Chapter 6
A Viability Model for Digital Cities: Economic and Acceptability Factors

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6.1 Introduction

Various notions such as "digital cities", "smart cities", "knowledge spaces", etc. refer to limited geographic spaces (e.g. cities, peripheries, neighbors, clusters) where information and communication technology (ICT) infrastructures and applications are installed and offer various forms of e-services. In this chapter, the term "digital city" (Anthopoulos and Fitsilis 2010) will be used to refer to all the above notions. The scope of the deployed e-services is extensive and many of them are based on Web 2.0 applications in order to achieve social participation. The components of a digital city usually concern "smart people", "smart environment", "smart economy", "smart governance", "smart mobility" which generally constitute the notion of "smart living" (Giffinger et al. 2007). On the other hand, according to Caragliu et al. (2009), a city can be "smart" "*when investments in human and social capital combined with traditional and modern ICT infrastructure fuel sustainable economic development and a high quality of life, with a wise management of natural resources, through participatory governance*". This last approach suggests the significance of "sustainability" in "smart living".

Digital cities are being evolved for more than 15 years and introduce new ways for peripheral and urban development, which are based on the simultaneous evolution of the ICT solutions in the urban space. According to Ishida and Isbister (2000), in 1994 more than 100 European organisations started to discuss and

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debate over digital cities, while similar initiatives were undertaken in the USA and in Japan during the same period. The objectives of these initiatives concerned the utilization and the exploitation of the ICT in order to reinforce the local stability, sustainability, and economy, and improve the everyday life in the cities. However, each initiative faced different challenges and priorities that lead to different objectives and to ways for evolution. The primary objectives of a city concern the improvement of the residents' everyday life, the development of knowledge-based societies, the "close" of the "digital divide" -in terms of ICT literacy, in the creation of free-of-charge e-services, and in encouraging social participation via the ICT, and the simplification of the public services (Anthopoulos and Fitsilis 2010). Moreover, some digital cities (e.g. Dubai and Amsterdam smart cities) prioritize e-commerce services and fee-based public services, while others (e.g. Trikala Greece, Barcelona, Hull) deploy free of charge the entire set of the deployed services. Others focus on the local quality of life, while others prioritize the viability of the digital city.

The social dimensions, the extensive scale and the diversity of the various digital cities, suggest a careful investigation on the economic and social needs that lie beneath such a project. The identification of these local needs will secure a careful and sustainable urban growth. Moreover, the deployment of Web 2.0 applications is critical since they establish social participation in decision making over the definition and the review of the digital city's objectives, which consider environmental, renewable resources', and health's issues. Finally, the success of such a project has to be secured, since huge funding supports its implementation and various social implications accompany its deployment.

In the following section, a domain analysis and a digital cities' classification constitute the background of this chapter. Section 6.3 concludes on the sets of e-services that are provided by the most important digital city cases, and considers the digital city as a unique Web 2.0 application where citizens can participate, deliberate, and contribute with various forms of sources via the available e-services. In Sect. 6.4, the sustainability and the viability considerations of a digital city are summarized and a viability model that can be adaptive by various different cases is structured and proposed. In the final section, some conclusions are extracted and some future thoughts are discussed.

6.2 Background

Cities around the world cover 2 % of the entire Earth's surface and host the 55 % of the global population. This rate is estimated to reach 75 % (6.4 billion people) until 2050. In fact, 450 cities have a population of more than a million people, while 20 of them have a population that exceeds 10 million people (OECD 2008). In 1975, only three megacities existed (Tokyo, Mexico City, and New York with 53 million people population) while in 2009 this number exceeded the 21 (Tokyo and New Delhi hosted 320 million people). According to McKinsey Global

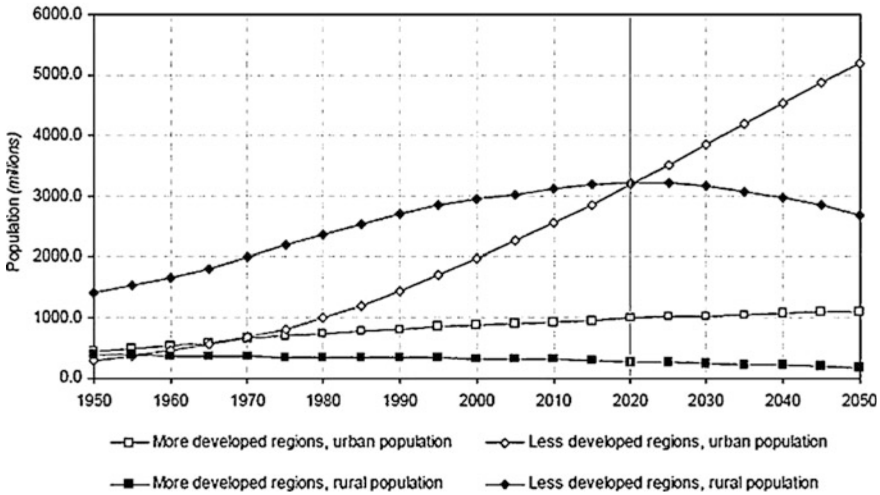

Fig. 6.1 Urban and rural populations per regional growth rate (U.N. Department of Economic and Social Affairs—Population Division 2010)

