking for an optimal situation or an outcome, but they are focused on the capacity of adaptation of the project. Depending on the context and the system analysed, the changes can be faster or slower, affecting some of the actors in different degrees. On the case study analysed, the changes are occurring according to the political frames and macroeconomic aspect, being the adaptability of the project limited by the law and policies.

2.3.4 Recent studies and new fields: Mega-projects and ICT

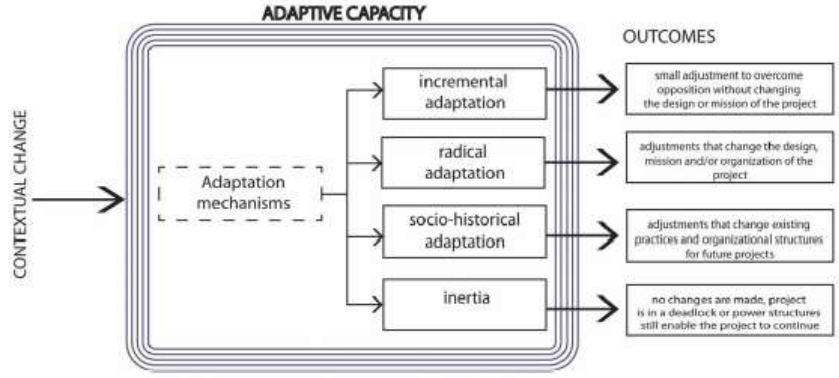
The idea behind the implementation of adaptive governance structures resides in the ability of the decision-making process to anticipate, learn and respond to changes. Long-term projects, with many different actors and interest, with high influence of external factors (e.g. economic or technological ones), are defined by complexity, uncertainty, and conflict. In recent years, some studies have used adaptive governance approaches, being relevant for my study, one that analyzes the adaptive capacity of a mega-project and another one about adaptation to new technology.

The first one is a study realized by Giezen, Bertolini et al. (2015), where adaptive governance theory is used to analyze the adaptive capacity of a mega project. Using organizational learning theory and empirical data, the study analyzes the complexity of a real case, concluding how incremental adaptation, among the different alternatives, is the most suitable to solve deadlocks. In fact, they identify four different sorts of adaptation (Figure 4), enumerated below:

1. Incremental (many small steps)
2. Radical (adjustment of policies, objectives, practices)
3. socio-historical (adaptation becomes a standard)
4. inertia (no adaptation)

Excluding the last one, that implies no action at all, the other three levels represent the manifestation of adaptation, from a small change within the project to more relevant structural changes that will affect future projects. Part of this structure will be considered and adapted for the conceptual framework of this thesis.

Figure 4 – Adaptive capacity mechanisms



Source: Giezen, Bertolini et al. (2015)

In order to anticipate, learn and adapt, there are some strategies that can be applied, like utilizing internal and external capabilities, decentralizing decision-making power or seeking to inform higher-level decisions from bottom-up.
A flexible design of the organization could be considered as anticipating measures in front of a situation that are in continuous evolution. Knowing the limits of anticipation measures, and considering that learning is a passive action, adapting is the only active and explicit action of the adaptive governance structure.

The second example shows a descriptive approach towards the real implementation of adaptive governance and its barriers. This study emphasizes the importance to find a balance between reacting quickly and ensure transparency and accountability, between the ability to adapt to changes and not become unstable. Another element relevant for this study is the consideration of the adaptation time among levels, which frames the capability to adapt to projects, in this case, urban regeneration projects.

Figure 5 – Differences in time at difference level of governance

Source: (Janssen and van der Voort, 2016)

Both studies mentioned the importance of learning as core values of the adaptive governance approach, since “the concept of learning acknowledges the inability to predefine and control all possible factors that come in” (Janssen and van der Voort, 2016). Thus, adaptability is a crucial element in order to reconsider the situation after every change, keeping in mind the different actors and goals.

2.4 Conceptual Framework

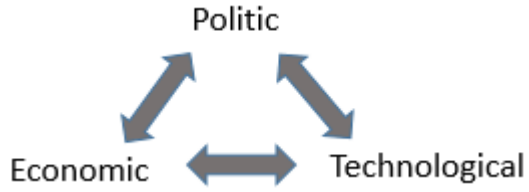
In this section, the conceptual framework of this research will be presented, linking the different theories and concepts explained in the previous chapter.

The independent variable is composed of the external factors or contextual changes as mentioned by Giezen, Bertolini et al. (2015) in relation to the innovation district system. Considering the adaptive governance theory, these factors are the external drivers mentioned by Hahn, Olsson, et al., Innovation district and urban regeneration might be separated, having innovation without regeneration and vice versa. In our case, the project combines both goals, having in common the majority of the key actors.

Many external factors can determine the evolution of this kind of a project, being necessary to limit them to the most relevant. The selected one have been chosen according to the governance system of the Triple helix approach, which emphasizes the importance of three main actors in the creation of innovation (Etzkowitz and Leydesdorff, 2000). The local government (City Council/Municipal Company), the private sector (general investors, developers, and companies) and the academic sector (universities and research centers), forming a Public-Private-Academic partnership. According to the literature review, political factors influence the public sector, economic factors affect mainly the private sector and the technological factors influence and are influenced by research centers.

There is a strong relationship between the three aspects, being useful for the scope of this thesis to include the three of them. As can be seen in Figure 6, there is a both-ways relationship among them.

Figure 6 – External factors connection



Source: Author compilation

- Political and Economic factors: The local government can decide where to invest and how much, where a political election and a change of the party responsible can further change the local government agenda. On the other side, an economic crisis will change municipal forecast and eventually generate budget constraints, pushing to Public and Private partnership that further increases the interdependence of both political and economic factors.

- Economic and Technological factors: Periods of economic growth can increase the investment in R&D, bringing more opportunities and reducing the risk aversion of investors. Besides that, any technological advance can open new markets or improve the efficiency and productivity of companies

- Technological and Political factors: Similar to the connection with the economic factors, regarding the technological sector, the local government might decide to

support or not the use of technology in the public domain, like e-government, smart city initiatives or Open Lab. The technological sector might offer new solutions to the local government, like new apps or solutions able to improve the communications with the citizens or promote participatory initiatives.

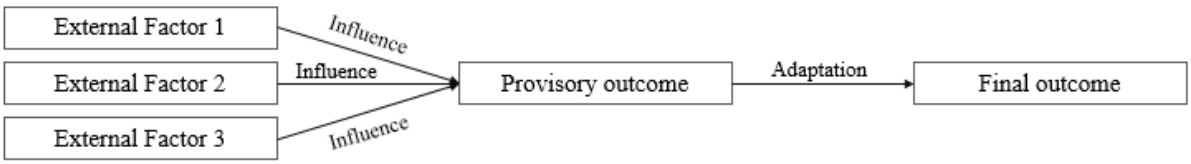
The dependent variable is the evolution of the project: the project has evolved during the years with the aim to regenerate the district by stimulating the creation of new businesses and activities related to the knowledge-based economy. In order to measure the development of the project, this research will consider the main goals and targets and classify them according to their physical, economic or social characteristic. These targets are the following aspects:

- Physical integration
- Clusters generation
- Stimulation Economic activity
- Promotion of the district (image and branding)
- Housing and green areas
- Programs for integration

These aspects consider the triple transformation that the 22@ project follows: physical, economic and social transformation.

Beyond the aspects considered in the independent-dependent relation, this research acknowledges the existence of a moderator variable, which is defined "… a third variable that affects the strength of the relationship between a dependent and independent variable" (Statistics Solutions, 2016).
Considering the Complex Adaptive Systems theory, adaptation implies a dynamic reality, therefore the relation between the independent variables and the dependent one is continuous and unpredictable. It means that after each influence to the project, the project slightly adapts to the new circumstances, being the final outcome something different that the simple impact of the external factors.

Figure 7 – Adaptation dynamic



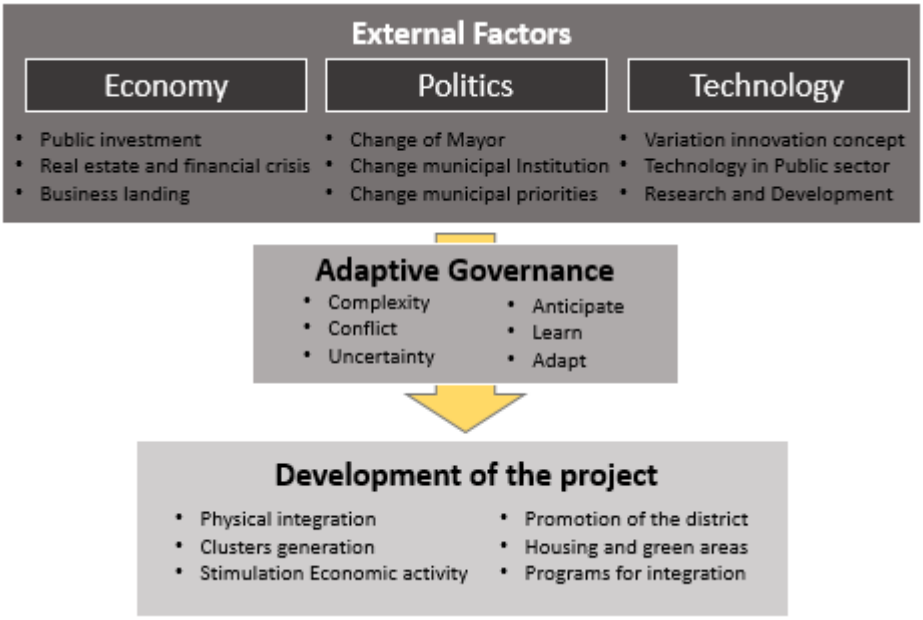
Source: author compilation

The adaptability of the project is a key element that this research analysed. This research wants to study the adaptability in the specific case of the 22@ District since adaptability is present in decision-making and implementation of the transformation.
This research will consider six elements to analyse the project through an adaptive governance approach:

- The essential assumptions of adaptive governance (complexity, conflict, and uncertainty) (Janssen and van der Voort, 2016).
- The essential action that characterized and adaptive system (anticipate, learn and adapt) (Wyborn, 2015, Holland, 1992).

The following framework (Figure 8) shows the relationship between the different theoretical concepts mentioned. It shows directly the causal relation that will be analyzed and the main variables that have been selected. The framework also shows the main indicators used to capture and measure the variables.

Figure 8 – Conceptual framework



Source: author compilation based on Holland, 1992; Wyborn, 2015; Janssen and van der Voort, 2016; Roberts, 2000; Katz and Wagner, 2014

The theories mentioned in this chapter are relevant to contextualize the variables in the case study and especially for the analysis of the data.
The selected external factors have a different impact on an urban regeneration or innovation district point of view and consequently on the achievements of goals. For instance, an economic shock that reduces the number of companies moving into the district is negative for the innovation district project, but can be positive from the urban regeneration side since it reduces any gentrification or pushes force over the local residents. This tension between regeneration and innovation will increase the interest of this research, showing how the consequences of some changes can converge or diverge between these two goals.

The adaptive governance theory will be used in the analysis, with the aim to show the suitability of the approach in urban projects. There are common characteristics between urban projects and environmental projects (large number of actors, complexity, long-term projects, conflict, change of conditions), therefore the strategies used in one area might be useful for the other.
These strategies will be used to analyze the evolution of the project, providing new knowledge and indirectly proving the validity of this governance system in urban projects. Such analysis will try to identify adaptive strategies like decentralization, facilitators, confrontation, shortening decision-making, flexibility or openness.

Chapter 3: Research Design and Methods

This chapter presents the operationalization and the research methods that will be used in order to collect and analyse the necessary information to answer the research question and sub-questions of this study. According to the iteration process of this research, the Chapter 1 and therefore the research question and sub-questions have been revised according to the theory review done in Chapter 2.

3.1 Revised Research Question

The main of this research is to explain the evolution of the regeneration project in relation to specific external factors that have a direct influence on the main stakeholders according to the Triple Helix system. The first part of the analysis considers the evolution of the triple transformation and the influence of the external factors, while the second part uses adaptive governance principles to analyse the evolution and adaptability of the project.

Before the data gathering, some assumptions have been done in order to guide the semi-structured interviews, the analysis of the data shows the validity of the assumptions, specifically related to the connections among the external factors and their real impact on the development of the projects. Another challenge of the research is the use of adaptive governance approach in a regeneration project. Previous articles already applied an adaptive governance approach for the analysis of mega projects (Giezen, Bertolini, et al., 2015) or related to the technological innovation (Janssen and van der Voort, 2016).

Considering the external factors mentioned and the adaptive governance theory, the central research question is the following:

> *What has been the influence of external factors on the physical, economic and social transformation related to the urban regeneration project '22@ Innovation District' in Barcelona according to Adaptive Governance theory?*

The following sub-questions guide the research and better clarify the scope.

- *How did the physical, economic and social transformation evolve in the last 15 years of the 22@ project (2000-2015)?*
- *How have the politic, economic and technological variations affected the 22@ project?*

The first two sub-questions analyse separately the external factors and the evolution of the different transformation layers. This split suggests the structure of the analysis since it is easier to understand a complex situation by unbundling in logical units.

- *What are the characteristics of the 22@ District that are comparable to the essential assumptions (complexity, conflict, uncertainty) and action (anticipate, learn, adapt) of Adaptive Governance?*

The third sub-questions considers the assumptions of Adaptive Governance theory in urban regeneration projects in determining the reason for its complexity, conflict, and uncertainty. This last step consists in using the adaptive governance to confirm the importance of adaptation and the use of adaptive governance in the 22@ project and generally in urban regeneration projects.

3.2 Research strategy: Case study

This thesis adopts the case study as research strategy since it is the best option to explain the evolution of an urban regeneration process within its context and considering different variables. According to Verschuren and Doorewaard (2010), the case study presents some key characteristics that suit with the aim of the research, for instance, the open observation on site, the qualitative intensive data generation and the deep understating pursued. To better comprehend the complexity of a phenomenon, it is necessary to describe, explain and explore the relationship between different variables, actors, and events. In brief, it is necessary some flexibility and openness in order to catch the essence of the event, considering the discrepancies between the theoretical assumptions and the evidence obtained during the data collection. Indeed, the case study allows structuring a research with relative few knowledge about the case, being open to the specific characteristics of the case and the knowledge of the interviewees.

As showed in the conceptual framework, there are external factors, in relation to the urban regeneration process, that drastically change the plans and forecast done. These external factors have been selected according to two different aspects:

- the first one makes reference to academic literature, which emphasizes the role of three key actors (Etzkowitz and Leydesdorff, 2000) and therefore their influence from specific external factors;
- the second one refers to literature about the specific case, which already shows some events that have affected the project (Cols, 2015).

The external factors have been subdivided into three sectors, each of them with determinant events that affect the regeneration process of the district:

- Political: Three Municipal elections (Sept 2006, Jul. 2011, Jun. 2015)
- Economic: Financial crisis, Public and private investments
- Technological: From "City of Knowledge" to Smart City

Besides the events mentioned, other events and variables for each force have appeared during the data collection and have considered according to its real impact, covering any eventual influence.

Qualitative information through semi-structured interviews and secondary data from municipal reports, academic studies, and critical reports provide the necessary data to analyse the case study with a certain degree of partiality. The openness in the interviews increases also the opportunity to obtain stakeholder's perception about the project and it is necessary for the objective of detecting relevance of adaptive governance. Indeed, adaptability is being considered by some academics (Chaffin, Gosnell, et al., 2014, Giezen, Bertolini, et al., 2015, Janssen and van der Voort, 2016) as a crucial governance characteristic that needs further empirical studies.
Regarding the indicators, some are being selected from the literature review in order to guide the data collection, others have been added to the analysis according to the information collected.

3.3 Operationalization: Concepts, Variable, Indicators

This section presents the transitions of the theoretical concepts explained in Chapter 2 to an empirical research. The concepts previously presented are being contextualized to the case study, determining the different ways it can be expressed, measured and analysed.

Independent Variable	Political, economic and technological changes (contextualized at district and project level)
Dependent Variable	Evolution of the project

There is limited literature that can guide the choice of variables due to the relative novelty of innovation district or adopt adaptive governance for urban regeneration projects. The variables selected are coming from academic definitions and information specifically related to the context of the case study. The following tables present a summary of the definitions of the main concepts for this thesis extracted from literature discussed in chapter 2.

