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Project and Portfolio Management Approaches in the Smart City: An

Empirical Investigation

Supervisors   **Candidate**

Prof. Alberto De Marco   Berkay Çalışır

Adriano Tanda

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ABSTRACT

Smart cities are among one of the trending subjects of the 21st century and discussed by high number of different parties around the world. In spite of all these discussions and studies on the subject, project management approaches of the smart city initiatives haven't been studied extensively and the gap in the literature glitters explicitly. This work has the overall objective of exploring the relationships between project management practices and how cities develop, implement, and manage their smart city efforts by focusing especially on two attributes; smart city organizational approaches of the cities and the project portfolio management preferences. Precise objectives of this research are to find out whether smart city projects initiated by local governments or by private organizations, to determine whether city offices involved in smart city initiatives organized as project management offices or not and to measure the level of maturity of project portfolio management in smart city offices. For achieving these objectives, a comprehensive survey was conducted to city governments and an empirical analysis was made. In the light of this analysis, best practices and approaches used by cities were tried to be identified and some suggestions have been made to the cities working on smart city projects. We believe, this work will enlighten the relationship between project management practices and smart city projects and will become a useful guide for the local governments dealing with smart city projects.

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1   INTRODUCTION

Smart Cities are one of the popular topics in 21st century and impact urban strategies of all types of towns regardless of size, population, country or continent. It is clear that smart city researches and initiatives will shape the future of urbanism and change the cities drastically. Undoubtedly, it will also change the way of living around the planet as we know it now and will impact on every single individuals' life.

Following this trend, a lot of cities around the world have already begun to work in this field and initiate their own projects to make their city smarter. The scope of these projects is quite diverse, targeting to obtain improvements in different type of domains which can be listed as natural resources and energy, transportation and mobility, buildings, living, government and economy and people.

Despite of all these initiations, our research indicated that most of the cities do not follow a mainstream project management methodology which has been studied and improved by academicians and industry professionals over the years. Addition to this, it is also interesting to see that there aren't any academic researches made on this subject explicitly.

Project and portfolio management are subjects that have been studied in detail and concepts that have already proved their usefulness. By 2019, most of the organizations around the world have established their own project management offices to manage their projects more smoothly, to use their resources more efficiently and to track their progress more precisely.

In the light of mentioned information, the general goal of this paper is to address the interactions between project management processes and how cities create, execute and handle their smart city initiatives by concentrating on two characteristics in particular; smart city organizational strategies and project portfolio management preferences. The research questions this paper tries to answer are the following:

1)   Do city administrations use bottom-up or top-down approach?

2) Are smart city offices or offices involved in smart city initiatives organized as PMOs?

3) Do city offices responsible for SC projects follow Portfolio Management Methodology?

After making a comprehensive research about how cities manage their projects and build their organizational strategies, an analysis was made. Last part of this paper contains the analysis made, deductions obtained from that analysis and answers obtained for the mentioned research questions. Additionally, it includes further advices and suggestions on the subject. It is believed that this research will illuminate the relationship between project management practices and smart city projects and will become a useful guide for the local governments dealing with smart city projects.

This research paper has been prepared by the collaboration of Berkay Çalışır and Mariano Amico. Distinction of the topics and chapters have been clarified further in the headings of the chapters.

2   LITERATURE REVIEW

2.1 Smart Cities (written by Berkay Çalışır)

2.1.1 Definition of the terms "Smart" and "City"

Smart cities are among one of the trending subjects in 21st century and discussed by high number of different parties around the world. Despite all this work, there is still not an agreement on its definition and scope. There are some different types of approaches towards the subject and it is hard to decide which approach has the strongest argument. Having said that, academicians and professional are trying to define it as best as they can. This section starts by trying to define the terms in the context.

To begin with, in the information and communication technology (ICT) framework, there isn't a consensus on what "smart" literally means (Cellary, 2013). While this term has now become popular, it is also widely used as a synonym for almost anything which is perceived modern and clever (Anthopoulos, 2017). Smart has many synonyms in solely definitional terms, including percipient, clever, shrewd and fast (Gil-Garcia et al., 2014). In addition, according to Meijer and Bolivar (2016), when connected to devices, smart is synonymous with efficient. Anthopoulos (2017) states:

> "The following concise vision of smartness can be considered to be quite broad: A servant surrounded by servants, which may be a configuration of both humans and devices, from both public and private sectors. While the word "servant" evokes images from aristocracy to slavery in the evolving smart ecosystems, a person or system will be surrounded by or embedded within "servant systems", which are the smart systems." (pg. 5)

Furthermore, the term smart addresses to concepts and people that offer clever insights but was more freshly embarked on urban planning by means of the cliché smart growth (Batty et al., 2012). Growth can be seen as urban expansion, population growth or domestic economic

upgrading, while smart growth means achieving greater urban efficiency by coordinating the forces leading to growth: transportation, land speculation, conservation and economic development (Batty et al., 2012).

Another subject that has to be discussed is cities. They can be considered as the core of the human civilization since the destiny of humanity had changed when our ancestors settled down and created first primeval villages. Today, urban areas generate 70% of global GDP (De la Peña, 2013) and maintain to be home of more than 55% of the world's population (UN Department of Economic and Social Affairs, 2018). According to United Nations (2018), forecasts present that 68% of the world's population will be living in urban centers by 2050. Doubtlessly, urbanization is and will definitely be the 21st century's trend and impact people's lives more than ever. Under these circumstances, cities will be analyzed from head to toe before moving into smart city subject.

Correspondingly, like the definition of smart, defining what is called city is not an easy task since it conceptualizes regarding to citizens' perceptions. According to the United Nations (2005), a city is considered an urban area which typically starts with a population density of 1500 people per square mile but it varies across countries. Depending on their agglomeration, cities range from localities or villages (e.g., Greenland and Iceland) of 200–1,000 inhabitants; to communities (or communes) of 1,000–2,500 inhabitants (e.g., Africa), to towns or places (e.g., Canada) or cantons of more than 400 (e.g., Albania) and less than 10,000 inhabitants (e.g., Greece); to towns of more than 10,000 and 1.5 million inhabitants (e.g., Greece); and megacities with a population that exceeds 1.5 million people (Anthopoulos, 2017). Some cities are also referred as global or international due to their impact that attracts residents beyond the country or even worldwide.

Moreover, European Commission and Organization for Economic Co-operation and Development (OECD) has its own classification system which defines type of cities in a clearer

way by using their population. The classification system has six different categories: small (50,000-100,000), medium (100,000-250,000), large (250,000-500,000), extra-large (500,000-1,000,000), extra extra large (1,000,000-5,000,000) and global cities (more than 5,000,000) (Dijkstra & Poelman, 2012). It can be deducted from the mentioned information that a city is an urban area with at least 50,000 inhabitants. Note that both classifications have a same approach towards so called global or international cities.