Institute (2009), it is estimated that a population of 350 million people will move from rural to urban areas, structuring an unprecedented poverty within the urban centers. It is expected that the world in 2025 will create refugees mainly from Asian countries that will move to Western cities as an attempt for employment and for political stability (European Commission 2010). By 2009, the 51 % of the world's population lived in cities. United Nations (UN) Secretary–General Ban Ki-moon stated that "*we are living in an 'urban century'*" (Ban Ki-moon 2009). Urbanization presents variation according to the national tendencies, the political affairs, the market transformations within and outside countries, and the realization of the growth and prosperity, which are all presented on (Fig. 6.1).

On the other hand, digital cities' evolution does not necessarily follow urbanism, since many cases occurred in small cities. In Fig. 6.2, the existing cases of various digital cities are classified according to their definition and to their objectives. In Fig. 6.2 the cities' names are mostly presented with the exception of Eurocities, of Portugal Cities and of Telecities, where the projects' titles are used. *Web cities* virtualized urban spaces and provided citizens with local information via the Web. *Digital and Smart cities* combine both the physical and the digital space in order to provide with e-services via extensive metropolitan infrastructures, while any smart city may be digital, but digital cities are not necessarily smart (Komninos 2002). Digital cities seem to mainly deploy public services designed by the State, while in smart cities collaboration between citizens and the State designs the kinds of e-services and forms of the digital space. *Ubiquitous cities (U-cities)* deploy ubiquitous computing around the city, which offers e-services from anywhere to everyone. On the other hand, *Broadband cities* use various communication technologies (fiber optic, Wi-Fi and Wi-Max networks, etc.) that enable connection to the

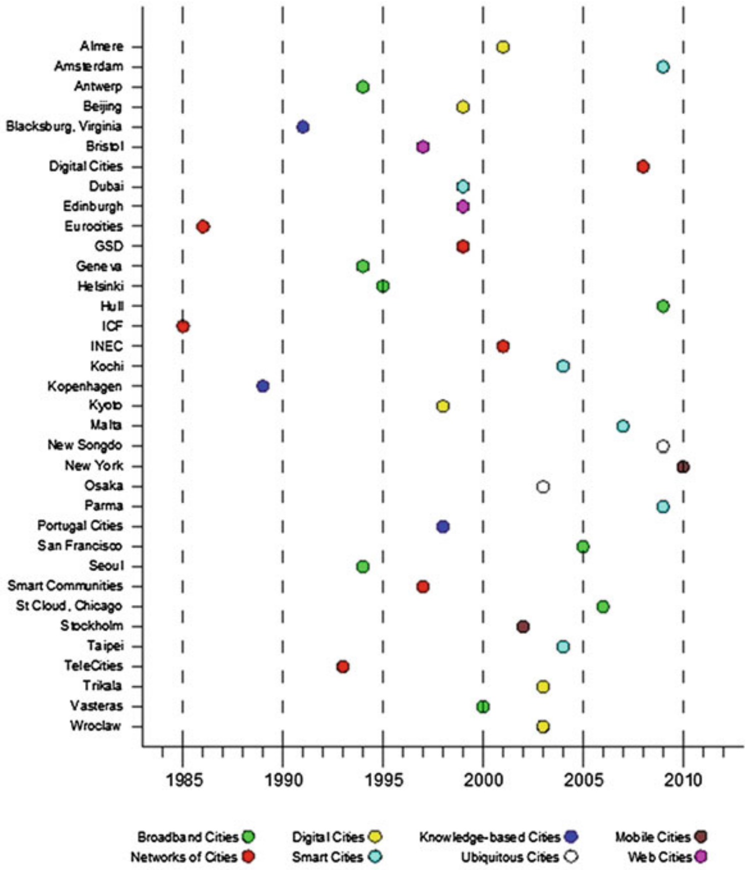

Fig. 6.2 Classification of major cases and their evolution

internet and to local e-services to citizens and enterprises. *Mobile cities* concern wireless networks installed in the city, via which residents and visitors access various types of applications and services. *Knowledge-based cities* utilize the ICT for their development. Databases collect local information and structure empirical knowledge bases of domains of interest in the areas, which are accessible by citizens and local authorities. Finally, *networks of cities* are structured via the ICT in order to face common challenges or to create opportunities for common growth by different cities in the same or in different countries.