Table 3 – Definition of Urban Regeneration

Author	Definition
(Roberts, 2000)	"…comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in an area that has been subject to change."
	"…integrated practice, emphasizing the necessity for partnerships and a broader notion of environmental, social and economic interconnectedness"
(Ercan, 2011)	"…comprehensive and integrated vision and action to resolve the multi-faceted problems of urban areas and to improve the economic, physical, social and environmental conditions of deprived areas"
(Adair, Berry, et al., 2007)	"…the process of reversing economic, social and physical decay in our towns and cities where it has reached that stage when market forces alone will not suffice."
(Lovering, 2007)	"…is creating city spaces that will be more balanced, more attractive, more socially inclusive, more aesthetically harmonious, more environmentally sustainable, and generally much better all round."
(Granger, 2010)	"'action to address need', where need refers to the need to resolve problems as a result of market failure and subsequent job loss and disinvestment.

Considering the case study of the 22@ of Barcelona, the stipulative definition adopted in this research is the following:

> *"Comprehensive vision that seeks to bring about a lasting physical, economic and social improvement of a decaying area that has been subject to a drastic change in order to make it attractive for the citizens and the business activity"*

This definition considers the three elements of transformation, highlights the fact that the area needs to be in decline after drastic changes and that the aim of regeneration is not only towards the current citizens living in the area, but also aims to generate economic activity attracting new businesses.

Table 4 – Definition of Innovation District

Author	Definition
(Morisson, 2015)	"… top-down urban innovation ecosystems that combine urban planning, productive, collaborative and creative environments, all coordinated under a strong leadership, with ultimate objectives of accelerating the innovation process and of strengthening the location's competitiveness."
(Katz and Wagner, 2014)	"…geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically wired and offer mixed-use housing, office, and retail."
(Cosgrave, Arbuthnot, et al., 2013)	"Innovation Districts are small pockets of growth in a town of city, which can be Stimulated by a variety of factors."

Considering the case study of the 22@ of Barcelona, the stipulative definition adopted in this research is the following:

> *"Urban compact area that offers mixed land used where research centres and companies concentrate and cluster, adopting a flexible and highly technological system that promotes knowledge economy activities."*

This definition considers the importance of location and concentration of actors and activities, adding the concept of flexibility and technology. The flexible specialization mentioned in Chapter 2 is therefore highlighted in the definition since is an element that supports the adaptive governance approach used in the analysis.

Table 5 – Definition of Adaptive Governance

Author	Definition
(Janssen and van der Voort, 2016)	"Adaptive governance recognizes ecosystem that technology projects are inherently complex, surrounded by a high level of uncertainty and different interests that might even be conflicting."
(Wyborn, 2015)	"Adaptive governance is about being able to improve the adaptive capacity of organizations to deal with uncertainty and improve the speed of decision-making."
(Stockholm Resilience Centre, 2015)	"Adaptive governance is an evolving research framework for analyzing the social, institutional, economic and ecological foundations of multilevel governance models that are successful in building resilience for the vast challenges posed by global change, and coupled complex adaptive SES."
(Chaffin, Gosnell, et al., 2014)	"range of interactions between actors, networks, organizations, and institutions emerging in pursuit of a desired state for social-ecological systems."

Considering the case study of the 22@ of Barcelona, the stipulative definition adopted in this research is the following:

> *"Cross-level and cross-scale governance system with a bridging organization that coordinates and cooperates with the other actors, internalizing the complexity and uncertainty of the environment and learning and reacting consequently."*

This definition considers the role of bridging organisations as the essential assumption and action of adapting governance.
The last concept that should be operationalized and appears in the conceptual framework is the one making reference to the external factors:

"Unexpected events out of the project level that drastically change the development of the project."

This definition practically states what this research considers external factors, delimitating the boundaries between internal and external according to the level of the project.

The following tables (6, 7 and 8) show in detail the operationalization of the research concepts. It shows the independent variables, the dependent variables and operationalized the main concepts of adaptive governance, which can be considered as a moderating variable.

The indicators of the independent and dependent variables have been used to prepare the semi-structured interviews, creating a guide for the questions. Please find in Annex I the preliminary structure of the interviews, since according to the questions were adapted and expanded according to the knowledge and experience of each interviewee regarding the project. In fact, following the case study as a research methodology, and considering the research goals of this study, the data collection has been open and flexible enough to obtain insightful information from the interviewees without losing the focus of the research.

The operationalization of the adaptive governance variables has been structured in a second phase, following the coding of the interviews. Starting with the three main assumptions and three main actions, the interviews were conducted in order to identify such elements and expanded them with secondary data.

Table 6 – Operationalization independent variable – External Factors

Concepts	Variables	Sub-variables	Indicators	Data Collection Method
External factors	Political Factors	Change of Mayor Change of Municipal institution Change of municipal priorities	Number of Mayors in the period 2000 - 2011 (2015) Change of the insitutional arangements and mission of the Mun. Comp. Relevant projects not located in the district Stakeholders Perception	Mainly qualitative data – Interviews Secondary Data – Organisational Reports; Government Reports; Media articles; Academic Journals
	Economic Factors	Public Investment Real estate evolution Business landing	Public investment (distrct and city) Vacancy and prices m2 Variation companies and sectors Stakeholders Perception	
	Technological Factors	Change of Innovation concept Investment in smart city initiatives Number of start-ups Number of research centres	New technological concepts (e.g. smartphone, apps, smart ciy,…) Main initiatives that demostrate the role of technology in the city Urban Lab situation Evolution of number of start-ups located in the district Evolution of number of universities / research centres located in the district Stakeholders Perception	

Source: author compilation based on Roberts, 2000; Katz and Wagner, 2014

Table 7 – Operationalization dependent variable – Development of the project

Dimension	Variables	Sub-variables	Indicators	Data Collection Method
Development of the Project 22@	Physical transformation	Status transformation	Number projects completed % area completed	Qualitative Data - Interviews Secondary Data - Academic papers, organizational reports
		Physical integration with the city	Connections with the city Connection sourranding projects Planning integration (streets and equipment)	
	Economic transfrmation	Clusters generation	Evolution clusters (number, size, degree of integration in the distrct) Research & Development structures created per cluster	
		Stimulation Economic activity	Evolution non-clusters companies (number, sectors, size, employment) Benchmark of economic activity with rest of the city	
	Social transformation	Promotion of the district	International presence in the district Assess international influence in other districts	
		Housing and green areas	Units of social housing Units of private housing m2 of green areas	
		Programs for integration	Programs for neighbours Programs business - neighbours	

Source: author compilation based on Modification of the General Metropolitan Plan (1999) and 22@ 10t and 15th anniversary Report,

Table 8 – Operationalization moderating variable - Adaptive Governance

Dimension	Variables	Sub-variables	Indicators	Data Collection Method	Sources
Adaptive Governance	Complexity	Multi-level and multi-scale situation Interconnected actors and goals	Number of levels and scales Identification main interactions and goals	Qualitative Data - Interviews Secondary Data - Reports	22@ Barcelona Plan, 22@ website, 22@Network website, 22@ 10th anniversary report, 22@ 15th anniversary report, City Council reports, Barcelona Activa reports, Business census GAPS, Other academic papers, Interviews
	Conflict	Variety of interest and refection Degree of participation (neighbours)	Identify conflictual positions Level at the Ladder of participation	Qualitative Data - Interviews Secondary Data - Academic papers	
	Uncertainty	Changes of structure Elements of Innovation Speed of transformation	Variation of leader Unique characteristics of the projects % of transformation achieved by 2015	Qualitative Data - Interviews Secondary Data - Reports	
	Anticipate	Flexibility of the project Vision of the project	Elements of flexibility of the projects Variation of the project in political agenda	Qualitative Data - Interviews Secondary Data - Reports	
	Learn	Lessons from previous situations Communication flow Cooperative partnership	Mention of previous experiences Structured scheduled meeting (cross-level) Strong alliances among actors	Qualitative Data - Interviews Secondary Data - Organizational reports	
	Adapt	Gradual transformation process Sensibility pre-existent situation Intagration with metropolitan projects	General examples of adaptation Catalogue industrial heritage Gentrification local businesses Common strategies and/or infrastructures Stakeholder perception	Qualitative Data - Interviews Secondary Data - Academic papers, organizational reports	

Source: author compilation based on Holland, 1992; Wyborn, 2015; Janssen and van der Voort, 2016.

3.4 Data Collection Methods and Sampling

The data collection for this research is obtained by using mainly qualitative information (primary and secondary) and quantitative to support the aspects more technical. In the next sections, each typology is explained in detail in order to show transparently the data collection process followed during this research.

3.4.1 Qualitative data collection methods

There are objective information sources that can provide the necessary figures to understand the evolution of the regeneration process and the innovation dynamic, although the aim of the research is to obtain information about the influence of external factors and the use of adaptive governance to analyse it. The qualitative data is able to provide an insight vision that increases the relevance of the study and the originality of its analysis. In addition, actors not directly implicated are being interviewed in order to have a certain degree of objectivity from academic and specialist on the topic.

The literature review has provided a guidance in order to organize the semi-structured interviews (check Annex 1 for a draft of the interview guide); nevertheless, the openness is a key element of the interviews in order to adapt the data collection to the specific knowledge and perception of the interviewees. The variety of the answers will make difficult any quantification or graphic representation of the answers.

In occasion of the 10th and the 15th anniversary of the project, the municipality, and many academics published reports to show the achievements of the project, analysing different aspects like the impact in real estate, cluster's development, creativity, technology or governance. This information is used to support interviewee's perception and increase objectivity.

3.4.2 Quantitative data collection methods

Similar to the secondary qualitative information, the secondary quantitative information is used to better understand the dimension of the project and try to quantify the impact of the different changes or strategies. The 10th and the 15th anniversary of the project allowed assessing quantitatively the results of the project until 2010 and 2015.

The municipal company22@ Barcelona was the responsible of promoting the project in order to attract investors and companies willing to move to the district, therefore, there was a strong marketing department that registered and divulged figures about the performance of the company and the project. This "communicative aspect" of the project provides valuable information to analyse the project.

3.4.3 Sampling

A purposive sample is used to select actors that have been implicated in the project or that have studied the project previously, having a more subjective insight vision and a more objective vision. A snowballing process has been partially applied starting from a contact person that worked on the city council for more the fifteen years, who provided the first list of 6 key persons that could provide valuable information, including a former president of the municipal company and a former mayor.

Further contact persons for the interview have been selected using reports, academic articles, and newspaper. The following table (Tab. 9) shows the position of the people interviewed and some key informers that provide valuable information but were not interviewed. The codes are relevant for the analysis since they show which profile provided specific information and quotes.

Table 9 – Interview List

Code	Position
I1	Planning Manager of the City Council of Barcelona, Deputy Mayor and father of the 22@ project
I2	Managing Director of *22* @Barcelona
I3	Director of Strategic Sectors and Innovation
I4	22@Barcelona Head of Marketing and Communication
I5	Former Mayor of Barcelona 2006 - 2011
I6	Former Mayor of Barcelona 2011 - 2015
I7	Deputy mayor of Barcelona
I8	Director Gerente del Consorci Administració Oberta de Catalunya
I9	Professor and policy analyst on spatial planning, strategic development and urban governance
I10	Secretary of the *22* @Network Association
I11	President of the Neighbourhood Association of Poble Nou
I12	Professor and Visionary "City of Knowledge"
I13	Professor and specialist on the 22@ project
I14	Research Director, Economic Promotion Area at Barcelona City Council
I15	Phd Student - Author book against the 22@
Informer	Consulting economists (impact of 22@ on urban development and real estate
Informer	Senior Researcher at Cushman & Wakefield (Commercial Real Estate Service Company)
Informer	President of *22* @Barcelona and father of the 22@ project
Informer	Prof. TU Delft - Expert in Adaptive Governance

Source: author compilation

The time constraint for the data collection have reduced the possibility to have a larger number of interviewees and therefore limited the quality of the final analysis. Secondary data will be crucial to supply any eventually weak point discovered after the data collection.

3.5 Data Analysis method

Qualitative and secondary data have been analysed using the text and audio analysis software Atlas.ti, which allows coding the information and organizing the relevant information. The 15 interviews done have produces 16 hours of audio, which has been transcribed for coding purpose. The codes have been structured in order to capture the relevant information for this research (please check Annex 2 for a complete list of the codes used.

As per the operationalization of the variables, the codes have been gathered in the following groups:

- External Factors
- Impact assessment
- Relevant actors
- Adaptability and Governance
- Other relevant information

The group other relevant information contain codes that can help to contextualize the information and enrich the analysis, like “externalities and synergies”, “metropolitan and global level”, “International recognition” or “Timeline”.

3.6 Validity and Reliability

The validity and reliability are important characteristics of a scientific research, since are the basic conditions that determine its quality. There are some limitations and challenges when taking a case study in regards to these two characteristics. They can be divided each of them into two sub-characteristics: internal and external validity, and accuracy and consistency for the reliability (Van Thiel, 2014).

3.6.1 Internal Validity

In a case study, it is more difficult to control all the possible variables besides the one considered, therefore there might be the risk of not considering other variables that can explain the evolution of a regeneration process. The literature review demonstrated that the connection between external factors and the evolution indeed exists, the point now is to demonstrate to what extent and how adaptability can be determinant for the outcome. The operationalization of the variables needs to be open enough to the insight information obtained during the interviews; therefore, additional indicators might be included in order to improve the understanding of the study. Finally, the triangulation of data sources using municipal-academic-critic documents improve the objectivity of the information and the quality of the analysis.

3.6.2 External Validity

The case study considers a sample relatively small in a specific context; therefore it is difficult to generalize any of the findings of the research (Verschuren and Doorewaard, 2010). The analytical process and more specifically the use of adaptive governance as an analytical tool for similar projects is the part of the conclusions that can be used by other researchers. Previous studies (Giezen, Bertolini, et al., 2015, Janssen and van der Voort, 2016) already mentioned emphasizing the need of empirical research in order to demonstrate the validity of adaptive governance in other fields. We can conclude that the external validity of the research is weak, although is also true that the aim of the study is to understand this

3.6.3 Accuracy

Using interviews there might be a high degree of subjectivity, therefore qualitative secondary data is used to increase the objectivity and corroborate and complement the information obtained. As well as the internal validity, the accuracy is protected by the triangulation of sources, which not only provide objectivity, but also a crosscheck of information.

3.6.4 Consistency

The case study as a strategy presents the same limitations as other research strategies when are used in social science regarding the repeatability. The researcher, the methodology or even the respondent might influence the outcomes of a data collection study. The three principles of data collection mentioned by Yin (2003) can guarantee a certain degree of consistency and general reliability: use of multiple sources of evidence, creation of a case study database and the maintenance of a chain of evidence.

Chapter 4: Research Findings

This chapter presents the analysis of the information obtained during the data collection process, based on semi-structured interviews, documents provided by relevant sources and other secondary sources. Quantitative information is used in order to corroborate and clarify the information obtained.

The first section introduces the case study and associates it with the theories explained in chapter 2 and the conceptual framework in chapter 3. The second shows the main elements that characterize the project itself, making it a model exported in other cities. The following section presents the analysis of the case according to the interviewees' perception and in relation to the external factors taken into consideration. The last section looks at the suitability of the adaptive governance theory in urban regeneration processes, considering the basic similarities and the effective utilization for this case study.

4.1 Description of the case study

The case of the 22@ is the response to the strategic project of the city to regenerate the east part of the city. This strategy contains different projects that reinforce each other but have been developed in different times and using different systems. The most representatives are the Vila Olimpica, the Forum Area, and the Sagrera station.
The project aims to regenerate part of the Poblenou district by creating an Innovation District able to generate economic activities and employment that respond to the new technology and new ways of information and communication.

4.1.1 Definition Innovation District and "@"

The idea of Innovation District in Barcelona comes from two ideas appeared at the end of the 90s regarding the future of Barcelona: City of Knowledge and Technological City.
The first concept comes from the studies done by Prof. Joan Trullén about the importance of knowledge in the new economy and the consequent municipal strategy "Barcelona, City of Knowledge" promoted by the mayor Joan Clos (Barceló, 2007). The basic idea is that the new technologies have made the information cheaper and more available; therefore, the knowledge is the element that differentiates and generates additional value, increasing economic competitiveness and social equity (Trullén, 2001).
The second concept comes from a book written by Miquel Barceló (founder and future president of the municipal company 22 Arroba BCN) and Antoni Oliva (future secretary of the 22@Network Association), which states that the new technologies allow the industry to be part of the urban economy of Barcelona. It is an industry that needs less space than the traditional one, is clean and less noisy and needs to be in contact with good infrastructures and with the centres of information, knowledge, and power, generally located in the city (Acebillo, J., 2009).
Regeneration and innovation are elements that characterize this project, where Barcelona wants to find a balance between the heritage and the local community from one side and the market and the new companies on the other side, deciding when is necessary to maintain, transform or substitute.