Furthermore, International Standards Organization (ISO) published a definition of a city either. According to ISO (2014a, 2014b), "city is an urban community falling under a specific administrative boundary" which indicates that for to call an urban area a "city", there has to be a unified governance activity. Community "is a group of people with an arrangement of responsibilities, activities and relationships" (ISO, 2016). Therefore, "a city is a system of systems with a unique history and set in a specific environmental and societal context. In order for it to flourish, all the key city actors need to work together, utilizing all of their resources, to overcome the challenges and grasp the opportunities that the city faces" (ISO, 2014b).

After mentioning all these different definitions of cities, other aspects of classification have to be analyzed accordingly. Another classification that can be made is to divide cities as existing and new according to their level of urban development phase. (Angelidou, 2014). Despite the fact that most well know cities are already existing ones, some countries started to build new cities for to implement smart technologies from head to toe for to satisfy strategic or economic needs. Songdo International Business District (South Korea), Tianjin (China), Cyberport Hong Kong (China), PlanIT Valley (Portugal), Masdar City (Abu Dhabi-UAE), Skolkovo Innovation Center (Russia), Aspern (Vienna) and Cyberjaya (Malaysia) can be given as an example for cities that are either from scratch or new zones of the existing cities.

Cities are designed and developed as complex adaptive structures consisting of physical or social components (Desouza & Flanery, 2013). Physical components relate to physical

resources and processes within the boundaries of a city or with which the city interacts. Social components reflect the human members permanently residing in a city or those flowing in and/or interacting with a city. A city can be conceptualized as a vast platform, which brings these components in an organized fashion, according to this approach.

The components mentioned above can also be termed as hard and soft facilities (Angelidou 2014; Neirotti et al. 2014). Hard deals with all types of tangible facilities such as streets, buildings, bridges etc. except natural habitat. On the other hand, soft deals with intangible facilities such as people, knowledge, wealth, organizations etc.

As it's mentioned before, urbanization tends to increase in the following years and will create an imbalance of population between rural and urban areas. This relatively new imbalance is expected to create new challenges for cities, local and central governments and citizens. There is no doubt that well-functioning infrastructures for urban areas are a prerequisite for accommodating this scale of urbanization, ensuring efficient and effective urban processes (Breuer, Walravens, and Ballon, 2014). As a result, investments in urban infrastructure are likely to persist and increase (United Nations Human Settlements Programme, 2012).

To sum up, there are different type of definitions for both "smart" and "city" which authorities couldn't have agreed on. After going through all these definitions and information, smart cities can be understood better.

2.1.2 What is a smart city?

This section is dedicated to describe definition of a smart city and it's features by making a comprehensive literature review. Despite it is an area studied substantially by authorities, lack of an agreed definition glitters clearly. Hence, analyzing different views and definitions will help to improvise the argument of this thesis and will allow readers to absorb provided information effortlessly. Section starts with giving some information about the history of the

term "smart city" and history of the academic researches made about it. Later it goes on with the alternative definitions which were made through the history.

To begin with, label of smart city has been dispersing in the last few years throughout the globe affecting strategies of every type of city regardless of their size. Recently, the notion of smart city was introduced as an approach to include modern urban production elements in a common structure and, specifically, to emphasize the importance of information and communication technologies (ICTs) to improve a city's competitive profile (Caragliu, Del Bo, and Nijkamp, 2011). In order to confront the increasing problems of urban centers, local governments, businesses, non-profit organizations and even the citizens grasped the idea of a smarter city which might allow them to use more technologies, form better living conditions and protect the environment.

Nonetheless, idea of having a smarter city has deeper roots which goes back to almost 30 years back from now. Various telecommunication investments made in Singapore has mentioned in a paper dated back to 1993 and importance of the role of information in production and distribution systems has discussed naming Singapore as an "intelligent city" (Heng & Low, 1993). According to Dameri and Cocchia (2013), a large literature survey of scientific papers on both smart cities and digital cities shows that these topics were studied 20 years ago.

Table 1 shows the number of papers selected by Google Scholar over the last twenty years on smart cities and digital cities (Dameri & Cocchia, 2013). As it can be seen from the table, first research about this subject has been made in 1994 and no researches have been made again until 1997. After 1997, number of researches that were made increased continuously until 2010 except a few years such as 2003 and 2006. Following 2010, number of papers regarding to smart cities and digital cities started to increase exponentially.
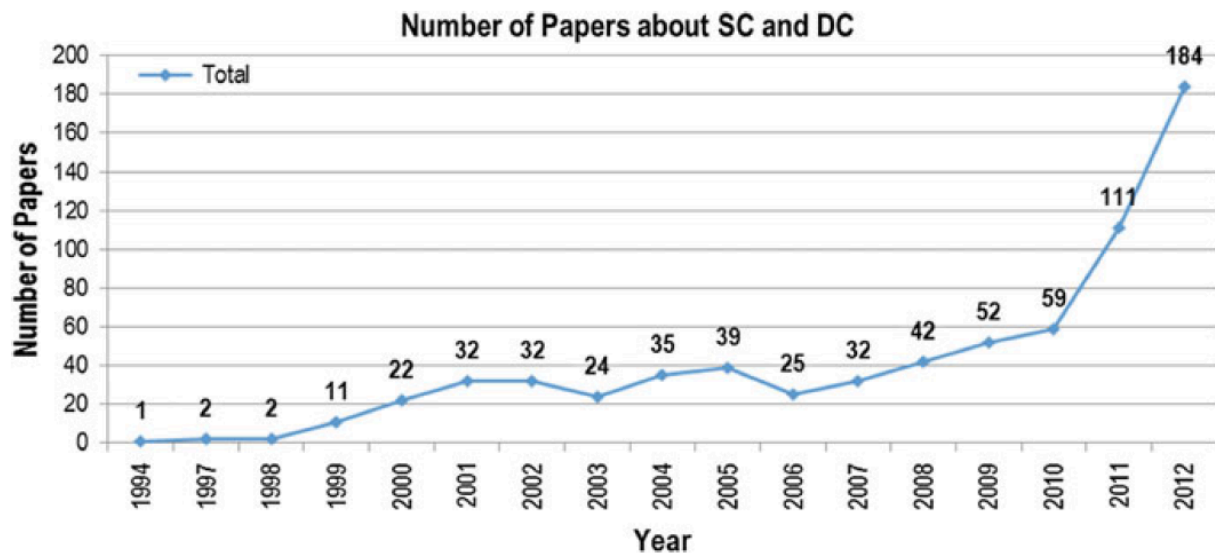
Table 1 shows the annual number of papers written about smart cities and digital cities

from 1994 to 2012 *(Dameri & Cocchia, 2013)*

Therefore, the concept of a town being able to be smart and digital, i.e. to use technology

and particularly ICT to enhance the quality of life in metropolitan space, is quite ancient, but

the attention to this subject only has a glimpse in recent years. There are several explanations

that might be the reason of this increased interest which can be listed as the greater diffusion

of mobile devices and internet among people, the increase in population of cities, the

requirement to protect the environment from pollution and the need for clean energy resources

and consumption.