As it was mentioned before, in this chapter the term *digital city* covers and describes all the above mentioned forms in order to not confuse the reader. In this context, the above classification gives the dimensions to a digital city that vary from metropolitan ICT infrastructures, to virtual representations of a city. The first dimension of *broadband and wireless cities* transforms a city to an extensive worksite, where all its physical features may be updated in order for the ICT to be incorporated and to support urban living. Moreover, ubiquitous infrastructure is installed and provides the decision makers with tools and methods to monitor and perform sustainable urban planning. Like in other large-scale projects, a transitional period until the completion mediates until the city transforms to digital.

The second dimension of *web cities* classifies cities in commercial, governmental, community networks, and virtual cities according to project's priorities. Commercial cities are driven by market and they offer guides and catalogs with information -such as sightseeing, restaurants and hotels, shops, etc.—for the residents and the visitors. An alternative web form concerns a network of similar information called Community Network, which was introduced by the *Free-Nets* in Cleveland (USA). The rationale that lies behind Free-Nets is the connection of similar web cities and the composition of a digital community. This community intends to collect and organize information in a consistent manner and to create websites for the communication of its members. Non-profit organisations are created and they operate through donations and governmental grants. The viability of Community Networks is not ensured since they provide free-of-charge services.

The third dimension concerns the *digital and the smart city* and it is supported by the local Government and/or the local market, as a means to develop e-Government and e-Commerce services and information. E-Services of the four e-Government levels are observed in various cases; while in some of them e-Democracy applications enable public consultations and social dialog. E-Services are grouped according to their users—e.g., the services provided by the municipality could be grouped under the name "city hall, while citizens can actively contribute and to participate in city's transformation.

6.3 Digital City's Services and Applications

In March 2010, the European Commission proposed the "Europe 2020 Strategy" in order to overcome the economic crisis and to support the European member countries for the upcoming decade. New jobs, productivity growth, and social cohesion have been identified as the primary challenges, while the Commission has determined the axes of precedence to achieve in particular objectives. The Digital Agenda suggests the cornerstone of the European policy, which presents the contribution of the ICT to various European challenges (European Commission 2010). In this context, the European digital cities capitalize funding opportunities provided by the European e-strategies in order to align their environments in order to:

- establish information flow cross-border services and create a common digital market,
- create secure networks and preserve privacy,
- install fast networks to support innovative services,

- use ICT for energy saving, for health and care services' provision and for the improvement of public services,
- promote research and innovation via the transformation of goods and services, and
- offer learning opportunities, and utilize human resources with the ICT.

Digital cities have to become viable through a two-stage phase (Schaffers, et al. 2011) in order to deal with above mentioned challenges. The first stage concerns the installation of (a) fiber optic network and wireless networks that will provide high speed connectivity, (b) sensors and smart devices around the city in order to collect and deliver data, and (c) appropriate applications to handle the collected information. The second stage concerns the structure of groups of central administrative members and of ordinary citizens that will monitor and review digital city's progress.

The components of a digital city are grouped in multitier (n-tier) architecture (Anthopoulos and Fitsilis 2010) and determine the structure and the features of new products and services. *Ubiquitous computing* can offer broadband connection in competitive prices. *Modern portable devices* provide ease-of-access to information and services. *Handheld devices* enable remote control of distributed infrastructures. *Open access* contributes to decision-making over issues of common interest. *Mining and statistical analysis methods* support decision makers. *The Internet of Things* concerns the wireless interconnection of sensors and other devices, in order to collect and process data from anywhere, and to contribute with energy saving, distant healthcare, weather prediction, atmospheric, and water pollution, etc. *Cloud computing* can support delivery of software as a service and of hardware as a service solutions of low cost. *Geospatial platforms* enable the visualization of the above information and support decision makers.

The transformation of applications into consuming services is vital for the development and improvement of the above mentioned components, and hence for the viability of digital cities. Utilizing applications should arise as a result of thorough planning and programing. The cooperation between the provider and the receiver of the service is considered even more crucial in order to improve the product and ensure the viability of initiatives.

Moreover, the role of Web 2.0 technologies (social networks, wikis, blogs, Podcasts, Enhanced events, extended networks, cloud services, etc.) is predominant. Via Web 2.0 applications the transparent information flow among the participants is enhanced, while there are no restrictions of the communication channels. Web 2.0 is a powerful and advanced technology, but in any case, the ICT are still evolving rapidly (O'Reilly and Battelle 2009). The adoptions of new technologies, business strategies, and social trends have to be effective (Murugesan 2007) in order for a smooth transformation to be established in the city. In (Fig. 6.3) the evolution of Internet technologies is presented, in order to describe how rapid the evolution is, and how critical the adoption of technological evolution is for the sustainability of the digital city.