The use of @ comes from the transformation of the zoning code from the industrial zone 22a to the new one based on the knowledge-based economic activities of the 22@, considered as activities zone (Ajuntament de Barcelona, 2011). "@" can be considered a symbol of the new

ways of communication, symbolizing the transition from the past "a" to the new "@". As @ is considered the activities that follow the following requirements (Eastway-Pareja, M., 2016):

1. They use production processes with intensive use of new technology
2. They have a high occupational density
3. They are directly related to the generation, processing, and transmission of information and knowledge.
4. They are not contaminants or annoying and can develop in central urban areas

The concept of "@" is generally used to every activity or concept related to the 22@ district, like the land use code 7@, which is used for the equipment that is related to the @ activities.

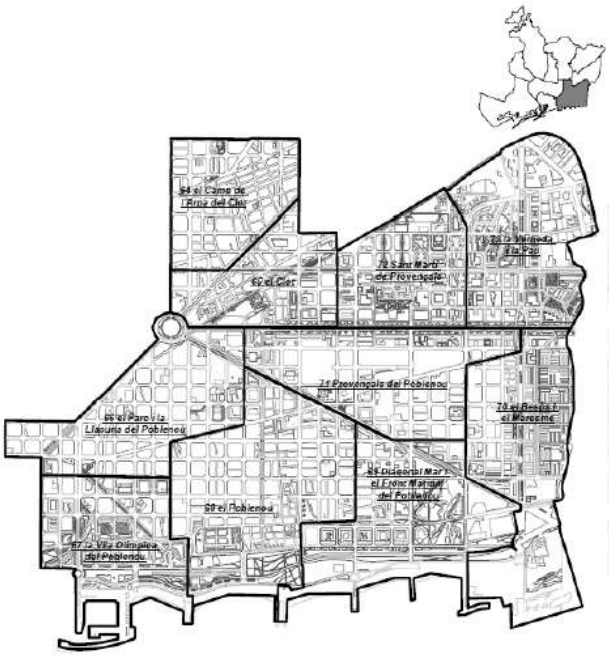
4.1.2 District geography

It is important to locate the area of the 22@ since it is relevant for the metropolitan strategy of the city.

Barcelona is composed of 10 districts, and the 22@ is within the district of Sant Martí, which is composed of 10 subunits. Figure 9 shows a small map of the ten districts on the right-upper corner and a bigger map of the 10 subunits of the district, being important considering that the most recent regeneration projects of the 90s and 2000s (Olympic Games 1992, Forum 2004, Sagrera Station).

Figure 10 shows the area covered by the 22@ District and in colour the predetermined plans.

Figure 9 - Map of Barcelona, district of Sant Martí



Source: 22@ Barcelona 2000-2015 (2016)

Figure 10 – Map 22@ District

Source: 22@ Barcelona Plan (2012)

The district is composed of six predetermined areas (Llull Pujades Llevant, Perú-Pere IV, Campus Audiovisual, Parc Central, Eix Llacuna i Llull Pujades Ponent) where the municipality determined the transformation, representing an aggregate value of 925.482 m² of land, that is a 47% of the total transformation área (Ajuntament de Barcelona, 2011). The rest of the area is undetermined and its transformation depends on private initiatives.

The 22@ is composed of two main areas, relevant for the concentration of anchor companies, universities, and public buildings. Especially relevant is the left area of the map, the most

developed which includes the Design, Media and ICT clusters. The middle part is not included because it is the historical centre of Poblenou and mainly residential and commercial area.

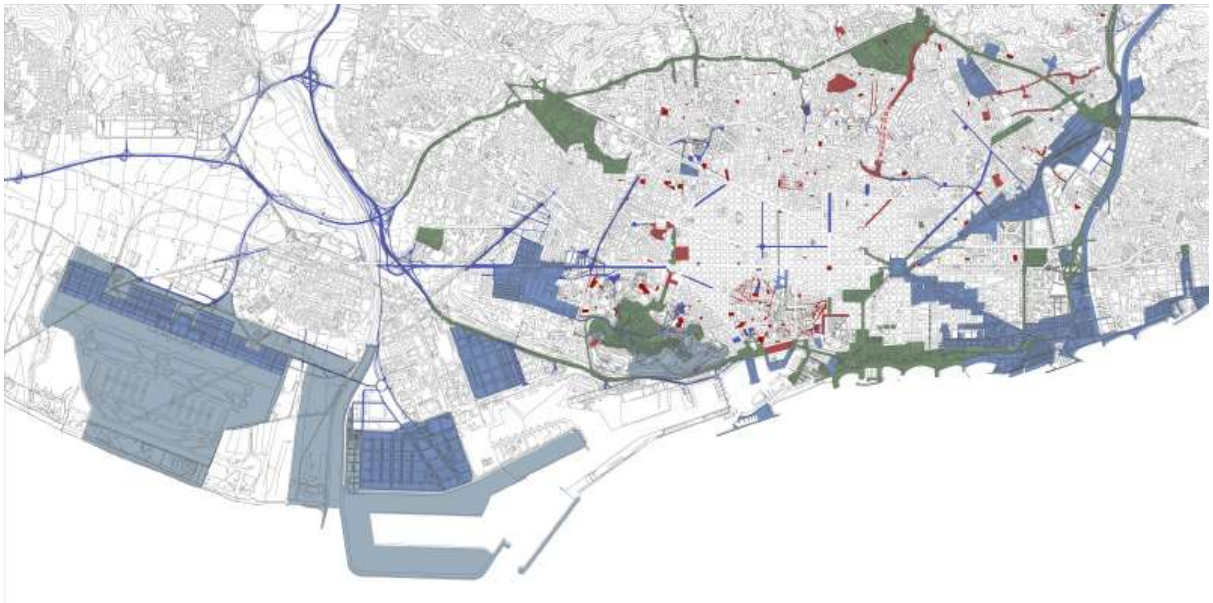
4.1.3 Barcelona Model of Urban regeneration

To understand the regeneration strategy followed in the case study analysed, it is important to consider the regeneration strategies followed by the municipality. The following map (Figure 11) clearly shows three different periods of regeneration strategies and also can be seen how the area of the 22@ was surrounded by areas previously renewed and therefore is part of a strategy of regeneration of the sea front and the east part of the city (Acebillo, J., 2009):

- 1980-1986: The red areas show the small scale approach based on the regeneration of squares streets and parks.
- 1986-1992: The green area highlights the areas renewed especially for the Olympic Games 1992, based on a larger scale focused on the sea front, sports areas and improvement of crucial road system.
- 1992-2004: It is the blue are, a metropolitan scale approach based on infrastructures and strategic areas.

After 2004, the approach has been the same, being relevant the inclusion of the 22@ and the area surrounding the future high-speed train station of Segrera.

Figure 11 - Map of Barcelona's urban regeneration approaches 1980-2004



Source: La città e l'ambiente: costruire città sostenibili (2009)

The Barcelona Model of urban regeneration is famous worldwide and has been crucial for the rebirth of the city. This model was possible thanks to mayor Pasqual Maragall, who gathered the consensus of social and economic actors in the creation of new models of public-private cooperation (Barber and Pareja Eastaway, 2010). The mayor Pasqual Maragall was also relevant since he decided to manage the Olympic transformation of the city, being the leader of the process instead of delegating it to a third person. This decision had a relevant impact since the municipality learned how to transform a city, being responsible for the spending of all the funding for the Olympic Games 1992. (I1)

The Barcelona Model have some specific characteristics that have defined the succeed of the regeneration project of the city (Blanco, 2009):

- Use of major events (1992 Olympic Games and 2004 Universal Cultures' Forum)
- Design and implementation of specific areas of the cities
- Development of a relational model of management
- Creation of autonomous public agencies
- Territorial decentralization
- Participation of citizens in public policy-making

The 22@ presents most of the previous characteristics with some exceptions: one difference is that there is no major event to promote a transformation, but it was a need of the city and requirement of the neighbours; the other difference is the lack of citizens participation, the fact that was highly present in the Olympic Games of 1992 and less in the Forum 2004. As Blanco suggests, there is a neo-liberal orientation in the regeneration projects that Barcelona after the Olympic Games 1992. This approach "…emphasis on high profitable private projects, giving a large role to private operators in the design and implementation of the regeneration projects and the clear weakening of public leadership."(Blanco, 2009 , p. 179).

4.2 Main characteristics of the 22@ project and the 22 Arroba BCN

This section provides relevant information about the background of the project and its main characteristics, highlighting the main characteristics of the municipal company, being the most relevant actor for the transformation of the district. Due to the complexity of the case and the many aspects it comprehends, only the most relevant and characteristics aspects will be explained.

4.2.1 Characteristics 22@ project

The 22@ project follows a new urban model that generates a completely new situation for Barcelona. There is the possibility to create and use a new urban model due to the "brownfield" characteristic of the area since the transformation does not start from zero but needs to respect pre-existent elements.

The project aims to create a district with **high density, compact, mixed uses and flexible** district. The density was low since the area was exclusively industrial; therefore, the project plans the construction of 4000 units of social housing plus the regulation[2] of another 4600 units. The compactness is necessary not only to obtain high density but also to have a more efficient use of the available land, being aware that the available land within the city is limited. The 22@ promotes mixed land uses with the 22@ zoning code, which focuses on a model where housing, commerce, offices, research centres and green areas are mixed. This mixture is possible only with a flexible system, in fact, the 22@ project is flexible in four aspects (22@ Barcelona, 2012):

- flexible in time: gradual and progressive transformation avoiding radical changes
- flexible shape of buildings: no predetermined morphological conditions
- flexible in the regeneration agents: public and private lead initiatives are allowed
- flexible in transformation mechanisms: different types of derived plans

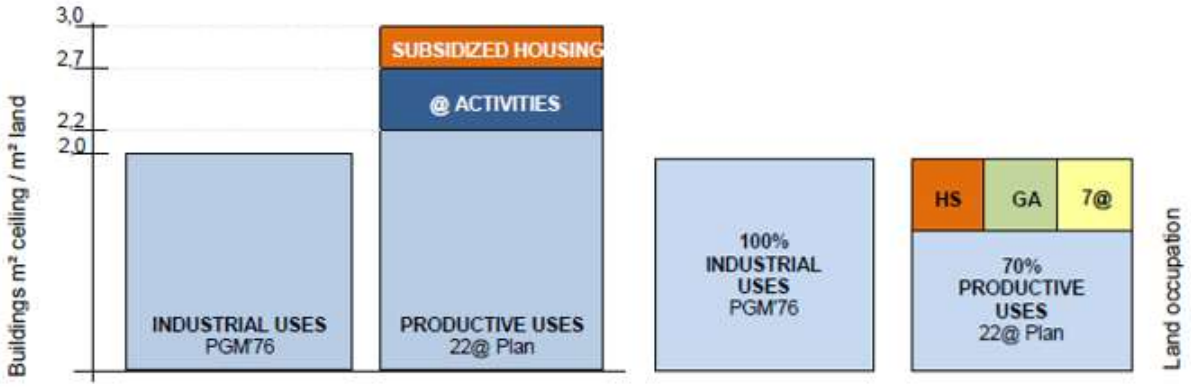
[2] The project normalized the situation of 4600 traditional homes that were in an irregular situation since 1953, when a new Regional Plan established an exclusively industrial use for all the industrial land.

An interesting aspect of the project is related to the **buildable area**, in fact, the project increased the buildable area in order to increase the density, attract investors, and finance the transformation. The PGM of 1976 allowed a construction of 2 m2 of ceiling per m2 of land, whereas the 22@ Plan allowed 3 m2 per m2 of land. This total increment (+1 m2) increment is based on the following reasons:

- 0.2 to everybody in order to partially finance the transformation
- 0.5 if the land contains @ activities
- 0.3 to subsidise housing

Additionally, the landowner had to transfer 30% of the land to the municipality, so that 10% goes to new amenities, 10% to new housing and 10% to new green areas (Figure 12).

Figure 12 - Buildable area and uses



Source: adapted from 22@ Barcelona Plan

The private sector has mainly financed the transformation of the district thanks to a **land value capture** created by the City Council, which transfers the management of these resources to the municipal company: right to 30% of the proposed development area or equivalent monetary value and a development levy of €80 per m2 developed (Huxley, 2010). It is a system where the private developers pay the cost of the transformation of the private-own land and participate in the reinvestment process indirectly through the municipal company. The 22 Arroba BCN uses these resource for land clearance and site preparation, infrastructure improvements, green space and public facilities creation, social and student housing provision and effective destination marketing (Huxley, 2010).

The 22@ Plan does not determine the outcome of the transformation, having rules that public and private plans need to respect. There are **six predetermined areas** of action, each of them with specific reasons that are interesting to mention shortly (Fig. 10 highlights these areas) (Ajuntament de Barcelona, 2011):

- Llacuna axis: in order to strengthen the relation sea-mountain
- Audiovisual Campus: facilitate the location of cultural and audio-visual centres and activities
- Central Park: transformation considering the façade to the Central Park of Diagonal
- Llull-Pujades East: continuity with the Diagonal Mar area
- Llull-Puajdes West: continuity between the core of Poblenou and the city centre plus metro line underneath
- Perú-Pere IV: the creation of a new centrality.

The rest of areas can be transformed by the public or the private sector, with the difference that in the predetermined areas, the landowners had no choice regarding the transformation due to the above reasons of each area, whereas in the rest of the areas, the landowners decided if they wanted to transform the land or not.

The **infrastructure** system is characteristic since it is a modern system ready to receive high technological companies and its regulation and characteristics are defined in the Special Infrastructure Plan (PEI) . It is relevant the fact that the status of plot is given to the land areas that besides the conventional utilities (roads, water and electricity distribution, and sewers) they also have fibre optic, selective collection network, connection to pneumatic waste, and spaces for centralised climate control systems (Ajuntament de Barcelona, 2011).

The **Heritage Plan** is another relevant aspect since it officially recognizes the industrial heritage of the district and decides the degree of protection of the buildings. A first catalogue was approved in 2000 and extended in 2006 and 2010, which includes national cultural heritage, local cultural heritage, and part of the buildings or buildings that need to be documented before demolition (I1).

The final aspect that defines the project it is related to the economic transformation and it is the **cluster strategy**. This strategy started in 2004, once the physical transformation achieved a certain degree of realization and the municipal company realized the importance to promote the economic activity of the district by creating synergies among the new companies. The Triple Helix approach and the knowledge-based economy required such strategy in order to combine research centres with the private sector and in order to attract specific companies that could increase the competitiveness of Barcelona in the specific sectors. The four original ones where Media, ICT, Energy and Medical technology, with the addition of the Design cluster due to the competitiveness of this sector in the city.

4.2.2 Characteristics 22 Arroba BCN

The municipal company 22 Arroba BCN S.A. has been crucial for the development of the project and thus all the interviewers recognized this fact. As instrumental company, the company was the main responsible for the transformation of the district, having as main tasks:

- Planning, execution, and management of urbanistic activities
- Planning, promotion, design, construction and management of infrastructures, equipment, urban services and public spaces
- National and international economic promotion of the district
- Support the creation of companies in the technological and communication sector

The interviewers have highlighted a different aspect that determines the success of the company, defined as a “local development agency” for the power of action it had over the transformation process. (I10)
One of them is the fact that the company was a single interlocutor for the different aspects of the transformation. In fact, the company was formed by three main departments (urban planning, management, and infrastructures) and in a second stage economic promotion and marketing. (I3)(I4) Having only an interlocutor, the impact of the bureaucracy and the municipal management was reduced and the efficiency was increased. (I1)

> "*…this dialogue is difficult. And there are instances of these that for me are the reason being that the 22@ have this structure. Now is still going on, but it is more difficult, there is no such synergy."* (I3)

Furthermore, the possibility of having a company working only for the 22@ avoided any competition of priorities with another district: the municipality managed the project of the rest of the city, whereas the Arroba BCN S.A.U. managed the project of the 22@.
The strong leadership within the company and the skills of the employees were another important elements of succeeding. The managers of the company believed in the project and pursued the goal of the company emphasizing different aspects (I7),whereas the employees of the municipal company knew perfectly the district, adapting the private and public requirements to the land and the citizen's needs. (I1)

> "*The talent that I saw accumulated in the municipal society 22 ARROBA SA, this is inimitable."* (I4)

The company was autonomy and the political interference was reduced, although it has been pointed out that in the last period of the municipal company, the political influence was present at managerial level.