After discussing the history of smart city researches briefly, let's move on to definition of

the smart city. It would be normal for someone to consider that definition of the smart city

comes from the combination of the definitions made in the previous section: an urban space

that is surrounded by or embedded in "smart systems" or a city with ideas and people that

provide clever vision (Anthopoulos, 2017). Smart systems cannot be restricted to ICT-based

systems. Intelligence can also refer to visionary design or innovative systems and so on. In this

regard, the "smartness" of a city describes its ability to bring together all its resources, to

effectively and seamlessly achieve the goals and fulfil the purposes it has set itself. (ISO 2014b). However, if someone is searching for a clear definition of smart city, they will fail to find one and instead collect many options that create an unclear significance.

Most of the researchers that worked in the smart city subject after its first appearance in early 1990s, made different definitions for it. For example, smart city defined as metropolitan-wide information and communications technology (ICT) based environments. (Anthopoulos and Fitsilis 2014; Albino and Dangelico 2015; Chourabi et al. 2012; Gil-Garcia et al. 2014, 2016; Meijer and Bolivar 2016). According to Chourabi et al. (2012), smart city is various ICT adjectives that describe a city. Neirotti et al. (2014) defined smart city as smart energy consumption, transportation and other hard asset management. Giffinger et al. (2007) stated that smart city is the "smartness footprint" of a city, which is measured with capacity indexes (people, economy, living, environment, mobility and governance). Komninos (2002) defined smart city as large-scale living labs for innovation testing. According to Meijer and Bolivar (2016), smart city is the ability of a city to attract human capital and to mobilize this human capital in collaborations between the various (organized and individual) actors through the use of ICT. Moreover, Gil-Garcia et al. (2014, 2015) expressed that smart city is the political jurisdiction (e.g., a city, a town, a nation) where a smart government applies emerging technologies and innovation. Additionally, Gil-Garcia et al. (2016) also stated that smart cities are cities that undertake actions towards innovation in management, technology, and policy, all of which entail risks and opportunities. According to Anthopoulos and Reddick (2015), smart cities are innovative solutions—not limited to but mainly based on the ICT— that improve urban everyday life and enhance local sustainability in terms of people, governance, economy, mobility, environment and living. Furthermore, Ishida (2017) stated differences between smart and digital cities as digital cities exploit the cyberspace while the smart cities the physical space. In addition, Cocchia (2014) summarizes different definitions

and discovers shared characteristics that characterize smart cities related to the role of innovation and technology; environmental needs; and social development.

Apart from the above, the FP7-ICT and CIP ICT-PSP programs of the European Commission describe smart city as a "user-driven open innovation environment" where city is identified as a platform to improve citizens' commitment and willingness to co-create (Schaffers et al. 2011). "Openness" is designed to apply different types of interactions between individuals, services, technology and infrastructure (Lee et al., 2014). Open public services promote the coordination of collaborative "living-playing-working" operations for people, while open-service business models operate in accordance with open industry norms in terms of technology and infrastructure (Lee et al., 2014). Open innovation systems encourage high-quality social interactions (e.g. within communities) that improve citizen participation and participatory decision-making (Anthopoulos, 2017).

Finally, it is essential to note how smart cities are defined by standardization bodies, at least by global ones. The International Telecommunications Union (ITU) (2014) underlines ICT and states:

"A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects." (pg. 1)

Moreover, according to the International Standards Organization (ISO) (2014b), smart city is "a new concept and a new model, which applies the new generation of information technologies, such as the internet of things, cloud computing, big data and space/geographical information integration, to facilitate the planning, construction, management and smart services of cities." (pg. 6) Furthermore, it defines the objective of a smart city is to pursue

"convenience of the public services, delicacy of city management, liveability of living environment, smartness of infrastructures and long-term effectiveness of network security." (pg. 6) Additionally, British Standards Institute (2014) defined smart city as "effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens." (pg. 4) Lastly, Anthopoulos (2017) tried to make a definition which covers most of the mentioned definitions like an umbrella by stating it as:

"the utilization of ICT and innovation by cities (new, existing or districts), as a means to sustain in economic, social and environmental terms and to address several challenges dealing with six (6) dimensions (people, economy, governance, mobility, environment and living)." (pg. 8)

To sum up, as it can be seen, most of the researchers and standardization bodies have their own approach of defining the term "smart city". Even though this seems as a drawback, it gives a chance for organizations and professionals to be more flexible in their smart city initiatives and projects since these definitions cover a broad range of aspects.

2.1.3 Top-down & Bottom-up Organizational Approaches

Top-down and bottom-up are both information processing and knowledge ordering techniques that are used in a multitude of areas, including software, humanistic and scientific theories, and governance and organization. They can be seen in action as a thinking, teaching, or leadership style ("Top-down and bottom-up design", 2019).
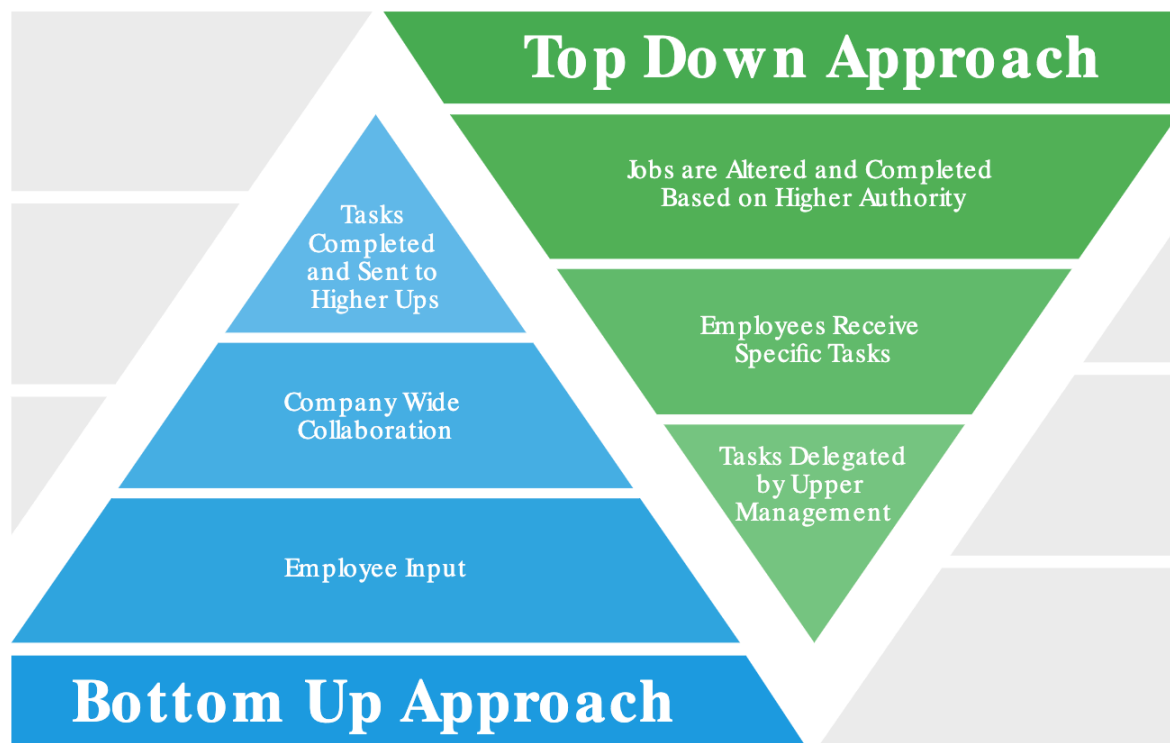
Figure 1 shows organizational approaches *("Top-Down vs. Bottom-Up Approach",2019)*