The above considerations and the potential digital city's e-services could be summarized as follows:

1. Digital city's infrastructures provide information exchange from everywhere to anyone.
2. Numerous e-services (e.g. e-dialoguing, e-health, tele-care services, crowd sourcing, and knowledge bases) concern the composition of social networks and crowd sourcing via Web 2.0 technologies.
3. Various social networks can be deployed in the city, which can focus on local particular needs (e.g. Smart Communities).
4. The entire digital environment that the digital city structures can offer global e-Government and various e-services, both from local and national authorities (Anthopoulos and Tsoukalas 2006).
5. The implementation model for a digital city (Anthopoulos and Tsoukalas 2006) considers various Web 2.0 issues such as privacy and ethics.

The above remarks show that a digital city can be considered as an entire Web 2.0 application, which offers various e-services and provides with crowd sourcing tools for social participation and for information collection across the city or a network of cities. This Web 2.0 environment could support local communities in addressing economic and social challenges. Moreover, this Web 2.0 environment can be effectively used only if it is adopted by the local community and by various stakeholders (enterprises, Non-Governmental Organizations (NGOs), and local Government).

Furthermore, various aspects concern Web 2.0 applications. From the citizen point of view, the adoption of Web 2.0 services is based on their contribution to the particular local needs. Particularly the governments can focus on collaborative decision-making and strategic planning (Reddick 2011). In this context, the constructive interactivity and interventionism with the citizens can reinforce democracy and participatory governance (Macintosh and Whyte 2008). Urban rapid growth that was mentioned above requires the transition from the traditional models of high resource demanding to modern ones, especially today where municipal budget are constantly truncated due to current economic conditions. However, like any other innovative project, there are risks that should be undertaken. Low participation, poor input quality, managerial inefficiencies, and trust, question the viability of digital cities (Osimo 2008).

On the other hand, from the business point of view, Web 2.0 in combination with the consumers' attitudes has brought huge profits to the private sector, which is enabled to easily collect information about consumers' preferences and satisfaction. Moreover, managers have reinforced marketing and sales strategies with improved and focused methods in order to extend their market share. Web 2.0 applications are low cost, effective and user friendly, and in this context they have been adopted by many enterprises. Additionally, Web 2.0 applications enable businesses to approach international markets.

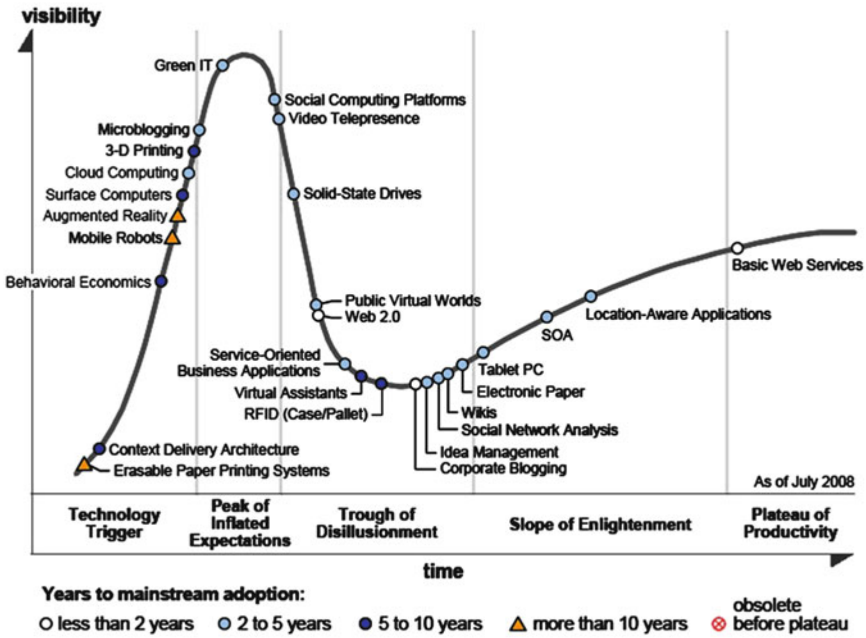

Fig. 6.3 Internet evolution (Gartner Research 2009)

6.4 Viability and Sustainability Aspects

During the second half of the tewntieth century, large-scale projects concerned transportation networks at national and supranational levels (railways, highways, and airports) and the improvement of everyday life (e.g. water supply and sewerage networks). On the other hand, during the last 15 years, cities around the world tend to capitalize knowledge and innovation via the ICT utilization in an effort to improve urban life (Komninos 2002). However, large infrastructure projects for digital cities constitute a novel challenge. Extensive funding is allocated on engineering projects, either by the public or the private sectors. These projects affect urban life and cause major problems in traffic and in environmental condition during their construction. Therefore, potential failure of these projects has to be avoided.