The alignment between the city hall and the municipal company was guaranteed at the beginning of the project (2000-2004) by the Ramón García Bragado, who was at the same time Planning Manager of the City Council of Barcelona and CEO Municipal Company 22 Arroba BCN SA. Due to the innovation of the concept and its execution, it was important to show that the instrumental company could make the difference and facilitate the transformation process, therefore the lack of conflict between the two governance levels was important to proceed as good as possible.

> "*Being CEO of the company and at the same time Manager of urbanism, I ensured that there would be no clashes or management problems.*"(I1)

At the district level, the municipal had to deal with two other entities: the district hall and the 22@Network. The first one was responsible on behalf of the municipality, whereas the second was the business association created in order to promote synergies among the companies and other actors present in the district. The municipal company was careful to avoid any conflict with the district hall, being another actor at the district level, and worked in tandem with the business association in order to improve the links between the new economic activities and the neighbourhoods. (I11)

The characteristics explained above have been successfully spread worldwide from the marketing and communication department of the municipal company, who worked in three different targets: the local community, the press and the investors. The company promoted the district and the city of Barcelona together, associating both brands and reinforcing each other.

The dismembering of the company meant the change of path of the project itself. The interviews have brought arguments supporting or rejecting this decision. Some of them considered that it was a political decision, although the dismembering of the company started

at the end of the government of mayor Hereu (claiming that the crisis pushed to reduce costs) and completed under mayor Trias (who wanted to arrobizar[3] the city). (I13)

> *"In other words, if you have an ongoing project that works, don't touch it."* (I12)

> *"We have seen it clear when the previous municipal government dissolved the company 22@, then the catastrophe arrived. Now this is totally paralyzed and nobody knows how to move it."* (I11)

From one side, the dismantling automatically reduces the strong cooperation among different departments (I4), eliminates the single interlocutor (I1), reduces the priority of attracting projects and therefore the transformation of the districts and determines the loss of focus, in depth knowledge of the situation and management capacity (I11).
On the other side, the defenders of such decision argue that the crisis implied the reduction of costs for the local governments and therefore municipal companies were integrated back into the municipality, gaining in coordination. (I5) Another argument is the fact that the company was necessary at the preliminary stage of the project, but now the market could itself promote the transformation of the area. (I7) Finally, another argument was the fact that the city decided to invest in a metropolitan strategy of the smart city, where the 22@ was integrated in order to reduce its singularity benefiting the rest of districts. (I8)

Beyond the different arguments, the 22 Arroba SA has shown the importance of an integrated approach of urban transformation (physical, economic and social) and a multidisciplinary team focused on urban planning and economic promotion. Its power of influence was able to include within the 22@ project, elements that theoretically are out of its boundaries, like the Torra Agbar or the Torre Telefonica. It worked as bridging organization among different levels and actors, being an element of continuity among all the changes, leaving to the 22@ Network (private sector) the responsibility of keeping the project alive.

4.2.3 22@Network

The 22@Network is a business association which members are the companies and institutions located in the 22@. It represents the voice of the business sector at the district level and it was created to be a partner of the 22 Arroba BCN SA.

> *"What we want is to promote business dynamics and to obtain results at the level of improvement of the competitiveness, creation of companies, creation of employment, innovation, business growth especially in the sector of start-up in general in all sectors or in all sizes of companies, internationalization, relationship university-company, relationship technological centres-company, etc"* (I10)

In fact, after the dismantling of the municipal company, the 22@Networks is considered as the successor and leader of the project, with much more limited powers. After any new elections, the 22@Network showed to the new Government what they were doing and what was the expected evolution of the project. (I10)

> *"...now 22 @ Network is the only thing keeping the name. This is nice because from a public project a strictly business entity has been generated*." (I5)

[3] [3] The At sign "@" is called "arroba" in Spanish, the invented word "arrobizar" makes reference to the idea of make something @, understating @ as synonym of innovative transformation.

It was created on the July of 2004 by the president of the 22 Arroba BCN SA, Miquel Barceló, as a strategy to support the economic transformation of the district. The organization is open to any company or institution that is interested in moving to the district, organizing interviews, welcome sessions and supporting with construction works, licences, and relocation services (22@Network, 2004). It offers benefits to the members in order to motivate them to join the association, like car sharing, free meetings rooms, special events spaces, discounts in hotels and restaurants… (22@Network, 2004)

At the moment, the association counts with 104 members located in the 22@ or related with the project (see Figure 13). The 22@Network recently stated the aim to promote the creation and attraction of companies. The president of the 22@Network and CEO of Telefonica in Catalonia, Ramon Salabert, want to increase the number of companies in the district, with a target of 50 new companies per year until 2026, recognizing the potential and importance of the district for the economy of the city and the entire region and country (22 Arroba BCN, 2011).

Figure 13 – Members of the 22@ Network

Source: www.22network.net

The transition from public-led to private-led is an important proof of the need to adapt the actors to the context in order to keep the project working. The recent decision to increase the business association shows that the vision of the project is still valid and important for the competitiveness of the city. The private sector acknowledges the importance of having a dynamic business environment able to attract human capital and opportunities.

4.3 Analysis of the 22@

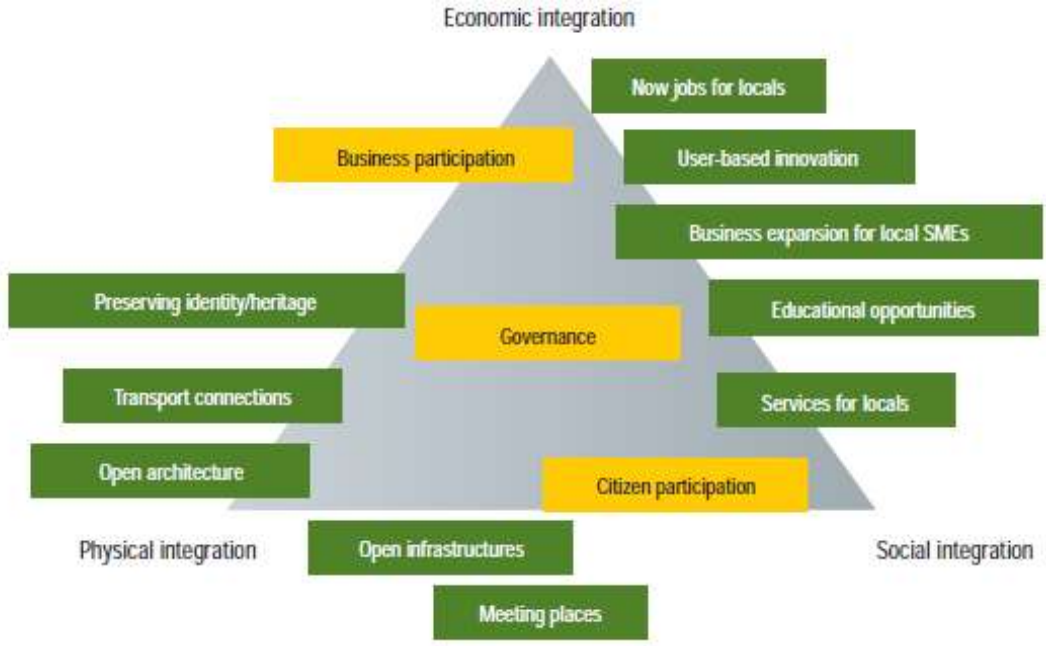
The analysis in this section starts with the evaluation of the regeneration project and the municipal company, showing the main characteristics and the negative and positive aspects, according to the interviewees. It is followed by an analysis of the political, economic and technological factors that affect the development of the project. The last part presents the timeline of the 15 years of the project, highlighting the relevant events that determined the evolution of the project, and indicates some aspects of the future of the project, according to the news.

4.3.1 Transformation / Regeneration

The project counts on a triple transformation of the district: physical, economic and social. These three areas of interest are consequential at the beginning and parallel in a second stage: the urbanistic change was required in order to attract companies, afterwards, when companies start locating in the area, they create more job opportunities and attract people to move in, reactivating the economic activity. After the basic conditions of each stage were completed, the next stage could start, until the point where the three transformations were working and they start evolving together. The companies did not wait until the entire district to be regenerated; they only needed their own building with all the necessary services and connections. The people also were living before in the nearby and the local business of the area gradually saw an increment of the citizens and therefore potential customers.

Such goals have been in European projects as the main aspect of integration between knowledge centres within the urban fabric. As shown in Figure 14, there are different strategies to obtain this integration, being necessary a governance system able to include business and citizens participations.

Figure 14 – Integration of knowledge hotspots in urban fabric



Source: The URBACT Tribune (2010)

Therefore it is not only important to obtain a triple transformation, but also an integration of the Innovation District goals within the existent community and the concept of regeneration and protection of the cultural heritage.

4.3.1.1 Positive aspects

4.3.1.1.1 Physical

The interviewees have recognised many positive factors of the project, emphasising its transformation capacity. It is important to highlight that the transformation of the project focuses on the promotion of economic activity, maintaining the industrial characteristic of the neighbourhood and allow Barcelona to keep the industrial activity within the city. The idea was

to create a new centrality of the city, completing the strategy of the city which had started already under the Olympic Games in 1992. In the following pictures (Fig. 15) are highlighted the different project for this part of Barcelona, some of them are a reality; others are still on-going or only planned.
The projects marked with number 1 are the areas of the 22@, the projects completed are 3-4-6 for the Olympic Games 1992 and 2-5-7-10-11 for the Forum in 2004, which represent the transformation of the coast. The other projects are related to the development of a new campus and the new high-speed rail station.

Figure 15 – Projects of the east side of Barcelona

Source: Diagonal Mar official website

The projects base the transformation on the concepts of compact city, highly densified and with mix land uses. It also respects the path dependency of the district, finding the balance between what has to be protected, restored and reused and what instead can be demolished and allow the construction of something new.

> *"It is a mix between regeneration of old things and transformation of new ones*." (I2)

The urbanistic plan followed the plan Cerdá with small adaptation, therefore the demolition of some buildings was mandatory in order to give continuity to the street planning.

As already explained before, the urbanistic transformation depends on the capacity to attract investors and companies to believe in the project, since the transformation is mainly financed by the private sector. The lack of private housing is one of the direct consequences of the economic-oriented root of the project, where only part of the private housing already existing was regularized and another 4000 units of social housing were expected to be built. It is a strict regulation that does not allow any speculative strategy, very common in Spain during the period of the Spanish property bubble.

The other main aspect of the transformation is the infrastructure system. The district counts with a modern infrastructure system that responds to the needs of the new economy industry. Besides that, the 22@ is also the best district to promote the Urban Lab project, which allows companies to test new solutions in this area in order to see their real impact, becoming a pilot test for many other urban solutions adopted in other areas of the city.

> *"The infrastructure plan that had to allow opening the urban mesh in the locks previously built and build all the infrastructures of energy, water,... The necessary*

infrastructures for an area that was supposed to have high technological and urban capabilities" (I13)

4.3.1.1.2 Economic

The transformation of the project was focused on the promotion of economic activity, maintaining the industrial characteristic of the neighbourhood and allow Barcelona to keep the industry, and therefore the work opportunities, within the city. This is one of the keys to the project since it is lined up with the strategy of the City Council, which after the financial crises adopted as a priority the employment creation. As one of the interviewed states:

"The important thing was having jobs inside the city. That was the 22@ and that is why it is a very powerful idea." (I1)

Another consequence of this strategy is the gentrification that might happen in the area, although considering the idea of replacing old industry with new industry, it affects only the potential expulsion of obsolete activities or activities that should better move outside the city (warehouses, logistic activities and transportation). The project brought investment opportunities to the neighbourhood, giving the landowners to obtain a profit from a land that was previously useless, having double positive outputs from the gentrification: from one side, undesirable activities are being pushed out of the city; from the other side, land that had a high potential value mainly due to its location, becomes useful for the re-industrialization of the neighbourhood bringing profits to the landowners.

"Gentrification can be good because it increases the land value and the landowners can benefit from it" (I7)

Besides the increase of the land value and the benefit of the landowners, the entire neighbourhood and the entire city takes advantage of the creation of the 22@ district, as many interviewees stated:

"It creates the foundation for the technological revival of Barcelona." (I9)
"It did not break the previous economic fabric, but reinforced it." (I12)

The clusters strategy is crucial to promote the knowledge-based economy in the district, having in the public sector, the private companies, and the universities as partners. The strategy has been to attract important companies from the five sectors to be clustered, inviting the universities, and especially specific faculties or research centres, to locate in the nearby. Other small companies would be attracted or even created in the same area, generating the cluster synergies. Creating clusters means integrate companies and activities that share something in common, and in this case, means also integrate these companies and activities in the city transformation, relating them to the daily lives of the district.

"Clusterization means integration and this integration of companies, academic institutions, and public institutions and normal life is what gives you power. This is going well in the 22@." (I7)

The cluster strategy is the tool used to improve the attractiveness in the area of "@ activities", although, there is a positive impact for the rest of the activities non-@, like the touristic and the hospitality sector. The number of people working in the district was 90,000 in 2010, decreasing due to the economic situation to 85,000 in 2012 and achieving 93,000 in 2015 (GAPS, 2015). These numbers are similar to the ones forecasted at the genesis of the project, since it was expected to have 120,000 working places, from a starting point of 30,000 places. (I12)

4.3.1.1.3 Social

The main social benefit for the district is the generation of economic activity, employment and the location of universities in the district. The new activity has not only increased the qualified job positions that could attract the young generations but has also increased the opportunity for the non-qualified jobs, like restaurants or small shops. It is important to notice how the historic centre of the Poblenou district divides the 22@, thus the benefits of the economic activity of the 22@ are spread to other areas in the nearby.

The construction of social housing and green areas has a clear positive impact on the neighbours who were living in an ignored and decadent area. Out of the 4000 social housing units planned, one-third was exclusively reserved for the people already living in the district, supporting the presence of the existent community (Eastway-Pareja, M., 2016).

Another positive aspect related to the physical transformation is the fact that the district is now an integral part of the city and is not anymore isolated and unknown. There is an urban continuity that brings new life into the district and that responds to the project of developing this part of the city.

Finally, there has been some initiatives to improve the integration of the new companies in the district and to reinforce the feeling of belonging under the 22@ Districte Digital initiative. Some of the actions have been a computer-recycling project, the virtual memory of the elder or the family programs that aims to teach parents of children in public schools more about computers (22@ Barcelona, 2012). Another initiative has been the 22@ Projecte Educatiu, focused on educational and training opportunities, like internships in companies of the district and vocational training centres.

4.3.1.2 Negative aspects

4.3.1.2.1 Physical

The transformation of the area and the need to concentrate buildable area due to the financial system of the transformation itself brought a drastic transformation of the area. Indeed, many companies moved in with the purpose of having a modern space in which they concentrate their activities.
As explained before, the balance of burdens and benefits establishes a transfer of 30% of the private land to the city council in order to obtain land enough for housing, parks and equipment, with the consequence that the buildable area of the 100% of the land was concentrated in the 70% that was still private owned. The consequence is the construction of buildings much higher than the standard building of Barcelona, creating a discontinuity within the neighbourhood, considering the high of the building of the historic part of the district.

> *"…as you go by removing land for construction, the height goes up, and of course you are going to have buildings of 50 and 60 meters. A building of 60 meters is an 18 floors building... Then the people started to realize that what we were doing was very strong and deep."* (I1)

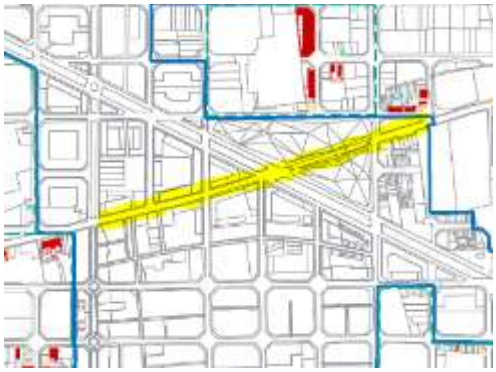
Besides the concentration of buildable area, the physical transformation did not consider the industrial heritage of the district as much as some parts of the civil society did since the city council extended in 2006 the catalogue approved in 2000 after citizen's mobilization. The "lack of consideration" of the pre-existent reality is a critical point in the trust between the municipality and the citizens.