According to Wikipedia (2019), a top-down approach (also known as step-by-step design and in some instances used as a synonym for decomposition) is fundamentally breaking down a scheme to gain insight into its architectural sub-systems in a reverse engineering manner. A top-down approach provides an overview of the scheme, indicating any first-level subsystems, but not detailing them. Then each subsystem is further refined, sometimes at many additional subsystem levels, until the entire specification is diminished to basic elements. With the help of "black boxes," a top-down model is often defined, making it simpler to manipulate. Nevertheless, black boxes may fail to illustrate basic mechanisms or be sufficiently detailed to validate the model realistically. The top down approach begins with the big picture. It breaks down into smaller sections from there ("Top-down and bottom-up design", 2019).

Furthermore, according to Smartsheet (2019), the top-down strategy, also known as autocratic leadership, is a method of management guided by the upper executive level of a

company. Senior project executives generate choices that trickle down to lower level departments throughout the company. The choices are weighed first on factors such as frequency and severity, and then made on the basis of such variables ' greater or lower concentrations. Upper management gathers the knowledge that employees perform and acts on it ("Top-Down vs. Bottom-Up Approach", 2019).

Additionally, this sort of strategy is based on a hierarchy of high-level versus low-level employees where high-level people depend on it to decide duties and objectives, and low-level staff to finish duties and attain objectives. This organized leadership programming leads to well-defined employee and department subsystems. Often referred to as a step-by-step design or decomposition, in order to obtain intuition into the lower elements that make up a bigger system, a system and its objectives are broken down into compositional subsystems. With the help of black boxes, this format is produced more explicit, making the reverse-looking strategy simpler to follow as choices are pushed down by top management. There is a separate division of job in separate departments between staff. This task assignment is sometimes referred to as reverse engineering or a large image perspective because of the fragmentation of bigger objectives into tiny assignments that are then passed down to the lower-level staff. ("Top-Down vs. Bottom-Up Approach", 2019). Even though this description made for the organizations, the same logic applies to the city organizational structures.

According to Smartsheet (2019), the advantages of top-down approach can be listed as decreased risk, strong management, good organization and minimized costs. It decreases the risks since the top management can be considered as the most informed and knowledgeable professionals within the organization and non-involvement of the inexperienced individuals is less risky. Secondly, with choices generated and implemented at the greatest ranks of a business, the upper officials in a company will be able to establish best practices and achieve objectives more easily. If instant modifications are required, a top-down change (also known

as an executive-driven change) may come into play to address any issues within an organization, bypassing a slower decision-making process involving lower-level staff which is the advantage of having a strong management. Thirdly, good organization can be considered as an advantage since activities are decided and filtered down company lines without controversy as business objectives are set by the top leadership and are not influenced by external views. Lastly, top down approach minimizes costs since lower level employees are free to complete their own tasks unique to their role in the company and aren't saddled with the responsibility of setting company-wide goals.

According to Wikipedia (2019), a bottom-up strategy is to assemble systems to create more complex systems which makes original systems part of the emergent system as sub-systems. Bottom-up processing is a type of processing of information relying on incoming data to create a perception from the setting. The system's individual base components are first defined in excellent detail in a bottom-up strategy. These components are then connected together to create bigger subsystems, which are then connected in turn, sometimes at many stages, until a full system at the top level is created. This approach often resembles a model of "seed," whereby the beginnings are insignificant but ultimately develop in intricacy and completeness. "Organic approaches," however, may lead in a tangle of components and subsystems being created in isolation and subject to local optimization rather than meeting a worldwide objective. ("Top-down and bottom-up design", 2019).

Furthermore, according to Smartsheet (2019), "the inclusive nature of the bottom-up approach benefits project management." Transparent cooperation and mutual solutions among all staff guarantee that projects stay fluid and objectives are accomplished in a timely manner. As unexpected incidents occur during projects, objectives are moved through the open communication line between business managers and lower-ranking staff. Bottom-up

collaboration provides companies the transparency they need to keep effective practices ("Top-Down vs. Bottom-Up Approach", 2019).

Moreover, advantages of having a bottom-up approach is listed as increased communication between the parties, built morale, shared solutions and increased collaboration in Smartsheet (2019). Firstly, when each employee actively participates in the decision-making process, there will be a significant increase in overall communication among organization members. Secondly, all business group members will feel inclusive and appreciated, fostering a supportive and communicative atmosphere in which staff can develop and flourish together. Thirdly, a broad heart of mental energy enters the company's issues as they emerge, resulting in faster problem solving and more effective alternatives. Lastly, staff at all levels have the chance to discuss issues, bounce thoughts off each other, and create confidence across business units.

To go on with, some types of top-down views have been strongly criticized with the primary argument that they are dictated by business interests and involve control and privacy issues. The Smart City "control room" strategy, which seeks to monitor all elements of city life, could quickly lead in information collection being ubiquitous, presenting a "set of potentials that are disturbingly in line with the practice of authoritarianism" (Greenfield, 2012). Too much surveillance and too many embedded systems and infrastructures, whether regulated by private organizations or governing bodies, can present real threats to liberty and privacy (Breuer et al., 2014). Additionally, Breuer et al. (2014) states that:

"However, the shortcomings of a top-down Smart City might go further. What has also been referred to as a "city-building industry" (Joroff, 2008) or as the outcomes to "assembly-line cities" (Koolhaas, 2011) might not only hamper the innovation potential inherent to cities, but in some cases even have detrimental effects: "More damningly still, the big technology companies are selling 'smart city in a box' solutions to cities, walled

gardens that prevent scalable local business innovation." (Hemment & Townsend, 2013,

p. 8)"

Then, as evaluated above, the organizational approach to the Smart City becomes

ambiguous. On the one side, top suppliers of technology have resources and expertise that the

public sector needs to depend on while facing urban difficulties. In addition, business

opportunities in this framework are too immense to avoid for companies with ambitious

business goals. On the other hand, cities are for citizens, for the people who live and use them;

in terms of who they are built for, but also in terms of innovation potential and finding suitable

alternatives (Breuer et al. 2014).

Breuer et al. (2014) expresses that, according to bottom-up approach, change and

enhancement only comes from the people lives in the city. It rejects any type of top-down

urbanization, especially involving strong private firms. The Smart City bottom-up is primarily

about the Smart Citizen; those who reside, work, and participate in all sorts of city operations.