A definition of the term sustainable development has been given by the prime minister of Norway, Gro Harlem Brundtland in her 1987 report to the UN as chairman of the World Commission on Environment and Development: "*the development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (World Commission on Environment and Development 1987). At the Rio Earth Summit in 1992, from which the Agenda 21 for sustainable construction arose, sustainable development was defined as "*the development which in the long run provides economic, social and environmental benefits meeting the needs of present and future generations*". The attention that international organizations (Organization for Economic Cooperation and Development (OECD), European Union (EU), United Nations (UN), etc.) and scientists paid on sustainability about its contribution for future social evolution, the term has been supported by legislation, while it has been integrated within the international law and the European Union's law.

Today, the notion of sustainability differs across countries and it is accompanied by a plethora of standards, while it reflects national economic growth. The most developed countries aim in upgrading their existing infrastructures and buildings, as well as their technological automation, in order to become innovative in implementing construction projects. Developing countries on the other hand, aim in developing digital cities of hybrid forms, based on the experience of best cases, and in an effort to capitalize funding opportunities by framework programmes. Various indices and factors can measure the viability of a digital city, while they can play a vital role in its planning and definition. These factors concern geographic, financial, socio-political, cultural, legal, technical, environmental, and social perspectives.

6.4.1 Recent Challenges that Affect Digital City's Viability

The composition of a viability model for digital cities should satisfy three primary parties: the client—usually the local Government—, the contractor, and the end users (Project Management Institute (PMI), 2008; Construction [sic] Project Management (Federal Transit Administration 2007). In this context, the OECD, the EU and the UN behave as regulatory authorities, and they define strategies and objectives to be followed by national Governments. These organizations are responsible for equal opportunities, for red tape bureaucratic elimination, for corruption treatment, for market competition and, in this context they offer funding opportunities to the Governments.

According to the declaration for the future of the Internet Economy that took place in Seoul (OECD 2008), the digital content is a key factor toward the formation of social and economic growth. Some primary principles were defined that support the implementation of various digital initiatives, the installation of ICT infrastructures and the encouragement of private investment in creation, deployment, and maintenance of digital content (OECD 2008). In June 2011, a meeting of the Internet Economy took place in Paris, in order to review and identify the reasons that caused failures in the aforementioned efforts. The participants noted that the delay in measuring the end users' expectations from the ICT initiatives led to unused and inactive projects. Moreover, it was highlighted that the Internet's power and vitality depend on high-speed networks, on transparency and on trust (OECD 2011).

6.4.2 Implementation Models for Digital Cities

On the other hand, the digital cities are modern projects and therefore insufficient data are available for decision makers. However, serious argument concerns the economic and the social dimensions of these projects, since the number, the types and the applicability of the offered e-services are unknown during the planning and the implementation phases. It is also difficult to predict the acceptance and the profit of these services. Moreover, ICT infrastructures alone will not contribute to (New Millennium Research Council 2005):

1. closing the "digital divide",
2. the economic growth, since they do not affect the key factors toward this direction (urban income growth, reduction of unemployment, etc.),
3. the economic viability.

The capitalization of infrastructures by e-services and applications is the only means to increase the value of the digital cities. Social networking and participation can contribute via composing an open digital space. In this context, the Government should act as a key-role market player, without abusing its power to act as a regulator and a service provider simultaneously.

As already mentioned, social participation during the stage of definition and planning of a digital city is critical. In this context, it is not determined whether the selected e-services in the digital city initiatives meet user expectations (Ishida et al. 2009). This occurs due to the existence of gap between computer science and social sciences (Ishida, Aurigi, and Yasuoka 2005). Technology offers opportunities, which are eventually evaluated concerning their practicality by the end users. For instance, collaborative environments of Web 2.0 applications are preferred due to their contribution in interoperability and in knowledge transfer. On the other hand, the insufficient end users' ICT skills will lead to overestimation of the available e-services. From technical perspective, insufficient requirements engineering is performed that demands extensive funding for infrastructure, while only a few e-services are deployed (e.g. digital city of Trikala). This ineffective requirements analysis results in huge infrastructure maintenance costs without citizens enjoying e-services. Standardization accompanied by a proper legal framework could lead to funding capitalization and to successful digital city projects (Anthopoulos et al. 2010). Other reasons of failure concern the inability to ensure the source of incomes/revenues or even to secure the initial funding, as well as its future maintenance and expansion (Iowa Communications Network, California's CALNET system, etc.).