"At anthropological level, the urbanistic strategy and economic development were aimed to the coexistence of the neighbourhood, to the identity of the neighbourhood" (I15)
"…we are a neighbourhood that has seen how everything was demolished to transform the neighbourhood." (I15)

Two urbanistic examples highlight the top-down planning of the district and the weak consideration of the community needs. The first one is the relevance given to the street "Avinguda Diagonal" (in a more metropolitan perspective) at the expenses of the street Carrer de Pere IV", an important street in the district reality. The second one is the creation of the "Central Park of Poblenou", designed by Jean Nouvel, which not only is surrounded by walls, did not include a playground in the initial project and has some other elements that are not user-oriented, but also cuts the Pere IV street.

"It is a paradigm of the planning, which was not thought at the local level. Nor at the local level or with social sensitivity." (I15)

Figure 16 – Planning of the Poblenou Central Park



Source: Modification PGM Dec 2009

Source: Google Maps (Central Park Poblenou) 2016

The Carrer de Pere IV is crossing the entire 22@ but is not used as the main road as in the past and only in the last months, there is a neighbourhood platform, which plans to promote all the area in a social and cooperative way.

"This entire area is abandoned, nothing will happen because there is nobody." (I15)

In the previous section, we mentioned the importance of the few housing units allowed in order to avoid any speculation strategy, although the lack of housing (public and/or private) is one aspect that slows down the rise up of local commerce. The absence of such activities reduces the vitality of the street, the opportunities to socialize and the perception of safety, having a "ghost city" in some parts of the district once the offices are closed.

"We are missing some housing, because if there is housing you attract the small commerce. If you now have to make a new plan, yes that would incorporate more housing, but I appreciate that there has been no private housing, otherwise it would have destroyed the little that remains." (I15)

"…at certain times at night it is a ghost town and I believe that this is the drawback of the urbanistic part." (I6)

Contextualizing this fact in the entire neighbourhood perspective, the lack of housing is justified with the presence of housing in the other parts of the neighbourhood not included in the 22@ project[4].

> *"The only criticism is that there is not enough private housing, and housing in general, although there was already a lot of housing in the area of the Rambla and the seafront. That is why I do not think that is a critical point, but could have more housing to increase density."* (I2)

The predetermined areas (maybe map p 61) had a strategic importance as already explained, but the transformation of the rest of the areas was based on the projects presented by the privates, who respected the rules given by the municipal company. Therefore, the lack of housing comes directly from the planning of the project.

4.3.1.2.2 Economic

The creation of clusters was necessary in order to attract and concentrate in the same place companies and universities and to promote knowledge-based economy in the area. This need for space in a specific location, as well as the obsolescence of some activities and the increase of the land value, pushed some local companies to move out of the district. Warehouses and logistic companies were not using efficiently valuable space in a strategic place of the city; other old activities were not profitable anymore, so they closed because they could not afford the transfer or because it was more convenient.

The cluster strategy has been relevant for the district and since 2011 a similar strategy has been applied at metropolitan level with the support to strategic sectors, for instance, the nautical sector in the old port of Barcelona. According to a business census realized by GASP, 16.7% of the companies in the census are related to one of the five clusters (GAPS, 2015), so we could say that the cluster strategy is important for the city's strategy, but has a limited impact in the business composition of the district.

One of the interviewees was critical with the project, pointed out the sector "exclusivity" of the economic transformation, which preferred some companies/sectors instead than others, penalizing the last ones.

> *"There was a criticism of exclusivity; prohibiting or preventing the renewal of licenses to small workshops... they were not medium or high technological companies. At the end of the day, it would have been possible to conciliate both situations."* (I15)

The analysis of the economic activity of the 22@ realized by GAPS offer some numbers that contextualize the dynamic of new companies and gentrified companies between 2012 and 2015(GAPS, 2015):

- 612 companies moved out of the 22@
- 431 companies closed
- 1937 new companies
- 894 net growth

[4] The population of the entire district of Sant Marti increased 12.6% in the period 2001-2015, important value in comparison with the population growth of the city of Barcelona, which increase a 7% in the same period (Municipality of Barcelona, 2016).

According to the census, 41% of the new companies is not new but is a company that moved in from another part of the city (65%) or from the metropolitan area (24%). We can conclude two important things: the first one is that the gentrification/destruction of companies is real and the second one is that it is important to differentiate the number of companies created and the number of companies that just relocate themselves in the district.

> *"…there were coming companies that generate a high added value that allows them to pay that price. However, smaller companies... Here there were many small companies but obvious they could not pay that price. In addition, the project promoted activities with an intensive use of m2: offices are profitable but a warehouse does not produce anything. So activities of storage or logistics were not profitable and not suitable for the new reality."* (I11)

> *"But it is clear that with the new infrastructure, only the economic activities that are able to assume a high price can stay."* (I13)

The strategic position of the district, the higher buildable area, and the modern infrastructure system, determine the attractiveness of the project, and thus the values per m2. According to a report prepared by the real estate services company Cushman & Wakefield, the price per m2 in some areas of the 22@ reaches the ones of the prime zone of Barcelona (Esclapès, M. and Bernades, J., 2016). The following graph shows the evolution of €/m2/month, being interesting to notice how the maximum rent and the average rent have increased in the last years and how the average rent is approaching the maximum rent.

Figure 17 – Evolution rent value m2 2007 - 2016

Source: Cushman & Wakefield

This fact can put off the small and medium businesses that cannot afford such prices, affecting even start-ups if they are not in any start-up incubator program.

> *"The mistake of 22@ is that it is expensive, and it is logical because it is in a very good place."* (I6)

> *"... the single landing engine of companies, was strictly the value of land."* (I11)

Private investors finance the transformation of the district, hence it is necessary to invite them to invest in order to have the capital enough to finance the urbanization, the social housing, the green areas and the equipment. In other words, the transformation of the district needs to

support the investor's requirements, since they are the ones that are financing what the public should do.

4.3.1.2.3 Social

The origin of any social negative aspect comes from the lack of participation and communication of the neighbours of the district. The project answers to the citizens' request of maintaining the economic activity, not converting it into a residential area. Indeed, the founders of the 22@ project presented some allegation against a first transformation proposal that was residential oriented.

> *"We want to know who wants to convert the Catalan Manchester in Malibu"* (I1)

This answer was a top-down approach with a strong leadership of the municipality. The need to attract investors created a situation where the transformation was responding to an economic interest that could benefit the entire city instead of paying more attention to the reality and characteristics of the district.

> *"The 22@ as a project had an original sin that was not communicated or communicated very bad and very little to the neighbours and that for me is serious"* (I10)

> *"In addition, a sudden change for people, a lot of them elder or who were used to a particular landscape, to a particular history, from one day to another everything changed… and this produced rejection"* (I10)

The neighbours agreed with the general idea, but were not involved in the details and had no power in the decision-making process. In this case, associations like the Neighbourhood Association of Poblenou or the anti-22@ association "Coordinadora contra el 22@" managed to organized demonstrations and activities that gave strength and media attention to the neighbours' voice. Afterwards, the municipal company started to better communicate and share information about new project proposals.
The attractiveness of the district had social consequences, especially for the touristic sector. Indeed, there are 15 hotels in the district, which support the touristic activity and the business one as well.

> *"I am quite critical both by the perversion of the 22@ project, one thing is that there are some hotels, another is that you have only hotels, as well as the pressure on the neighbourhood."* (I10)

The news has compared this situation with what happened in the old maritime district of the city (Barceloneta), famous in the last year for the conflict between a large number of tourists and the local community.

4.3.2 External factors

In any project, there are elements that cannot be controlled and have an impact on its implementation and evolution. As already explained, the factors have been selected due to their direct connection with the three main actors of the triple helix governance approach: public sector and political factors, the private sector and economic factors and finally the academic and research sector and the technological factors. In the following section, each factor will be analysed and their impact will be determined in the case.

4.3.2.1 Political factors

The change of mayor in Barcelona is the factor that mainly has influenced the evolution of the project. The municipal company created was under the control of the city council, depending on the metropolitan strategy of the city. A change of mayor usually brought a new strategy or vision that influenced the priority of the 22 @ in the political agenda.

During the period of analysis (2000-2015), Barcelona had four different mayors from three different parties:

- Clos (26 Sept. 1997 - 8 Sept. 2006) Socialists' Party of Catalonia
- Hereu (Sept. 8, 2006 - July 2, 2011) Socialists' Party of Catalonia
- Trias (Jul. 2, 2011 – Jun. 13, 2015) Democratic Convergence of Catalonia
- Colau (13 Jun. 2015) Barcelona en Comú

It is relevant to comment how the socialist party (PSC) that governed the city council of Barcelona from 1979 until 2011, had shown the importance of continuity and the power of the party in the city. The popularity of the Olympic Games gave high reputation to the party, creating a continuity that helps to bring forward a vision and a strategy for the city

There are two elements that help to analyse the political changes at local level: one is the idea of mayors of continuity and mayors of discontinuity, a distinction that can be understood beyond the political differences; the other one is the idea that candidates for the municipality need to propose a new project, a new vision, necessary for the elections in order to gather votes.

> *"... you want to give a feeling that you think on going beyond for the city. If you say that what is yours is the same as the past, you give the feeling that you do nothing."* (I4)

The continuity between Clos and Hereu is understandable since both come from the same party and Hereu worked with Clos when he was the mayor of the city. During the government of Clos, the project of the 22@ was born and started to be implemented. Once mayor Hereu became mayor[5], he believed in the project of the 22@, collecting the results of the work done by Clos, as he confirmed during the interview:

> *"Paradoxically, at the time of crisis, I opened many things which were already before. I always said that each opening is a sign of hope."* (I5)

Mayor Hereu also had his own projects, one was the successful implementation of the public bicycles system, whereas the connection of the two trams systems was not supported by 79,8% of the neighbours and was not implemented (Editorial, 2010).

> *"Only with Clos when the 22@ was founded and a little stage of Hereu, this project was still a municipal project, afterwards no."* (I10)

After mayor Hereu, Xavier Trias became e new mayor of Barcelona in June 2011, being the first mayor of a different party since 1979. He has been considered a mayor of continuity by some of the interviewees, due to its strategy to bring the lessons from the 22@ to the rest of

[5] Jordi Hereu was nominated mayor of Barcelona by the Socialists' Party of Catalonia as successor of Joan Clos on the 8th of September 2006, after the last one became Minister of Industry, Tourism and Trade in President. In the municipal elections of May 2007, Jordi Hereu was confirmed as mayor of Barcelona with the support of the Iniciativa per Catalunya party.

the city, whereas others consider that he was a mayor of discontinuity, due to its vision focused on the smart city, relegating the 22@ in another level. Barcelona, but generally also Spain, was suffering the consequences of the crisis, being forced to follow politics of austerity during the first period of his mandate, to invest in the Smart city strategy afterwards.

> *"At the level of speech, the idea of a smart city was the speech of the conservative government."* (I13)

> *"The mayor Trias, although from the opposition party, already from the beginning the 22@ was supported by all political forces, therefore there was no question about the project, you may change some nuances, but not the entire project."* (I2)

The 22@ is connected with the smart city strategy because it attracted and concentrated companies that were investing in the smart technology, although the smart city strategy was a metropolitan strategy, whereas the 22@ was just an area as other areas within the city.

> *"I would say that Trias was the dilution (of the 22@ project) in the Smart City concept, which is to die of success"* (I5)

> *"I would say that with mayor Clos there is a marked municipal leadership, with mayor Hereu it decreased and ended with mayor Trias."* (I4)

The election of Colau determines an important discontinuity with the past governments. Her vision is focused on the social inequalities and overall the social aspect of the city management, not prioritizing the competitiveness of the city on a global scale.

> *"I believe that the government of mayor Trias was rather of continuity, although it was a political change. The breakdown has occurred now… I would call the new government neo-Luddites."* (I8)

> *"Mayor Colau has a social and local agenda and considering the global and economic dimension of 22@, that made the 22@ not on its priority agenda."* (I2)

It is still difficult to analyse or judge the current municipality due to its relative recent election. Its position is clear, more social-oriented and less business-oriented, but it can be risky for the branding and the global position that Barcelona has created with the previous mayors.

> *"It is logical having changes, but I am concern about drastic turns."* (I5)

Barcelona bases its strategy on elements like innovation, technology, and smart city, whereas the new government seems to be against the technology as an element that increases inequalities.

A change is legitimate since there is a political change, although the changes need to be gradual and honest, keeping the good projects of the past. It seems that the 22@ is one of them: the new municipality recognizes the importance of knowledge and innovation for the economic activity of the city and wants to increase the importance of the social aspects, like in the Eix Pere IV project[6].

> *"We spent four years with no changes and is now things are moving again. The possibility of building housing has been opened and the works of urbanization of Pere IV have begun, now we are speaking about super-block... There is a plan to*

[6] The idea is to regenerate the street with a social-oriented strategy, for the community by the community. Sharing economy, urban gardens or social equipment are some of the projects they are promoting.

expand the catalogue of heritage and urgent restoration of pieces of heritage that are especially damaged. Things are opening up, and at least here in the Poblenou, we are having a radical change." (I11)

The following table summarizes the different periods, with the different approaches and strategies.

Table 10 – Mavors of Barcelona

Mayor	Political Party	Strategy	Approach to 22@
Clos (26 Sept. 1997 - 8 Sept. 2006)	Socialists' Party of Catalonia	22@	Origin
Hereu (Sept. 8, 2006 - July 2, 2011)	Socialists' Party of Catalonia	Trams Connection + Bicing	Continuity
Trias (Jul. 2, 2011 – Jun. 13, 2015)	Democratic Convergence of Catalonia	Smart City	Continuity/Discontinuity
Colau (13 Jun. 2015)	Barcelona en Comú	Social equality	Discontinuity

Source: author compilation

Considering the 22@, the project was approved by unanimity by all the forces of the municipality, reducing the political label of the project, being a project of the city and not a project of a specific party.

"The good thing of 22@ is that as a city project, it linked together politicians, businessmen, academics... The project was approved unanimously in the town hall." (I4)

"But when there are projects that make sense, it does not matter the political colour, at the technical level the work remains, which made this project continue. It was a project that really changed the urbanism of the city, positioned Barcelona." (I14)

"I believe that there is something good in Barcelona that is the continuity. No matter what political colour we have in the City Council or the personality of the mayors. When there has been a strategic successful, and the 22@ it is unquestionable, this has continued and has not been a big difference." (I7)

Obviously, there were different agendas and the project played different priorities for each government, although there was a strategic plan that was adapted to different agendas and the same agendas adapted themselves to the characteristics of the city.

"They do not forget the 22@ because it worked, but they focus more on other projects that could be more saleable and can generate more votes." (I4)

The concept of "arrobizar" shows these continuity/changes of the project due to political changes. The idea was to take the lessons of the 22@ and every positive aspect that could be implemented in other parts of the city. Practically, the municipality wanted to bring economic activity in every district of the city, avoiding the concentration of all the activities in the 22@ District.

"In the project of mayor Trias, the idea of "arrobizar" the city was based on new technologies and had to be spread at urban level and not concentrate everything in one district." (I9)

Examples of such de-concentration are the "Barcelona Tech City" (founded in 2013), digital business cluster located in the old harbour of Barcelona or the new technological park "Parque

BZ" located in the "Zona Franca" strategically close to the port and the airport (founded in 2011).
As one of the interviewers said, the 22@ "Died from its own success", being a good project implemented at urban level and exported to the entire city: from cluster strategy related to knowledge and technology to strategic sectors where Barcelona had a competitive advantage.

4.3.2.2 Economic factors

The influence of the economic factors in the development of the project have been relevant, taking into account the dependence on the private sector for the transformation of the district.
The interviewers have identified two important elements for the project: the macroeconomic situation at beginning of 2000, especially the entry of Spain in the Eurozone and the Spanish property bubble (2008-2014) and the financial crisis (2008-2015). This section will show how these events influenced the project.

The timing has been crucial for the project since it had the time enough to evolve and be ready for the impact of the crisis. The project could achieve a good level of the physical and economic transformation; according to the planning presented in 2007 by the president of the municipal company Miquel Barceló (2007): the planning and management were the main goals until 2003; the construction of the infrastructure system and the first buildings started in 2004 and 2005; with the fist companies started the economic transformation of the district.

Table 11 - Status report 22@ 2007: Evolution

2000	2001…	…2003…	…2004…	…2004/05…	…2005/06…	2007
Industrial and private land Low urbanization	Urban Planning	UrbanManagement	Infrastructures	Construction	Corporative projects Cluster	Compact city Good infrastructures More employment

Source: Adaptation from status report 2007

> *"It has been a lucky timing because the project has had a few years to mature."* (I14)

> *"During 5-6 years it was a first very powerful moment, because, besides the well functioning of the entire machine, it was a time economically very bright with lots of economic activity."* (I1)

There was a forecast of ten years, which expected to keep the status quo of the construction sector for the ten years, combining the arrival of new companies with the physical transformation and expecting to receive most of the companies as of 2007. The crisis changed this plan producing the following dynamics, based on the requirements and capital of the private sector.