Such a perspective of the Smart City requires a decidedly distributed approach rather than

working towards centralization, promoting and embracing some type of chaos. Lindsay (2011)

states this as follows:

"The bias lurking behind every large-scale smart city is a belief that bottom-up complexity

can be bottled and put to use for top-down ends — that a central agency, with the right

computer program, could one day manage and even dictate the complex needs of an actual

city. The smartest cities are the ones that embrace openness, randomness and serendipity

— everything that makes a city great"

While these features have a beneficial effect on the local level, decision-makers, urban

planners and the globalized economy's dynamics sometimes conflict with goals. Chaotic

procedures from the bottom up reject the concept of a master plan, an ' optimal ' state of

position. Hence, Smart City's top-down approach (in reality, to urbanism in particular) often

aims to regulate rather than find methods to allow and use this default mode. Because the city is a system of processes that individuals put together to bring it to life, it is complicated and can only be vibrant and flexible. The solution to the urban challenges of the future, a real Smart City, is therefore more than just technological, networked and smart: it's about people (Breuer et al., 2014).

Therefore, Breuer et al. (2014) states "This means looking at the Smart City as a meeting place where the public sector, private interest and citizens can come together to generate new value, to collaborate and innovate together." (pg. 158). Smart Cities can only succeed if they act as platforms for local innovation bringing together all stakeholders concerned. Nevertheless, according to Shepard and Simeti (2013), no one has so far found a way to intelligently bring together the big technology platforms offered by global corporations, with local technology projects and the interests of citizens. O'Reilly (2011) accepts and conceptualizes such approaches, describing how technology can play a part in bridging public, private and citizen interests; presents government thoughts as a platform and "government 2.0". Lastly, Breuer et al. (2014) expresses that for their platform approach to the Smart City, the notion of open innovation can be extremely important and it's about public-private-people partnerships, i.e. structured cooperation among all stakeholders concerned (governments, companies, users / citizens, etc.).

Regarding to all those aspects, it can be seen that a chance should be given to the bottom-up approach. In the next sections of this research paper, the cities implemented the bottom-up approach will be discussed and analyzed further.

As a conclusion, it can be recognized that the current level of researches made in this field are not sufficient enough for to make definite deductions. One of the purposes of this paper is to fill that literature gap and present more precise guidelines by providing an empirical study.

2.2 Project Management Offices (written by Berkay Çalışır)

This section contains the basic information of project management offices such as history and description of it. Additionally, it provides necessary information found from the literature regarding to project management offices, especially focuses on the role of project management offices in public projects.

The roots of the PMO are connected to the execution of the scientific management method, initially presented by Frederick Taylor approximately a century ago, and the increase within the number and complexity of projects overseen by single organizations. Within the 1930s, a project office function developed by U.S. Air Corps and it might be the first recorded use of the project office expression (Crawford & Cabanis-Brewin, 2011). The structures that form the basis of the traditional PMO can be traced back to the growth of complicated missile systems by the U.S. military in the 1950s. Each weapon system consisted of several sub-projects in system program offices (SPOs) grouped together and not only whole project systems (e.g. missiles) were commanded, but also its warhead, launcher and training and logistics support (Giraudo & Monaldi, 2015). The main advantages of this project office were centralizing financing into job packages rather than distinct parts, improving budget projections, facilitating a conventional phased scheduling strategy, and identifying non-strategic measures prior to the distribution of funds.

The project office idea was exported to manufacturing, IT, and other industries during the 1980s, thanks in part to computer technology boosting. Giraudo and Monaldi (2015) states:

"Project management diffusion gained a lot of momentum in the 1990s, with professional associations and project management certifications becoming recognized industry standards; the UK's Office of Government Commerce Projects In Controlled Environment 2 (PRINCE2) diffusing outside the IT sector, and associations such as the Project

Management Institute (PMI), and the International Project Management Association

(IPMA) gaining prominence with associates and practitioners."

Organizations began searching for more effective ways of managing their enhanced

number of projects and resulting compromised efficiency (e.g., delays, cost overruns, and

falling short of quality and requirements) and questioning whether their projects should be

operated in solitude or managed in a coordinated manner to enhance the use of resources and

prevent disputes between projects. A main factor in the diffusion of contemporary PMOs was

this need for a coordinated and standardized strategy for managing projects within the entity.

As the idea of PMO was implemented worldwide, various "PMO flavors" began to

burgeon. Because of the scope of contexts, using a single, easy acronym for various reasons

has become increasingly confusing and improper. Therefore, it is essential to explain what a

PMO is, what it should do, and where it should be located within an organization.

The definition of PMO may differ in name and function in distinct organizations, but it is

fundamentally an organizational structure that centralizes, coordinates, and supervises the

project and program management (Giraudo & Monaldi, 2015). According to A Guide to the

Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, the PMO is an

institutional structure that standardizes project-related leadership procedures and promotes the

sharing of resources, methodologies, instruments and methods. A PMO's obligations vary from

offering project management assistance to managing one or more projects directly (PMI, 2013,

p. 10).

PMO, acting directly on project management activities, helps entities to innovate, achieve

long-term competitive advantage and growth, ceteris paribus, and tries to reduce ambiguity

(Pansini, Terzieva & Morabito, 2014). As government administration institutions' demands rise

and projects become more complicated, a PMO can be a useful solution to ensure resource

efficiency (Santos & Varajão, 2015).

Project management handles the complex process of managing multiple coupling agencies and companies. Governance has traditionally to function in compliance with legislation, financial means, and information (Bemelmans-Videc et al., 1998). There are two parallel subsystems in the management of domestic public investment projects: political; and administrative (Santos & Varajão, 2015). Public projects have become highly complicated and hard to handle, long-lasting and multi-agency (Klakegg, Williams & Shiferaw, 2015).