The evaluation and review of a digital city concern the identification of viable solutions for the particular case. Evaluation plays a vital role in innovative projects since they involve uncertainty and complexity. A flexible evaluation process that enables management and correction of any divergence through the setting of metrics and goals has to be identified. Moreover, the space where digital cities are developed is dynamic, and it is formed under the interaction between local stakeholders (Fig. 6.4).

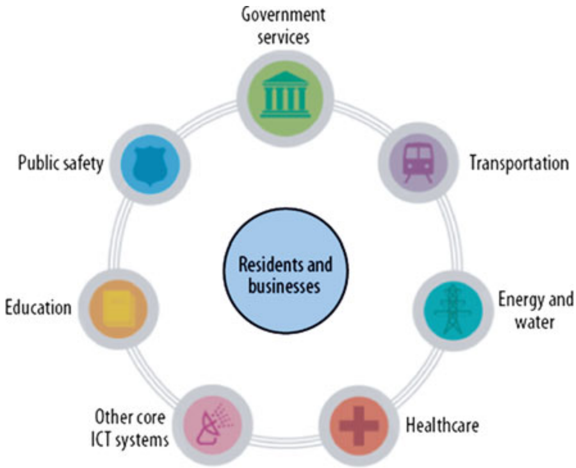

Fig. 6.4 Local stakeholders participating for effective management (Naphade et al. 2011)

Therefore, the implementation model of a digital city consists of three levels (IBM 2009). *Planning* utilizes the information that is collected from users and/or the existing city services. It supports the management team to define and align strategies to the local priorities, and to make use of best practices. *Management* enables the implementation of coordinated tasks for the implementation of infrastructures and for the association with the future urban development. *Functions* embody multiple data sources that represent the real time coordination of city's components.

The satisfaction of various parameters that are defined by the involved stakeholders under a bottom-up procedure (Anthopoulos 2005) is necessary in order to the digital city to be successful and adopted. For the purposes of this chapter, these factors are classified in the following categories (Van Bastelaer and Lobet-Maris 1999), which affect requirements engineering process (Anthopoulos 2005).

Geographic factors refer to the geopolitical conditions in the country, city or region where the digital city will be located. They are influenced by the national strategies and framework programs. *Economic and market factors* refer to wealth, enterprises, and growth level in the particular area. A flavor economic environment for households and firms typically secures technology acceptance. Additionally, regional funding opportunities support innovative initiatives. *Sociopolitical factors* concern the intention of local community to participate in project definition, development, and use. The political factors mainly focus on the level of transparency in public procedures, and on the encouragement for projects' initiation. *Legal factors* refer to the legal framework that prevails in the region. The flexibility and the absence of bureaucratic procedures support e-service deployment and use. *Cultural factors* concern social attitudes and indicate the existence of communities of common interests, which could potentially support innovative initiatives. *Technological factors* refer to the technologies that are involved in the project, and to the existence of the appropriate ICT industry to provide and support them. *Human factors* indicate the existence of supervisors and executives with proper skills. Finally, *Environmental factors* identify project's environmental implications, and means to establish sustainable urban planning with the ICT.

The above factors can compose a suitable viability model, which with appropriate alignments can lead to a viable digital city. A digital city can be considered large scale due to its implications and duration—since large-scale projects are usually concerned with a budget of more than $1 billion, with timeframe of more than 5 years, with significant implications for the society, the environment, and the economy (Flyvbjerg et al. 2003). Moreover, digital city is affected by a variety of factors, some of which were potentially considered under project's planning, but others rise during project's implementation and cause delays or even project's abandonment. In this context, sufficient management and continuous project evaluation by the project team are necessary to secure project's completion.

6.4.3 The Determination Process for a Viability Model

The proposed viability model requires stakeholders' involvement during all implementation phases (design, development, operation, maintenance, and expansion). However, this is a complex procedure since stakeholders see project from different perspectives, while they have different levels of duties during the lifecycle of the project (PMI 2008). Their involvement varies from participation in surveys to full involvement in development and management. Moreover, the involvement of the end users in the development and the operation of a digital city is critical. Additionally, an effective collaboration between project team, end users, and society has to be established during project's lifecycle, with identified limits for social participation. Furthermore, the development of a digital city requires the private–public sector involvement, in order to the funding to be secured. The involvement of the above stakeholders structures a complex project organization, which can be optimized with the identification of limits and of relations among each other. End users for instance are involved to secure adoption; they have to be approached during project design and must be kept informed during project development.