- Fewer companies were able to invest in a new building
- Many companies had to reduce the number of employees, reducing the need for new spaces
- The overall economic uncertainty reduced any investment plan
- The lack of companies/investors influenced the necessity and the capital for the urbanization of the area.

The financial crisis affected Barcelona as affected the entire country, having a global impact. From the business point of view, the crisis reduced the number of companies that transferred in the district in comparison to the previous years; many companies were forced to closed or fired people (I10). Besides that, the district kept attracting companies: for instance, the number of companies that have moved to 22@ between 2000 and 2009 was 1,502, 4.2% more than the 2008 census. The following list shows clearly the impact on the business sector, concluding that the companies were still coming to the district, but the growth drastically decreased (Municipality of Barcelona, 2011):

- 2000-2003 → + 489 companies
- 2004-2006 → +552 companies
- 2007-2009 → +461 companies

Comparing the numbers, we see that between 2007 and 2008, 400 companies moved into the district, whereas between 2008 and 2009 only 61 companies.

The impact of the crisis in the district was not as strong as in other sectors especially due to the decision to attract knowledge-based activity; indeed, preliminary studies of the project analysed and quantified the resistance of this sector in comparison to other sectors, concluding its resilience. Once the project was presented to the neighbours and the neighbourhood association, the high generation of employment and its resilience were the elements that convinced them to support the regeneration plan. (I12)

The cluster strategy was reinforced during the crisis with the creation of the design cluster. This cluster was created to reinforce the design tradition of Barcelona, having double branding results: on onesie, the people who already knew the 22@ project became aware of the strength of the design in Barcelona; on the other side, the project of the 22@ could count with a new cluster, highly integrated with the Media and ICT clusters.

From a political point of view, there was the intent to counterbalance its impact, and in Barcelona, we have two different strategies that pursue the same that goal. The mayor Hereu back in 2008, decided to invest public money in order to protect and stimulate the economic activity of the city, whereas the mayor Trias adopted an austerity strategy, not only because of the higher investments done by the mayor Hereu but also because the austerity was the strategy used at national and even continental level.

> *"The strategy against the crisis I called +Barcelona, and that is to say more investment, more development."* (I5)

> *"Mayor Trias arrived with a project of austerity and control of expenditure, which is what it, was needed."* (I9)

Checking the values of the real investment of the City Council of Barcelona, it is possible to see how indeed the public investment increased during the crisis until 2010, when austerity measures and the reduction of the municipal deficit forced to limit the expenditures. Only in 2013-2014 the public investment started growing again.

Table 12 – Real investment 2006-2015

	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Real investment	352,11	401	133,32	333,12	346,03	573,22	567,13	542,75	457,9	383,18
% variation invest.	-12%	201%	-60%	-4%	-40%	1%	4%	19%	19%	-

Source: author compilation based on Statistical Yearbook of the City of Barcelona (2006-2015)

The crisis had a direct consequence for the municipal company 22 Arroba BCN SA since the company was dismantled and the different activities were integrated into their respective municipal department. Beyond the strategy to bring the lessons of the 22@ to the entire city, there was a request from the central government to reduce cost, therefore municipal companies created in a positive economic period were dismantled during the crisis. (I5)

The crisis was a stress test for the project, useful to see if the transformation process and the ideas behind were strong enough. From a financial point of view, the flexibility was important since it was a gradual process, which transformed the district according to the private sector needs (I7). When companies are growing, the can need a new space and make an important investment for a new building, thus the transformation works, when there is no such need, the transformation slow down.

> *"It was a good project, it was a strategic project for the city, so that despite the difficulty that has led the economic crisis, I would say that the 22@, paradoxically, showed much more its worth as a project"* (I5)

As per some interviews, constantly companies were moving to the district even during the crisis, since during the physical transformation, many buildings were built following the positive economic situation. When the crisis arrived, many office spaces were still pending to be rented, thus there was a stock of space for the coming years. (I10)(I4).

> *"Before the crisis, there was a high level of construction that stopped with the crisis. There was an original vacancy of 10%-12%, and with the time went to 7%-8%. Now the problem is that there is not enough m2 available in the 22@ of a certain quality and dimension."* (I2)

Only recently, this stock is not enough anymore for the new opportunities coming, being necessary to build new offices if the strategy is to keep under control the price per m2 (Esclapès, M. and Bernades, J., 2016).

> *"The crisis affected much more to the creation of new buildings and infrastructure, since if there is not urban transformation; there is no capital available for the project. It slowed down, like a transatlantic that costs stop, that with the crisis begins to slow down and only now beginning to take off again."* (I4)

According to the last study realized by Dr. Montserrat Pareja Eastway for the 15th anniversary of the 22@ project, 50.6 % of the land of the 22@ district is still pending to be completely transformed. It is clear that transformation is delayed being a 20-years project and the financial crisis is one of the explanations of this slow down (Eastway-Pareja, M., 2016). Two figures prove that fact: by December 2010, 68.92% of the land was approved to be transformed, whereas in December 2014, the percentage increased to 70.5% (+1.58%); regarding the 4600 social housing units expected, 1520 were already built in 2010, being 1600 in December 2014 (+80 units). (Eastway-Pareja, M., 2016)

Barcelona started to overcome the crisis since 2013, where the touristic and logistic sectors kept generating employment together with the technologic activities related to the smart technology. (I9) The Smart City Strategy was the project adopted from 2013 until 2015 for the public investment, reinforcing the innovative tradition of the city and associating the brand of Smart City with the one of Mobile World Capital.

4.3.2.3 Technological factors

The 22@ is a project that considers innovation as a key element in many of its aspects: finance, infrastructure, regeneration, economic promotion. Innovation includes the concept of research and development, where companies and universities play and important role and have the capacity to create new markets and therefore new jobs.

> *"The technology changes it absolutely everything"* (I10)

This is the link between the technological aspects and the 22@ goals. These aspects have shown a limited power of influence in comparison with the political and economic elements, mainly due to the public leadership of an urban and economic regeneration projects, directly related to the other external factors.

There are two specific elements whose impact could not be foreseen when the project was planned: the smartphones and the smart technology. Both elements have characterized the profile of the new companies and the strategy of the city in the last years.

> *"There were no smartphone, apps, mobile games and e-commerce and these technologies changed the profile of companies."* (I10)

> *"There was really an important antecedent of as to see that digitization was going to change the way to work, there was a vision."* (I3)

The smartphones and the market and employment generated by the development of apps supported partially the economic goals of the district in terms of employment and creation of companies. Barcelona was already an attractive city for start-ups in general, where the agency of economic development Barcelona Activa[7] promoted the startups incubators and supported the generation of companies in the technological sector. The city council realized the importance of this sector, obtaining in 2006 the GSMA Mobile World Congress and became since 2011 and until 2023 the GSMA Mobile World Capital (Barcelona Activa, 2011). The offices are located in the MediaTIC building in the 22@ district.

The smart city strategy started during the government of mayor Trias in 2013, being the new vision of make from Barcelona a smart city referent. It was a metropolitan strategy born outside the 22@ strategy (I4), but the infrastructures and the high-tech companies made from the 22@ the optimal place to develop the model.

> *"In fact, the 22@ was a smart city without knowing it."* (I2)

Indeed, it was expected the creation of a smart city cluster in the district with the creation of the Smart City Campus by that Cisco and Schneider Electric using the former industrial building of Ca l'Alier. The retirement of Schneider Electric and problems with the construction company are paralyzing the project. (I11)

It was not possible to expect the impact of these technologies on the everyday life but was clear the importance to promote the research and the creation of new markets, giving to the private sector and the market itself the optimal conditions to grow. It was crucial the modern

[7] Barcelona Activa plays an important role in the economic development of the city. Founded in 1986, the agency "… is responsible for promoting the economic development of the city, designing and implementing employment policies for citizens, and encouraging the development of a diversified local economy". (Barcelona Activa, 2011)

infrastructure system, which made the 22 @ the best place in the city to test new smart technology, related with phones and sensors. (I7)

> *"In fact, the municipality used the 22@ as a space for the development of new infrastructures."* (I2)

> *"The 22@ became de facto in the laboratory scale 1 to 1 of Barcelona."* (I1)

The Urban Lab (started in 2008) is the main project that connects technology and urban transformation. According to the website of the 22@ project, the official definition of Urban Lab is the following (22 Arroba BCN, 2011):

> "Urban Lab is a tool to facilitate the use of public spaces in the city of Barcelona to carry out tests and pilot programs on products and services with an urban impact, which are in the pre-market stage and in line with the Barcelona City Council's aims, priorities, and lines of action."

This project supports the technological strategy of the city about the smart city, which aim to generate a solution that can be exported to other cities. The smart city vision pursues the generation of solutions applicable in a different context at the global level, with the aim of spreading the City Protocol Society[8].
It is a win-win situation for the public and the private sector: the private sector could test new technology cooperating with the city council, and every tested solution could be exportable creating a new market. (I8)
These are some of the project developed in the Urban Lab (22 Arroba BCN, 2011):

- Implementation of 12 outdoor public street lighting points Eco Digital with LED technology
- Pilot program to read gas, electricity and water meters telematically in more than 150 housing units
- Sustainability mobility project (1st phase)
- Traffic lights adapted for the blind at all crossings in 22@Barcelona
- Fibre optics in homes
- Bicycle lanes

The 22@ was functional for the project but was not the element towards the smart strategy of the city. The idea of the municipality was to reduce the singularity of the project by bringing the sector strategy in other districts of the city. (I8)
The 22@ needed a special concentration of companies since they were the ones the financed the transformation of the district, once the transformation became secondary in relation to the economic promotion, the city decided to include the project in a city strategy. This loss of priority also explains the lower impact of the technological aspect of the evolution of the regeneration project, since the area of action was expanded to the entire city.

4.4 Analysis of the 22@ through Adaptive Governance theory

After analysing the impact of external factors on the development of the project and identifying the episodes that determined the current stage of the project, this section will consider the

[8] It is a project inspired in the Internet Protocol and aims to "inspire city leaders, technologists, urban designers, architects and citizen-leaders to develop more efficient, resilient and sustainable future cities."(City Protocol, 2014)

suitability of adaptive governance theory for the governance system of urban regeneration projects. The first sections will consider the theoretical aspects of adaptive governance that can be applied to urban regeneration cases, afterwards, there is a more descriptive analysis, which shows a practical analysis of a real situation where adaptive governance principles could have been applied.

4.4.1 Scales and levels

As explained in chapter 2, adaptive governance theory uses the concepts of scales and level to better identify the nature of today's problems, where the ideas of cross-level and cross-scale already show the level of complexity of adaptive governance.

In the 22@ case study, we can identify three different levels located in a hierarchical structure:

- District level: it is the level closer to the transformation, which considers the interest of the limits of the 22@ and the Poblenou neighbourhood.
- Metropolitan-level: this level contains all the districts of the city of Barcelona and the interest of all the citizens.

  "If the transformation process goes fast or slow, I do not think that is a political problem or a social problem simply is a city that has a capacity of adaptation." (I1)

- City-network level: this level represents the economic global network of cities, where cities connect and compete with each other.

  "We compete against Milan, Lyon, and Bordeaux... Somehow there is a strategy in which the vision of the problem is no longer limited to the 22@, but from the 22@ starts an overall strategy." (I1)

These three levels have an impact on the 22@ regeneration project analysed since the metropolitan level determine the priority of the project in the political agenda and the city-network level can shift the focus from citizens-oriented strategies to another one focused on competitiveness and global placements. The district and metropolitan level are justified from the principle of subsidiarity, which stated that a central authority should perform only the task that cannot be performed at more local level (The principle of subsidiarity, 2016). The city network dimension is explained by the trends and studies that focus on the connection and flows among cities and how cities compete globally, giving importance to aspects like connectivity or branding inside a competitive networking (Malecki, 2002).
The vision of the city towards the future is crucial to have a cross-level alignment. The vision of the 22@ was powerful to be maintained through different municipal government, being alive and keep evolving nowadays.(I7)

The scales considered in this case come directly from the two dimensions of regeneration and innovation:

- Physical scale: this scale includes all the topics related to construction and real estate, the infrastructure system and industrial heritage preservation
- Economic scale: is based on the cluster strategy, generation of synergies, general economic activity (before-@ and non-@), the attraction of investors, companies and employees.
- Social scale: it considers the impact of the transformation on the local community.

- Innovation/Knowledge scale: it contains the knowledge-based economy strategy, interaction of universities and companies, generation of start-up and creation of new products and markets.

There are cross-level and cross-scale interactions that define the need for adaptive approaches in the governance system. Examples of cross-level interaction are the integration of the 22@ (district dimension) within the "arrobizar" strategy (metropolitan strategy) or within the smart city strategy (city-network dimension).(I9)
Some decision in one level can benefit or damage the interest of other levels. The tourism is an example if it, since at metropolitan level, the strategy was to promote hotels in the 22@ in order to reduce the pressure on another district, but at the district level, Poblenou and its citizens were not ready for this increment. (I10) The decision of dismantling of the municipal company represents a reaction to the crisis with a metropolitan vision of developing strategic sectors all over the city, not considering the consequences at the district level. (I2)(I5)(I7) Finally, the global competitiveness of the city locates the 22@ as a key element of the metropolitan economic strategy based on the triangle Sant Joan (industrial park), Baix Llobregat (Zona Franca, port, and airport), and Bessos (22@). (I1)

Examples of cross-scale interactions could be the generation of Urban Labs (economic and innovation) or the construction of social housing (physical and social). There are scales issues coming from a mismatch between scales, and a good example in the 22@ case could be between the economic and social scales (implantation of new economic activity) or between physical and economic scales (protection of industrial heritage).
Framing scales is not easy and can be strategically used: there is something called the "politics of scale", which emphasize "that framing policy problems as local, regional, national, international, or transboundary, or as a short-term or long-term problem, involves strategic upscaling and downscaling and can be considered a political act" (Olsson, Folke, et al., 2007). It gives the possibility to include or exclude actors, which can use the frame to "claim or reject responsibility in a situation". In the 22@ case, the scales are defined by clear purposes with the exception of the Innovation/knowledge scale, with no real possibility of changing frames.
It is important to distinguish when issues are local or not since the scales are limited to specific frames. For example, the creation of employment or the degree of transformation of the area depends on of the attraction of companies and during the crisis, this process slowed down, therefore it is not correct to consider it as a local issue when is a global one.

4.4.2 Bridging organization

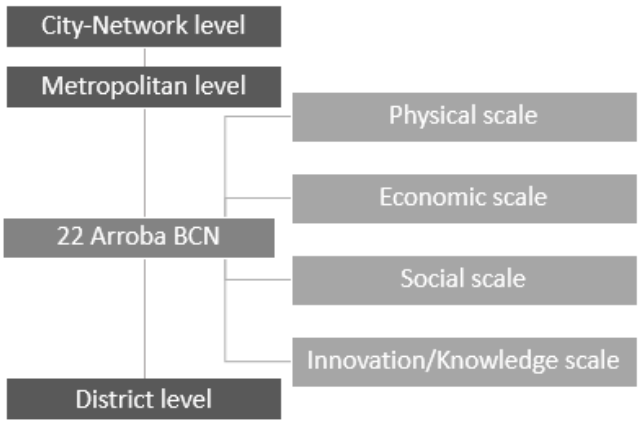
The cross-level and cross-scale interactions foster the creation of bridging organisations able to create "… the right links, at the right time, around the right issues…" (Olsson, Folke, et al., 2007). In our case study, the municipal company 22 Arroba BCN S.A.U. is the bridging organisation, responsible if the triple transformation of the district and the generation of economic-based activity.

Figure 18 shows the position of the municipal company in relation with the identified levels and scales. The link between the metropolitan and district level is clear since the company was created as an instrument to work in a specific district. This link was reinforced at the beginning of the project since the CEO of the 22 Arroba BCN SA was also the planning manager of the City Council of Barcelona, ensuring a complete alignment between both levels. (I1) The municipal company had to deal with political and neighbourhood pressure, therefore, was

important to protect the vision and goal of the project, acting as an umbrella protecting its mission against any interference. (I4)

Figure 19 shows the main actors related the different levels. The one on the top and the one on the bottom represent the main actors for the metropolitan and district level respectively, whereas the other two are hybrid actors. The district of Sant Martí is the district government, playing at the district level but with metropolitan legitimacy, (the municipal company is below this government level). The 22@ Network is a partner of the municipal company and represents a network of companies of the district, important for the generation of synergies and the clusters strategy.
The existence of a municipal company responds to one of the four key factors of social-ecological system, which states the need for supporting flexible institutions and multilevel governance systems (Hahn, Olsson, et al., 2006).