Public projects always cope with numerous stakeholders whose views can have a major impact on the project (Jałocha et al., 2014). These projects are generally commissioned by governments and supplied by private companies (Clegg et al., 2002). Because of their significant effect on the society, the environment and budgets, many of these projects generate public attention. Thus, globally, public sector organizations are under pressure to improve efficiency while providing enhanced and integrated services, innovations that increase the economic value of organizations of the highest value (Lourenço, Santos-Pereira, Rijo & Cruz-Correia, 2014). Lack of PM systematization in public projects, intra-ministerial PM organization problems, absence of inter-ministerial PM systematization, and absence of PM culture can all result in resource waste. In this context, shared services can play an important role (Santos & Varajão, 2015). Figure 2 demonstrates a typical government administration shared service framework. According to Santos and Varajão (2015), "the existence of this type of structure makes easy to emerge Project Management (PM) innovative solutions." (pg.1194).
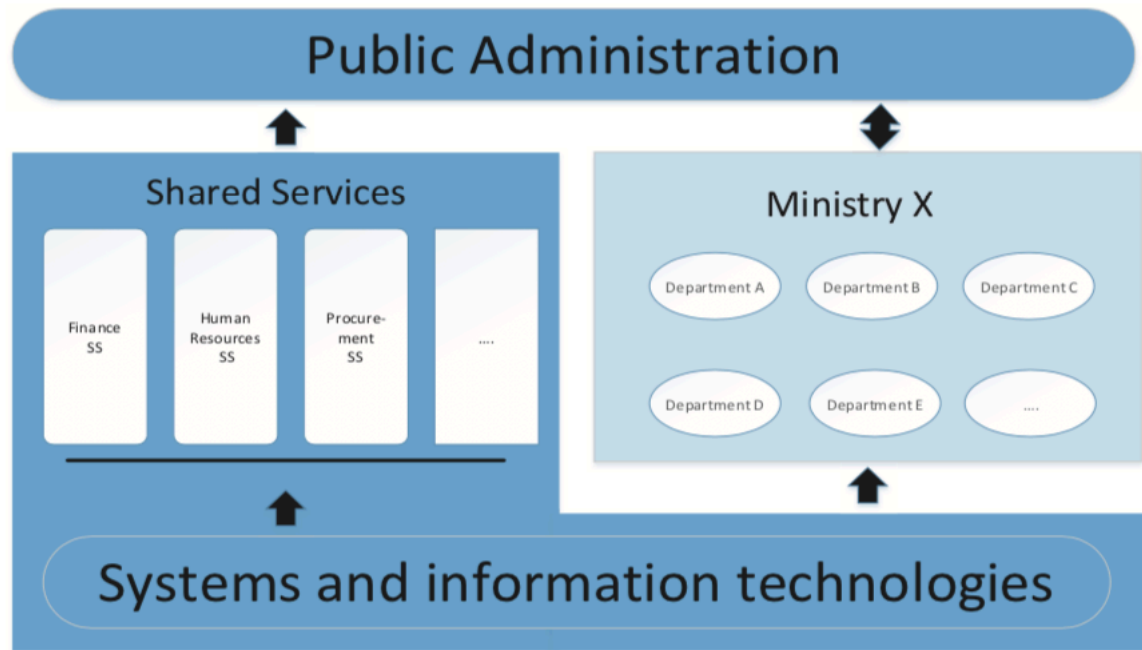
Figure 2 shows the typical structure of share services in public administration *(Santos &*

Varajão, 2015)

There is therefore a need to find creative Project Management (PM) alternatives. Santos

and Varajão (2015) states that "the implementation of PMO strategies can be a promising way."

(pg. 1194). PMO is linked to the growing amount and complexity of projects and the need to

acquire skills. Santos and Varajão (2015) proposes the following scenario for to overcome

these problems: "a "PMO" local implementation at the ministry level together with a PMO

implementation at the shared services level." (pg. 1196). This scenario would enable better use

of intra- and inter-ministerial resources, improve the ministry's capacity for project execution,

facilitate the "bridge" between shared services and ministries with a global project vision, and

facilitate the deployment of a PM culture (Santos & Varajão, 2015). The sketch of the proposed

scenario can be seen below in Figure 3.

Figure 3 shows PMO local implementation at the ministry level together with the

implementation at the shared services level *(Santos & Varajão, 2015)*
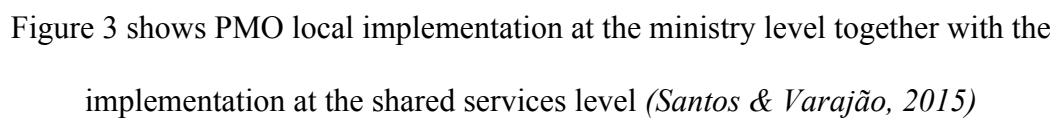
To sum up, literature shows that project management offices would be extremely useful

for public projects in terms of increasing efficiency and gaining success. Scenario proposed by

Santos and Varajão (2015) seems like a promising alternative and should be considered by

public authorities.

2.3 Project Portfolio Management (written by Mariano Amico)

A portfolio is a collection of projects, programs, other portfolios, and operations that are handled as a group in order to reach strategic goals. Each component of the portfolio can be quantified, meaning for instance it can be assessed, categorized, evaluated. The portfolio components may be related or unrelated, independent or interdependent, and may have related or unrelated objectives.
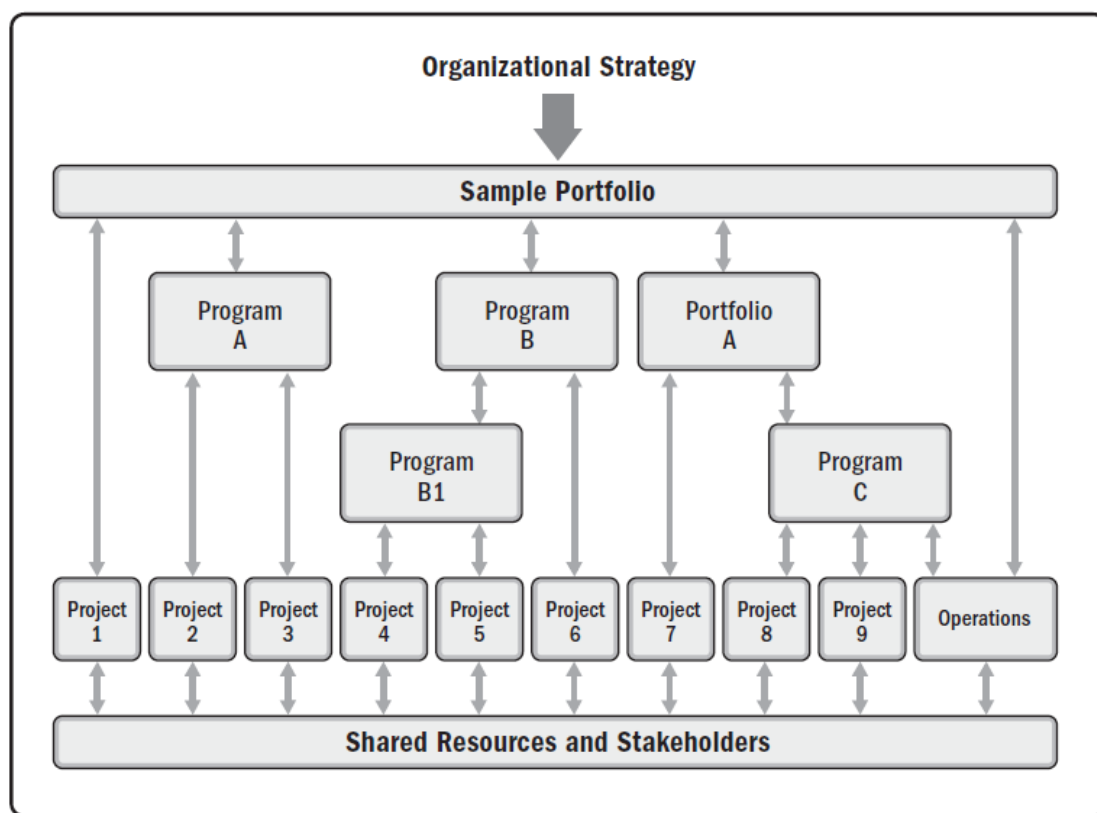
Figure 4 shows the relationship between Portfolios, Programs and Projects *(The standard for portfolio management, 2017)*

Portfolio management is the centralized management of one or more portfolios. The main activities undertaken by an organization by adopting a Portfolio Management approach are: identification, categorization, monitoring, evaluation, integration, selection, prioritization,

optimization, balancing, authorization, transitioning, control and termination of the portfolio

components. This organized approach is followed with the intent of achieving the company's

strategic goals, as stated by PMI: "Portfolio, program, and project management should be

aligned with the organizational strategy and contributing together to the achievement and

implementation of strategic objectives".