The viability of a large-scale project—like a digital city—is influenced by quantitative and qualitative parameters. The proposed model incorporates the most important qualitative factors that affect the development, and influence quantitatively its viability. Moreover, the model has been flexible in order to align to different cases. In this context, Ozdoganm and Birgonul (2000), introduced a model that was based on a list of qualitative factors, which were aggregated according to whether they were project, country, or government policy related. Nevertheless, due to the subjectivity of judgment, their model does not measure the precise influence of qualitative factors on project development and it cannot support decision making process. Dias and Ioannou (1996) introduced a model that returns an index of attractiveness of projects via qualitative factors, which relate to the project and the national characteristics. However, their model requires time for structure and application, and it is limited to construction projects. The proposed model is inspired by the work performed by (Salman et al. 2007), which concerns concession projects (Built-Operate and Transfer (BOT) projects).

6.4.4 The Proposed Viability Model

In this chapter, only the construction procedure is presented, and an indicative form of the model is given on (Fig. 6.4). The presented indexes are indicative too, the actual implementation method, and data collection and process for this model are beyond the purposes of this chapter. The proposed model was structured in two phases: during the first phase the determination of viability critical factors is performed with literacy review (Tiong 1990, 1995a, b, 1996; Centre of Regional Science 2007; Dias and Ioannou 1996; Levy 1996; UNIDO 1996; Gupta and Narasimham 1998; Ranasinghe 1999; Ozdoganm and Birgonul 2000; Salman, Skibniewski and Basha 2007) and with the contribution of experts in large-scale ICT projects. During the second phase, the selected indices were determined with the contribution of senior ICT project managers and academics, via the Delphi method (Björn 2011).

The Delphi method is designed to support decided during the process of planning for the future, priority setting, and decision making. Delphi can be used to create hypotheses about the development of scenarios and their socio-economic impacts. For example, it has been widely used for the provisioning in the field of technology, education, and other sectors. These procedures are not easily supported by statistical models because it requires the inclusion of human crisis, as shaped by economic, technical and historical data (Björn 2011).

During the second phase, the income from the first phase was analyzed and classified in initial categories of factors. Initially, the qualitative factors were distinguished in two levels: the country level and the project level. In this context, the model becomes flexible and adaptable to a variety of different cases. On the other hand, the model has to be tested concerning the environmental performance of the project, its alignment to national policies, and to legal or other restrictions. Practice shows that the viability factors at this level are fuzzy and the evaluation procedures are usually defined by the international organizations (UN, World Bank, etc.), through annual reports and future forecasts. At project level, three (3) hierarchical levels structure the model (Dias and Ioannou 1996): the *first* hierarchical level concerns the objectives of the viability model; the *second* defines three or more primary categories of factors; and the *third* contains the qualitative factors (Fig. 6.5). These qualitative factors are determined under a Delphi method (Schmidt 1997), which has to be performed on senior ICT project managers, and/or experts, and/or academics. The Delphi method uses questionnaires that are structured, responded, and reviewed in at least two cycles: the first cycle intends to highlight, to aggregate and to prioritize critical factors for project viability (collected by domain analysis as well as from the individual recommendations).

The collected information is analyzed and submitted for evaluation to the respondents. The evaluation results are collected and used to update the initial model. The updated model can be reviewed similarly in other cycles. At the beginning of each cycle, the respondents are informed about the results of the previous round. Various cycles are executed until the "criterion of agreement" will be obtained, which achieves a minimum matching of 66 %. One of the Delphi method's advantages is the ability to capture expected future developments (Daniel and White 2005), such as research challenges and their implementation in a research agenda. After the collection of data from the executed cycles the final version of the hierarchical model is structured (Fig. 6.5).

After model's composition, model's validation is required in order for its relevance and adaptability to be tested. According to Dias and Ioannou (1996), several methods have been applied in an effort to validate results of multi-factor models because of the subjectivity's amount. For the purposes of the presented model, the Delphi method was applied on a panel of four academics, and on a panel of ten senior ICT project managers. These experts were questioned about their opinion on suggested viability model. The collected information was evaluated with a Chi-square test, in order for differences in the responses to be identified (SPSS 16.0 Software Package was used for this test). The results returned no significant differences between the two panels of experts.

6.5 Conclusions

In this chapter, the context of the digital city was analyzed as an attempt to determine sustainability and viability factors and to answer economic and social considerations on Web 2.0 applications. Various types of digital cities were identified and classified, together with their e-services and more specifically their Web 2.0 services. The entire digital city was considered as a Web 2.0 application that offers collaboration and crowd sourcing services.