Figure 18 – Bridging organization: levels and scale



Source: author compilation

Figure 19 – Main actors and level

Source: author compilation

Figure 19 shows the main actors related the different levels. The one on the top and the one on the bottom represent the main actors for the metropolitan and district level respectively, whereas the other two are hybrid actors. The district of Sant Martí is the district government, playing at the district level but with metropolitan legitimacy, (the municipal company is below this government level). The 22@ Network is a partner of the municipal company and represents a network of companies of the district, important for the generation of synergies and the clusters strategy.
The existence of a municipal company responds to one of the four key factors of social-ecological system, which states the need for supporting flexible institutions and multilevel governance systems (Hahn, Olsson, et al., 2006).

This cross-level and flexible agency responds to urban regeneration practices that create a municipal company to separate the operative tasks from a specific area from the tasks that matter the entire city. Already in the famous report "Towards an Urban Renaissance" (Rogers and Urban Task Force, 1999) states:

> "*The pace of regeneration could be increased if responsibility for delivering area programs was placed in the hands of 'arms length' organizations, owned by local*

partnerships. Urban Regeneration Companies could not only oversee work to completion, but also raise private finance and undertake direct development where necessary."

It possible to say that the creation of municipal companies is therefore supported by adaptive governance theory and urban regeneration theory, the fact that support the suitability of adaptive governance in regeneration processes. Innovation districts indirectly (but not necessary) request the existence of actors able to deal with the public, private and academic sector.

4.4.3 Elements that justify the suitability of the theory

This section shows the link between the 22@ regeneration project and the six concepts identified as core concepts of the adaptive governance theory: three of them make reference to the basic assumptions (complexity, conflict, uncertainty) and the other three are related to the core values of adaptive governance systems (anticipate, learn, adapt).

4.4.3.1 Complexity

Urban regeneration projects are complex due to all the domains and approaches already mentioned in chapter 2, but the case of the 22@ is more complex due to the goal of creating an innovation district based in knowledge and technology. The urbanistic transformation brings additional complexity due to innovative financial system used, the new development potential, and the mixed land use development. The magazine Tribune, issued by URBACT highlights the complexity of creation of knowledge hub (Van Winden, 2010):

"The development of an 'urban' knowledge hub is a complex challenge. Many stakeholders play a role, with different interests: knowledge institutes, housing corporations, neighbourhood councils, real estate developers, local government departments, etc. New urban knowledge hubs are places where these different (and often conflicting) interests fight their battles. They are also places where the new economy merges with the old, where new 'elitist' knowledge workers mix with the indigenous inhabitants, and where new architecture and structures blend with the existing urban fabric."

Other elements of complexity could be the cluster strategy since the municipality forced the generation of synergies by selecting specific strategic sectors and bring together companies and universities. These new opportunities improved the attractiveness of the district, receiving new neighbours and new companies and therefore changing the structure of the actors. An example of it could be the 22@ Network, who gathers the voice of the new companies of the district. (I15)

From a management point of view, the triple transformation of the district shows brought into the municipal company professional from different departments (urban planning, economic development, marketing,…), representing a challenge for the management of the project. (I3)(I12)

The last element worthy to highlight is the existence of an industrial architectonic heritage that had to be documented and decided the degree of protection, increasing the tension between the regeneration and transformation goals.

4.3.3.2 Conflict

The conflict in this case study is natural due to the many interest interrelated of the different actors and the double mission of transforming and regenerating the district. (I1) Some specific sources of conflict identified during the data collection are the following:

- lack of involvement and communication with the local community (I15)
- decisions regarding the protection of the industrial architectonic heritage (I11)(I15)
- approach to pre-existent economic activities (I14)
- Impact of the tourism (I12)(I15)
- Simple rejection to the change (I7)
- Ideological/political rejection (I5)

Some conflict raised between the municipal company and the institution Barcelona Activa since there was an overlapping of competences regarding the promotion of the economic activity. (I1)(I2)(I4)

There was also conflict among the neighbourhood association and other political organization of the district, due to a more cooperative approach of the Neighbourhood Association of Poblenou in comparison with a more intransigent approach of other groups (Asemblea de Jovenes, Coordinadora contra el 22@ and Plataforma de afectados por el 22@). (I10)(I15)

The department of marketing and communication did a focus group in order to better understand the aversion of the neighbours towards the 22@: part of the people was against because they did not know exactly what the project was about, thus more information would reduce this rejection, the other part was against and were informed. This group was around a 3%, so they decided not to change the strategy because of them but just improve the information and communication.(I4)

Another specific conflictual case was the transformation of one of the predetermined plans (Eix Llacuna) since the buildings planned were higher than expected by the neighbours due the concentration of the buildable area. After some demonstration, the municipal company decided to review the project and to include the neighbours in parts of the decision-making process in order to avoid future conflicts. (I1)(I11)(I15)

4.4.3.3 Uncertainty

The uncertainty of the project comes from three main elements:

- the strong leadership of the City Council (I1)(I13)
- the financing system highly reliant on the private sector (I2)(I4)(I13)
- the key role played by innovation and technology (I2)
- the long-term of the project (I14)

Political changes and the changes of the political agenda modify the priority of the project as already shown in the previous sections. Indeed, the City Council was a guarantee for other stakeholders, who supported the project knowing the deep involvement of the public sector. (I13)

The flexibility of the physical transformation is another source of uncertainty since the lack of investors reduces or stops the transformation. This fact influences directly the economic transformation and indirectly the social transformation, generating uncertainty in all the scales of the project. (I11)

The visionaries of the project could not expect the drastic economic opportunity created by the smartphones and the apps at the beginning of the century, although is clear the impact in the

targets of the project as the generation of employment, the creation of clusters or educations and skills. (I2)

4.4.3.4 Anticipate

The anticipation is the weakest element of the adaptive governance that suits the urban regeneration case analysed. In ecological governance, anticipation is related to problems like climate change, pollution, floods and droughts, elements that can be studied and forecasted. Considering the external factors influencing the urban regeneration case, anticipate such changes is not easy or even possible: ecological governance based the changes in science, which allows studying, generalized and prove findings; whereas urban regeneration is based in social sciences, with unpredictable events and consequences (e.g. financial crisis or political changes).

4.4.3.5 Learn

Learning and adapting are close related because before adapting is necessary to know what has changed and improved for the future. Learning is a feasible act and easy to implement, since the policies and strategies applied can be evaluated and modify if necessary.
The 22@ project could not be possible without the learning process coming from the organization of the Olympic Games in 1992. In fact, the city council decided to keep the organization task within the municipal institutions, bringing the opportunity to learn how to transform the city (infrastructure, financing, urban planning, urban regeneration,…)

> *"These people know how to transform the reality on the business basis, they know what they have between the hands... they are not theoretical."* (I12)

For the 22@ Project, is interesting to notice that the mayor who promoted the project (Joan Clos) was the deputy mayor who was responsible for the financial aspects of the Olympic Games. The learning process is therefore facilitated by continuity at the political level: same political leadership supports the same vision.
There are lessons coming from the financial crisis, which showed the importance to keep the industry within the city, and if possible, a new industry that has already shown more resistance in comparison to other sectors.
A lesson coming from the first implementation of the 22@ is being applied in the development of Eix Pere IV, focused on social equality and promoting participatory processes in order to increment the sense of ownership of the neighbours of the street.

> *"I see it how the thing that could not be made at the time with the 22@."* (I15)

The municipality tried to replicate the 22@ cluster strategy in the district of Sarrià (I2) and the infrastructure system in the district of Segrera (I4). Finally, the 22@ is being considered the basis for the Smart City strategy applied at the metropolitan level. (I8)

4.4.3.6 Adapt

There is adaptation when the project changes due to the change of the context and in this study, the alteration of the context is based on the three external forces: political, economic and technological. Many episodes highlight the adaptability of the project:

- faster decision-making process and bureaucratic system (I1)
- predetermined plans and private initiative plans (I1)(I11)
- dynamic physical transformation according to investor's availability (I2)(I10)(I7)

- modification transformation dynamic (from investment and then clients to clients and then investment) (I2)
- variability of the buildable area according to land uses (I7)
- sensibility to opportunities and actors available for potential projects (I2)(I7)
- integration of the project goals to district reality (brownfield situation) (I1)(I3) (I5)
- creation of new economic activities aligned with global trends and future development (I7)
- the inclusion of city's needs in the district project (e.g. hotels) (I12)
- exportation of the strategy at metropolitan level reducing singularity of the project (I5)
- change of project's leadership from municipal company to business association (I4)
- selection of clusters (according to the assets of the city (competitive advantage) or to the potentiality of the sector in Barcelona (potential competitiveness) or future potential in the global market (growing sectors) (I3)

From the aforementioned points, the availability to consider each opportunity and adapt the strategy and the vision to the new situations is crucial. One of the interviewers highlighted the fact that the design cluster was not in the program, but there were all the elements to create this cluster, thus they created it in the 22@. (I2) Another element is the mobile sector since it was not included specifically in the project and after Barcelona became the Mobile World Capital, the offices and related activities were located in the 22@.
The vision is able to adapt to different opportunities due to the fact that the district is not "thematic" (financial, shopping, technologic…) but considers and ambiguous and an open term like "innovation", which focuses more in the "how" and not the "what".

> *"Flexibility is resolved with the governance, it has to be open and go clipping the different opportunities."* (I2)

From a political point of view, the political agenda of each government adapted itself to the situation of the city and the on-going projects of the strategic plan of the city, but at the same time, the strategic plan of the city was modified according to the political agendas of each government. It can be considered a dynamic of feedback adaptability, where the decisions of the past influence the decision of the future and the decision of the future modify the evolution of the impact of the decision of the past.
An adaptive system needs an adaptive governance since it is necessary to include in the governance system all the flexibility, complexity, and uncertainty that exist in the real world.

4.4.4 Practical example Adaptive Governance analysis: PERI Llacuna

In order to prove the validity of such theory in the analysis of the case study considered in the research, this section shows a practical example of how the aforementioned principles have a practical use in the implementation of urban regeneration projects.

The specific case considered is related to the PERI (Planes Especiales de Reforma Interior, Special Plan of Interior Reform), that are the predetermined plans that work as a model for the rest of private initiatives of transformation. The PERIs were commissioned to the ETSAB (Escola Tècnica Superior d'Arquitectura de Barcelona / Barcelona Architecture School), where different professors worked in specific plans. After the original proposals, the projects were submitted to public consultation, being accessible to the citizens, associative fabric, landowners, political groups of the municipal Government and technical experts (Ajuntament de Barcelona, 2011). The main critics aroused were the height of the buildings in the areas nearest the residential fabric, the need to maintain the existing buildings, the programming of

the long-term transformation and the protection of elements of the industrial past (Ajuntament de Barcelona, 2011). The initial proposal considered the outcome of the public consultation and adapted the request as much as possible.

The PERI Llacuna is particular for the strong opposition on the implementation phase and the consequences it had for the development of the regeneration of the area. The neighbours strongly rejected the idea of two high buildings (48-50 high) close to the Rambla del Poblenou, the main road of the historic district centre. After the public consultation and citizen's demonstrations, the PERI Llacuna was modified: the height of the buildings was reduced, modifying the building typology, and more residential and activities fabric were protected.

The following analysis considers the main characteristics of the Adaptive Governance theory and relates them to the reality if the case:

- The **complexity** of this case is based on the characteristics of the project, aiming to find a balance between maintaining, transform, and substitute. The PERI Llacuna decided to concentrate the buildable area in one specific area since it wanted to protect a hemp factory.
- The **conflict** was originated especially due to the lack of participation of the neighbours in the decision-making process. In fact, two organization appeared to fight this transformation: the "Associació d'afectats del 22@" (Association of affected by 22@), which is composed of the residents and local commerce affected by the PERI; the "Coordinadora contra el 22@" (Coordinator against 22 @), composed by anticapitalistic youth organizations. In this situation, the City Council and the Neighbourhood Association of Poble Nou adopted a more conciliatory position, who signed an agreement in order to calm the situation.
- **Uncertainty** is originated by the fact that the few information available and the innovative way of transformation did not give any reference point to any of the actors about the potential issues and development of the project. Such uncertainty increased the conflict between who had the decision-making power and who was affected by the decisions taken.
- It is not easy to identify opportunities to **anticipate** due to the novelty of the system, although, the previous transformation of the area could have been considered. For the Olympic Games in 1992, the entire district of Icaria was demolished in order to build the Olympic Village the residential area for the athletes. As the historian Francesc Caballé mentions, the construction of the Olympic Village "did not take into account or value any existing element" (2010).
- In order to **learn**, the City Council and the municipal company should have increased the communication with the directed implicated actors of the transformation, introducing the in the decision-making process already before the public consultation. The confrontation with all the actors involved is the solution to know better the needs and demands, linking them with the goals of the project.
- An example of **adaptation** is the agreement found between the City Council and the Neighbourhood Association of Poble Nou shows the learn capacity of the system:
    - Economic reactivation of the industrial fabric respectful with the history and personality of the neighbourhood.
    - Improvement of the information and participation of district representatives, creating a commission for each PERI that considers the prerogatives of the community.

- Creation of mechanisms that regulate the location of the previous activities in the new buildings.
- Creation of a monitoring commission for the effective development of the equipment plan.

The previous points show a basic example of how the theoretical concepts can be used in the implementation strategy. It is important being aware of the complexity of the situation and any source of conflict and uncertainty, being the learning part (e.g. communication with the stakeholders) crucial for the adaptation. In the case of the PERI Llacuna, a better information and communication among actors (learning), together with a participation of the neighbours affected by the plan in the decision-making process, would have reduced the conflict and uncertainty. Considering the "Eight Rungs on a Ladder of Citizens Participation" (Arnstein, 1969), a level of participation of Placation would be easy to achieve and promote, having a constant flow of information and allowing the citizens to advise during the decision-making.
In the case of Eix Llacuna, there is an adaptation as a consequence of confrontation when it should be pursued adaptation as the final goal of communication and participation. A constant communication and respect for the goals of each actor are necessary to establish a trusted environment where every actor is willing to make concessions in order to allow the project to achieve its goals.

Chapter 5: Conclusions and recommendations

This thesis set out to analyse the influence of specific relevant forces on the evolution of an urban regeneration process and to consider an adaptive governance approach to analyse such development. The assumption behind these research objectives is the fact that an adaptable reality needs an adaptive governance system in order to obtain the best outcome. The transformation status of the project in relation to the external forces and the adaptability of the project have guided the analysis.

5.1 External forces in the 22@ evolution

Among the external factors selected, the political and economic ones have shown to be the most relevant, whereas the technological factors have an influence on the business diversity and creation of new markets, although its impact has been spread along the city.

A change of mayor means a change of the political agenda, the fact that affect partially long-term strategic projects: the 22@ project has evolved following some pre-establish goals, being adapted to the local government vision, which also adapts itself to the assets and advantages of the city. In this case, the 22@ was an area of economic and demographic growth, therefore there was no reason for drastic changes. A change of municipal priorities and changes of the management of the project have shown to be determinant aspects since complex projects need a specific framework and tools, like the continuity of previous positive projects (from 22@ to Smart City and then to social equality) and a bridging organization (22 Arroba BCN S.A.).

Economic aspects are relevant due to the transformation nature of the project and the funding system that relies on the private capital. The 22@ started in a positive macroeconomic situation (Spanish membership in the Eurozone) and was able to achieve certain maturity once the situation worsens (financial – real estate – national debt crisis). During 2013-2014 Barcelona started to recover from the crisis, generating employment and increasing the real investment in strategic sectors and infrastructures. The lack of investors and construction of new buildings increased the price per m2, although the vacancy was high enough to still receiving new companies and only recently is getting too low, requiring the construction of new buildings.

The technological aspects have a less relevant impact in comparison to the other two aspects since is not directly related to the management or the funding of the project. It is relevant for the evolution of the 22@ due to the importance of the openness of the concept of innovation and the integration of the 22@ in the smart city strategy of Barcelona. The Urban Lab experiment started in the 22@ and implemented in other parts of the city, together with the Mobile World Congress and the consequent growth of the apps market, modified the businesses activity of the district.