The ultimate goal of linking portfolio management with organizational strategy and

strategic business execution is to establish a balanced, realistic plan that will help the

organization achieve its goals. The impact of the portfolio management plan upon strategy is

attained through six performance management domains or processes, that represent the

collection of good practices.
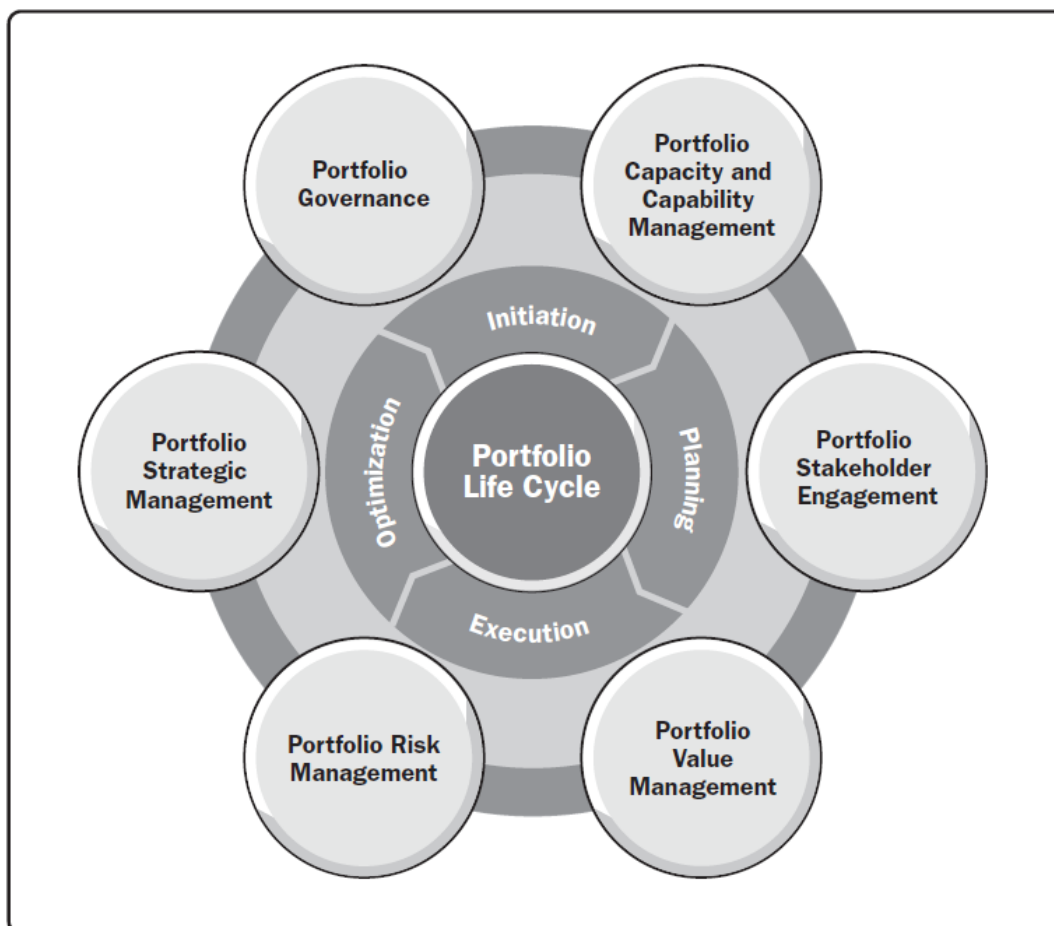
Figure 5 shows the Portfolio Management domains during the Portfolio Life Cycle *(The*

standard for portfolio management, 2017)

Portfolio managers have the responsibility for the establishment and implementation of portfolio management by managing the daily operations of its main processes.

A portfolio's continuous life cycle consists of several stages: initiation, planning, execution, and optimization. All stages within the portfolio are adaptable and flexible, as the portfolio can be changed and updated to adapt to internal and external factors that affect management decisions.

- The initiation sets the approach and principles for major processes that define how the portfolio and its components will be managed throughout the life cycle.

- During the planning stage the portfolio plan is developed and agreements are reached. They regard management and scope of portfolio components, budgeting to execute them and prioritization, identification of risks, requirement of resource and other minor goals. A first optimization of the portfolio is done by revisiting the portfolio business model to ensure it is aligned with business and organizational strategic objectives.

- During the execution phase the manager makes sure that some important goals are achieved, such as delivery of all components, effective management and solution of risks and issues within and across portfolio, monitoring and control of benefits realization.

- Optimization is the process of making a portfolio as effective as possible by maximizing available conditions, constraints, and resources. The manager ensures that the organization realizes the intended benefits.

2.3.1 Portfolio Strategic Management

Portfolio Strategic Management is the management of intended and emergent initiatives that are often identified at an executive level and provide the basis under which portfolio management is executed.

Portfolio Strategic Management is characterized by two fundamental activities: while at the executive level focuses on the continual monitoring of strategy and investment decisions, the practice should provide feedback on the impact and feasibility of such strategic decisions, with the consequent outcomes.

In strategic management, the portfolio manager needs to maintain a long-term vision in order to execute the best practices of decision making, risk and value management. Strategic management plays an important role in providing feedback to all stakeholders on the effectiveness of the organization's strategies and the feasibility of its strategic goals.

An organization's portfolios should cover 100% of the organization's strategic goals: this means that any taken initiative that doesn't aim to a specific strategic objective has to be terminated. A strategic objective must state the goal to be achieved and the approach adopted to achieve it, focusing on the benefits also offered to customers.

Two formal documents regarding the strategic management should be developed by the organization: the portfolio charter and the portfolio roadmap.

A portfolio charter is the document that formally authorizes the portfolio manager to apply resources to the portfolio components and should be present with every occurrence of formal portfolio strategic planning.