Moreover, recent challenges and new technologies suggest participatory methods and applications to secure digital city's viability. Regardless the consideration of citizens', businesses' and State's perspectives during project's design, the viability of digital cities is critical. In this context, general guidelines offered by International Organizations were investigated, which will contribute failures' estimation and avoidance.

Finally, a viability model for digital cities was introduced, which incorporates several qualitative factors that can affect the evolution of a large-scale project. The development of the presented model was based on domain analysis for factors' proposition, and on a performed Delphi method on senior ICT project managers and academics for model's determination and testing. The subjectivity in factors' selection cannot be avoided, and returns weaknesses to the model. However, the above model provides the decision maker with the possibility (a) to determine the development of the project and focus on strengthening the factors that will assist

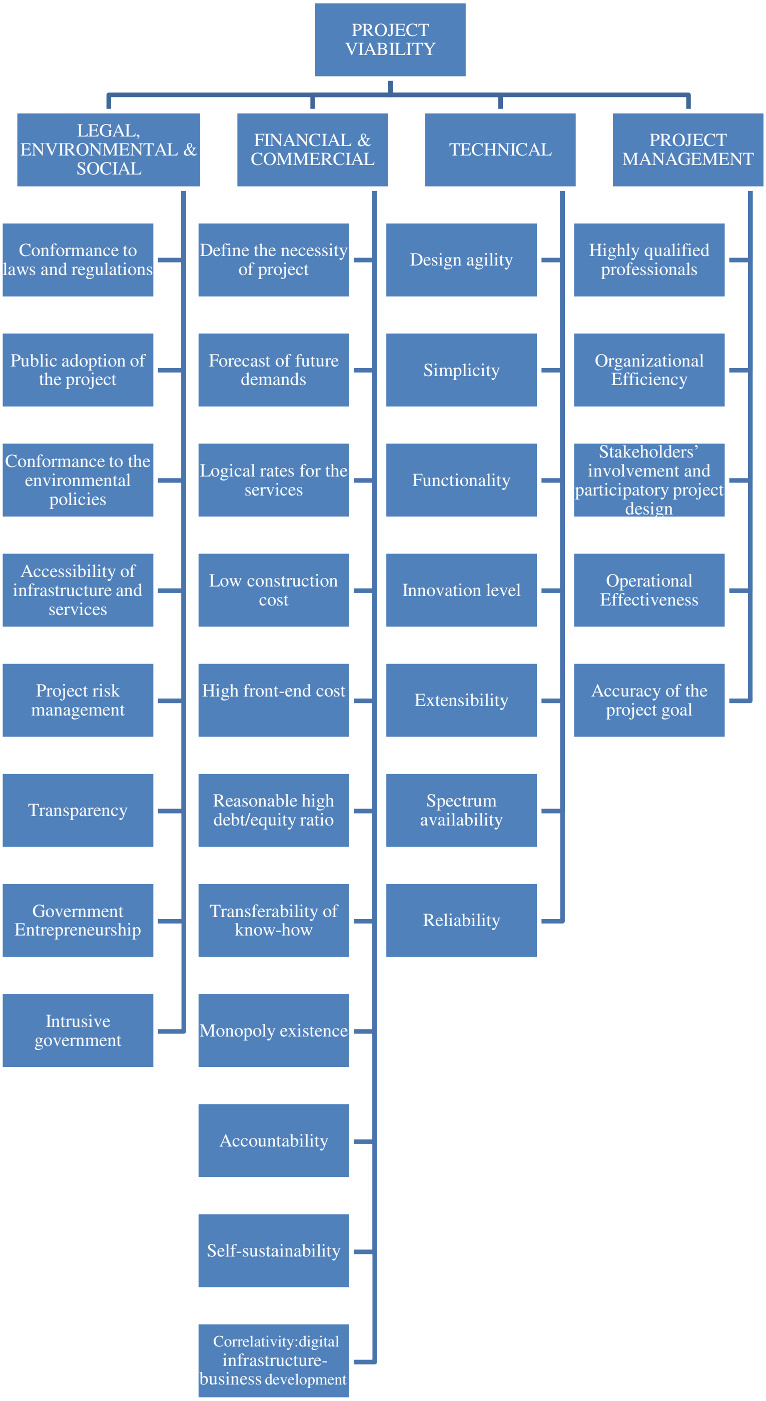

Fig. 6.5 The proposed viability model for digital city

project's success; (b) to specify the qualitative factors influencing digital city projects; (c) to incorporate new factors that rise during project's development, via the testing of the viability indices and the prioritization of factors; and (d) gives the opportunity for adding further categories that evaluates project's viability. Our future thoughts, concern the further testing of the proposed viability model on digital city's project managers around the world, in order to provide with as secure as possible viability indices to recent and to future digital cities.

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