5.2 Triple transformation of the 22@

The financial crisis and the dismantling of the municipal company 22 Arroba BCN SA determined the slow-down of the transformation process. According to a figure of 2014, 50,6% of the 22@ land is still pending to be transformed, being mainly occupied by offices, universities and public buildings.

The new infrastructure system of the district and the urban planning connect the 22@ area with rest of the city, eliminating a historical separation and facilitating the densification of the area: new metro and tramlines, bike lanes and parks, a continuation of the blocks system of the Plan Cerdá.
The 22@ also is connecting the rest of the municipal projects of the surrounding areas among each other, creating a new centrality in the north-western part of the city: The Vila Olimpica, the Forum Area, the Maritim Front, the Glories square and the Sagrera.

Regarding the economic transformation, the cluster strategy allowed companies and research centres to concentrate in a specific area. To the original four clusters established in 2004, an additional one was added in 2008, showing the good results of the strategy followed. The new technologies brought new opportunities for small and medium companies as well, being specially developed the Media, ICT and Design clusters. The economic activity generated by this strategy also benefited other sectors related to the tourism, like hotels and restaurants, and also local shops, reactivating the economic vitality and creating an attractive area to open new businesses. Is especially interesting the re-modelation of a shopping mall close to the 22@, which transforms from a closed shopping mall to an open shopping venue, highlight the new approach to the new customers.

The international promotion of the district not only promoted the attraction of the international businesses and investors but also made from the 22@ a model for other cities around the world that declared to inspire directly to the experiment of Barcelona, like Boston or Medellin.
From a local perspective, only 1.600 units out of the 4.000 planned have been constructed by 2015 and the green areas increased 40.737 m2 out of the 145.000 m2 planed. Obviously, the economic situation prioritized projects with a higher return for the investors, although the urbanistic rules are specific and gradually all the goals will be achieved. The protection of 114 heritage elements is important for the protection of the identity of the community, being relevant the aim to re-use such elements in order to integrate them as assets for the citizens. Finally, the project considered the importance of helping the community in the transitions phase from an obsolete and decaying situation to the new economy and global markets, creating projects focused especially on children and young people

5.3 Adaptive Governance in the 22@

The flexibility and adaptability of an urban regeneration project need an adaptive governance system able to contemplate any change and react. This research aimed to show the suitability of adaptive governances systems in urban regeneration projects.

The municipal company can be considered as a bridging organization that works cross-level and cross-scales, connecting actors from different levels (from the neighbours to international investors) and from different scales (from universities to businesses), supporting the suitability of the theory in this field. One of the main goals of the bridging organization is to deal with different stakeholders and find the balance between the different interest and different actors, adapting to each opportunity and obstacle in order to achieve the best possible outcome. Since situations are changing, actors and their interest are also changing, being important to "orchestrate" this change looking for a common agreement to keep the project functional.

In the governance of the project, the business sector has had a more relevant position, due to the financial support they provided, in comparison to the local community, which was informed

in public consultations and gradually was more integrated into the decisions making process. It is important to integrate the variety of the main interest within the planning of the project since is the only way to reduce conflictual situations and increase the ownership feeling of the neighbours. In fact, the main source of rejection was the lack of communication, where the neighbours had the feeling to be "spectators" of the changes. The ideological rejection was a noisy minority that managed to mobilize the community, obtaining a higher integration of the local community in the decision-making process.

In Chapter 4 has been showed the main assumptions and actions of the adaptive governance system, proving the similarities of assumptions and possibility to apply the main action, especially learning and adapt. Anticipation is more difficult to apply due to the non-scientific nature of the external drivers, whereas social-ecological system can analyse and predict ecological disasters like climate change or floods and droughts.

Lessons from previous urban regeneration process, as well from errors or confrontation with other actors involved, gave the opportunity to improve the skills and the know-how of the City Council in dealing with complex urban regeneration projects. In fact, PPPs are the base to the Barcelona Model of regeneration and have been the base of the transformation structure of the 22@. Only knowing what happened in previous experiences and communicating with all the actors, allows adaptation. Urban regeneration projects have to adapt to the existent reality (e.g. local community and businesses or cultural heritage) and to the changes that might happen (e.g. smart technology in the service delivery), and in order to do that, the governance system needs to be open enough to include all the actors and flexible enough to react to changes.

5.4 Contribution to urban regeneration theory

This study supports the effects of external forces in urban regeneration process and shows how adaptive governance theory is suitable to be applied in such kind of projects. The three main theories considered present important similarities among each other and the case study of the 22@ proves the fact that these theories can be used to better manage urban regeneration projects. The awareness of a complex reality, that change due external forces, and the creation of an adaptive bridging organization, are the main elements that connect the three theories.

The slowing down of the transformation of the project it can be justified by the economic macro context and the changing of priorities and the consequent dismantlement of the municipal company. This fact reinforces the importance of the consideration of external forces and the relevant role that municipal company can play in such projects. The re-activation of the project can only come with a new investors availability and the role that the business association 22@Network as a new leader.

Urban regeneration projects should be therefore more resilient and promote a gradual and flexible process able to react to any change. In the case of the 22@, this was the case since the positive economic situation allowed a high level of construction, creating some vacancy that decreased when the crises arrived and the construction stopped. Afterwards, instead of building and then looking for tenants, the developers looked for tenants and then construct a building, reacting to the changes and adapting to the new market reality.
The project was not only flexible, but was able to adapt to new situations in order to keep transforming the district, obviously at a different speed, but it is still a project with a high potential that will keep growing in the future.

5.5 Validity and reliability

This research bases its finding on the case study of the 22@, presenting some limitations on the generalization of the findings.

The primary data (interviews) are also influenced by the political nature of the project since it was a project from a specific mayor from a specific party, making the opinion of the interviewers might be biased by political ideology. The secondary data cover the entire period analysed, although the main sources have been written for the 10th and 15th anniversary, missing information about the impact of the crisis on the project. Some secondary date would have better support some of the findings of this research, although not all the information was easily accessible. On the other side, some interviewers provided internal information that was not confidential but was not available on the internet as they were internal reports or information already removed from the internet.

The interviews have been conducted in Spanish and only the quoted parts in this document have been translated, keeping as much fidelity as possible to the Spanish version. The interviews were transcribed and if necessary, the information was restructured (dividing in more sentences, deleting repetitive words, changing unfinished sentences), improving the understanding of the messages. The transcription files were analysed with the software program ATLAS.ti, using subjective categorisation according to the operationalized variables selected by the researcher.

The use of adaptive governance in urban regeneration studies is the result of a combination of theories that share many similarities. The analysis responds to the decisions and the creativity of the researcher in considering the relevant elements to prove the suitability of adaptive governance in urban regeneration, being possible that other elements have not been considered and therefore reduce the reliability of the findings.

5.6 Recommendations for further research

This research has contributed to the application of adaptive governance principles in urban management field: from the original field of socio-ecological systems, adaptive governance has been applied in megaprojects studies and systems where technology plays a main role.
It provides a relevant case study where the funding system and the goal of innovation increase the importance of external forces and need of adaptability.

This need of adaptation suggests that further studies could focus on the cooperation among actor towards an adaptive governance system. The 22@ project and this research consider the Triple Helix approach as a model of cooperation, whereas future studies could expand and use a quintuple helix institutional structure with civic, social, cognitive, public and private actors .

A next step would be the creation of an adaptive governance system in an urban regeneration project, considering the real issues in designing and implementing such kind of projects and therefore analysing the internal factors that can influence the development of the project.
Considering the urbanistic transformation and the economic promotion of the district as the main goal, further research could study the generally the integration of the previous reality in the new projects, specifically the impact on the residents, the local businesses and the integration of the cultural heritage.

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Annex 1:

Guide for interviews

1. Introduction

- Could you explain the involvement you had in the project?
- In order to better organize the information, could you please let me know in which period you have been involved in the project?

To better organise the information, the areas of interest are the following: political, economic and technological. General questions will be asked in order to give them the freedom to express their own opinion and provide insight perception. If any of the questions is not adapted to their area of expertise or knowledge of the project, we will skip to the next question or directly to the next block of questions.

2. Political questions block

- Over approximately 15 years of the project, there have been different mayors in Barcelona with different ideas about the 22@.
    - Clos (26 September 1997 - 8 September 2006)
    - Hereu (September 8, 2006 - July 2, 2011)
    - Trias (July 2, 2011 - June 13, 2015)
    - Colau (13 June 2015)

  At a general level, which power has had each mayor to influence the development of the project? What mayor has interfered the most? Could you summarize the positions, that according to you, each mayor has taken in regards the project? There are mayors of rupture, then downsize or empowerment of the project?
- How has it changed the priority of the project for each mayor? (autonomy and powers given to the municipal company 22 ARROBA BCN S.a.)
- In the district was promoted the policy to facilitate the concentration of companies and research centres. Is it still being the priority or is promoting a similar strategy in other neighbourhoods of the city? Could you provide examples? Who takes such decisions?
- How is the position of the 22@ within the "triangle of centralitat" (area of economic development among crossing different neighbourhoods)?
- The project tries to regenerate and transform the area, with a possible tension between the past and the future. What position has been taken at the time to recognize the historical heritage? There has been any conflict with other actors in the research of a balance between innovation and regeneration?
- The Barcelona model in the field of urban regeneration is characterized by the high level of citizens participation. What role has been given to the neighbours of the district in the decision-making process? Do they have been consulted? (Citizens not organized)
- What relationship has been maintained with the "Associació de Veïns i Veïnes del Poblenou"? (Neighbourhood association)
- The city council has given extensive powers to the company 22 ARROBA BCN S.A. (Annex 1), but there was any control system? There were decisions left open for the future in the implementation phase?

- Considering the different documents that form the 22@Barcelona plan:
    - Modification of the Municipal General Plan (MPGM)
    - Special Infrastructure Plan (PEI)
    - Modification of the Special Plan of Architectural Historic-Artistic Heritage sites of the city of Barcelona

  What power had the city council at the time of adapting these projects to new needs? Considering the technical level of the document, which was the guidance given by the politicians?
- There is high flexibility in different aspects of the project. At the political level, this flexibility has had some advantage (greater adaptation to the needs of each project, increase attractive to very different projects) or disadvantage (ambiguity, provision of services)?

3. Economic questions block

- The project has been financed (XXXXXXXX) value capture Finance as a system of financing the project. Could you explain to me as have structured the whole process?
- What relationship has been between the private sector and public at the time of financing the transformation of the neighborhood? Has this relationship varied depending on the project and during the time? How did the real estate and financial crisis affect the project?
- How did the project react to such crises? (alternative financing, reduction of project, increase marketing campaign of the neighborhood)
- There have been other financial/economic events that have affected the development of the project as planned? (Macroeconomic events)
- The international promotion of the neighborhood managed to attract foreign companies and investors. Have you prioritized in some way international companies? What has been offered to local firms to locate in the neighborhood?
- Considering the start-up and the technological incubators, how was the relationship between the small realities with large companies and universities that were in the neighbourhood?
- The number of clusters has changed during the time. It has been a decision of 22 ARROBA BCN SA or has emerged from the private sector? Do you consider that has been a wise decision to create clusters? Why?
- With regard to the real estate sector. What relationship has been with builders and "developers"? What has been according to you the greatest achievements and criticisms of this process of transformation of the neighbourhood? (skyscrapers, financing system, gentrification)
- The clusters of innovation have also altered the demand for the type of workers. Do Workers of the neighbourhood were prepared for these new requirements? Do you consider that the connection between universities and enterprises is helping to better prepare young people?

- ¿considering the different clusters that have been promoted and the time that has passed, we could say that the cluster can support by themselves and generate synergies between them?
- There has been a strong campaign of internationalization of the neighbourhood. How has increased the number of foreign workers? How considers that the 22@ has been internationalized?(residents, workers, enterprises, tourism)
- Barcelona is promoting the Smart technology to increase its efficiency in the provision of services, improving existing ones and adding again. In the creation of the concept of Barcelona as Smart city, who has been the greatest promoter? How has the main project been financed?

4. Technologic questions block

- Since the beginning of the project at the beginning of 2000, there have been many technological changes whose impact was impossible to foresee.
  How has it changed the concept of innovation? (informatics, the internet, smartphones, sensors, Internet of things, Smart City)
- How has grown the innovation project in relation to these advances? Has it been able to grow with them, to lead them or has underestimated their potential? (Internet of things, Smart City, smartphones, 3D printers,…) What role has had the 22 ARROBA BCN SA in this process?
- The technological advance in the 22@ has had repercussions in the municipality? Or has been the city council who has led to changes in the 22 ARROBA BCN SA? (The purpose of the question is to know if the technological improvement of companies and research centre has had an impact on the way of working of the public sector (e-governance)).
- Does the public sector has benefited from some of the technological advances/new knowledge? (the benefit for the private sector is clear, this question wants to know how the public has benefited from it).
- Technological advances and the principle of sustainability have driven research and creation of green infrastructure. How has adapted the 22@ to all these new technologies? (renewable energy, pneumatic waste collection, sensors)
- In the creation of the concept of Barcelona as Smart city, who has been the greatest developer?
- Considering the main actors of innovation, the public sector has been the main promoter of the project, but how were the relationship with the private sector and the research centres and the university?

5. Adaptive questions block

After having captured the evolution of the project in these three different aspects, some additional questions are necessary to emphasize the adaptation process.

- The company 22 ARROBA BCN SA has functioned as "bridging organization" in the development of the project. (match-making) Could you explain how the company reacted to changes that have been mentioned above?

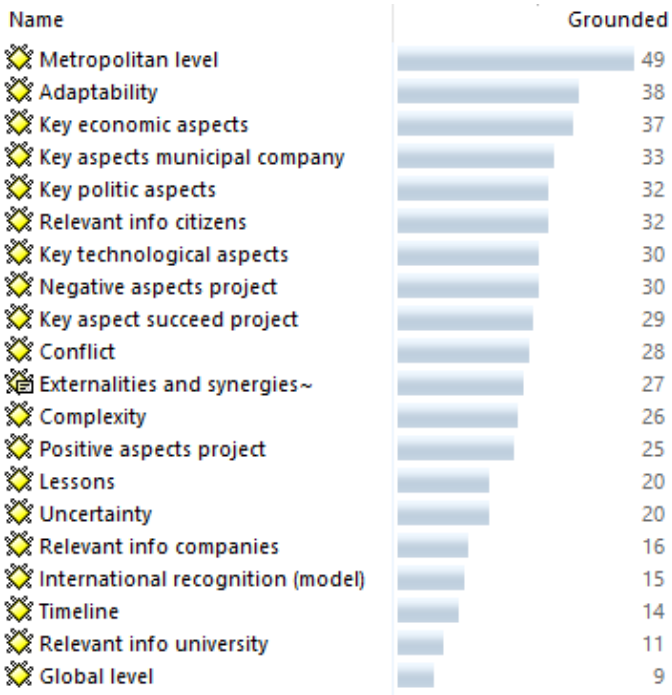
- At the time of adapting, it is important to learn and be aware of what is happening. Hos did the company 22 ARROBA BCN SA related to the rest of actors? How did the company resolve conflict situations with other actors, especially with the community?
- Do you think that the use of the term innovation, have a certain ambiguity that allows encompassing different projects and initiatives under a single umbrella and in turn easily adapt?
- Flexibility has been a characteristic element of the urban restructuring of the neighbourhood (not detailed management of the territory, flexibility in time, the manner of buildings, agents, mechanisms of transformation). What other elements have characterized the flexibility of the neighbourhood? So much flexibility might be counter-productive?
- High level of autonomy to the company 22 ARROBA BCN SA surely has streamlined the process of decision-making. There might be any issue for the control system? (This question wants to know if the flexibility and the "autonomous and fast" decision-making may put at risk the accountability and transparency).
- Adapt also means making use of local knowledge. Which relationship managed to establish the company 22@ with organized citizens and non-organized?
- It is important to encourage people to be more reactive and able to take quick decisions that are on different levels. Did the company focus on the training aspects within the company?

Annex 2:

Table 1 – Codes Atlas.ti

Code	Position
Adaptability and adaptive governance	Adaptability
	Complexity
	Conflict
	Uncertainty
	Lessons
Impact assestment	Key aspect succeed project
	Negative aspects project
	Positive aspects project
	Key aspects municipal company
External factors	Key economic aspects
	Key politic aspects
	Key technological aspects
Relevant actors	Relevant info citizens
	Relevant info companies
	Relevant info university
Other relevant information	Externalities and synergies
	Metropolitan level
	Global level
	International recognition (model)
	Timeline

Table 2 – Frequency of codes Atlas.ti



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