The portfolio roadmap is a high-level document, usually having a graphical representation, that details how the portfolio and its relevant components are matched to the strategic goals of the organization. The roadmap should be updated at least in every portfolio re-optimization and when major changes are made to the portfolio.
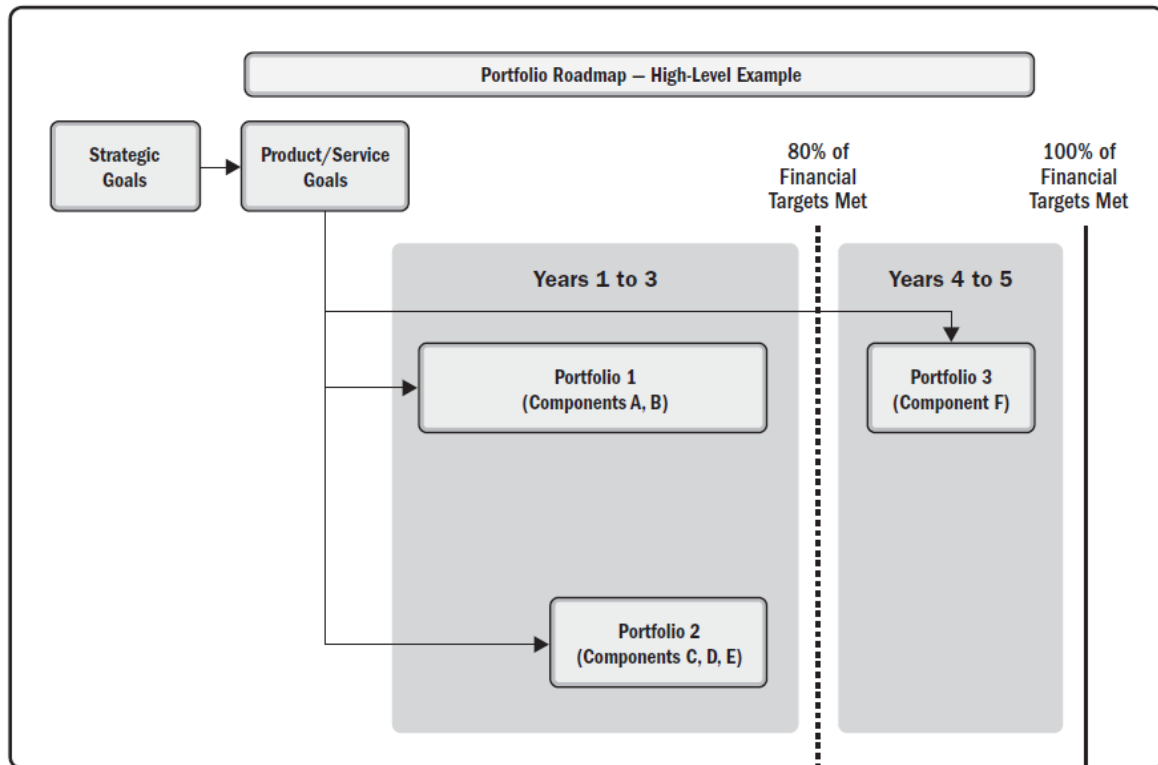
Figure 6 shows the structure of a Portfolio Roadmap *(The standard for portfolio management, 2017)*

2.3.2 Portfolio Governance

Portfolio Governance is a set of practices, functions, and processes within a framework based on a set of principles that are the fundamental norms, rules, or values that guide portfolio management activities in order to optimize investments and meet organizational strategic and operational goals.

The governance domain is composed of four governance functions that represent the processes and activities that may be repeated throughout the portfolio and its components: decision making, oversight, control, and integration.

Since the Portfolio Management works within the limitations set by the governance framework with the overall aim of achieving the organizational objectives, Portfolio

governance design will have a significant influence on whether the portfolio can consistently meet its goals throughout its life cycle.

Portfolio managers may be assigned responsibility and accountability for effectively managing the portfolio in pursuit of organizational goals as authorized by the portfolio governance board. When doing so, a portfolio manager assumes a responsible role for the governance practices within the governance domain.

2.3.3 Portfolio Capacity and Capability Management

The objective of Portfolio Capacity and Capability Management is to determine the optimal balance between what the organization can do now, or its capacity, and what the organization can potentially do, or its capability.

Portfolio Capacity and Capability Management focuses on the human, financial, asset, and intellectual capital resources an organization uses to execute portfolio components.

Capacity management addresses the overall resource demands of portfolios and their components. Capacity is the organization's ability to fulfil aggregate resource demands for successfully executing a planned portfolio of initiatives. It helps identify what resources and how many are needed, and when resources are required to support the portfolio, including ongoing optimization to maximize utilization and minimize conflicts.

Capacity management uses a comprehensive and integrated approach for resource management. It embraces four elements:

- Capacity planning provides the overall portfolio supply and demand profile. It helps defining the allocation of resources and the ranking criteria, prioritizing, and selecting profile components, and the in-process portfolio balancing and optimization.

- Supply and demand management includes portfolio components analysis and allocation of resources in order to balance supply and demand.

- Demand optimization concerns measurements and monitoring of resources for ongoing corrections during portfolio execution.

- Reporting and analytics aim to identify and capture data and associated analysis for trends and patterns to assist portfolio decision making.

A capability is the ability of an organization to execute an entire portfolio of initiatives for delivering goods and services. Capability creates competences that provide a competitive advantage in the marketplace and deliver a desired customer value proposition and the achievement of the organization's goals and objectives.

A capability assessment analyses strengths and weaknesses with respect to resources, thus aiding with the selection, funding, execution, and optimization of the portfolio. Strengths are capabilities that the organization possesses and has developed, which can be exploited and developed into a sustainable competitive advantage and targeted value proposition. Weaknesses are capabilities that are lacking or deficient and prevent the organization from developing a sustainable competitive advantage. An assessment can provide the organization with valuable information as:

- Gain an understanding of the current state of the organization;

- Identify gaps between the existing and desired capabilities of the organization;

- Learn what needs to be done and when to achieve organizational goals;

Organizations continue to assess and evaluate their environment to identify new capabilities to develop or sustain existing capabilities in line with business strategy and market conditions.

However, as stated by PMI "in complex systems, the sum of attributes may be less or greater than the whole, and this complex relationship is what makes balancing capacity and capability within the portfolio so difficult".

2.3.4 Portfolio Stakeholder Management

Portfolio stakeholders are the individuals, organizations, or groups that can affect or may be affected by a decision, activity, or outcome of a portfolio. The stakeholder list at the portfolio level is significantly different from the list at the portfolio component level, since Portfolio Stakeholder Engagement deals primarily with delivering strategies and allocating resources, whereas programs deal primarily with benefits management, and projects deal with delivering scope in terms of quality, time, and cost.

Stakeholder engagement includes practical implementation topics, such as working with portfolio stakeholders to maximize portfolio and organizational performance. A portfolio manager communicates frequently with stakeholders using modes and techniques appropriate for the context. The portfolio manager facilitates communications among stakeholders to negotiate agreements and make portfolio decisions.

Three main stakeholder groups can be identified as affected by the portfolio execution:

- Executive leaders and managers of an organization. These stakeholders need access to the resources of the organization to perform and achieve their given objectives.

- Internal or external organizations and individuals working for a portfolio component. These stakeholders have a strong personal interest connected to the funding and direction of the relative component.

- Internal or external users and customers of the portfolio components. These stakeholders have both implicitly and explicitly documented requirements connected with the portfolio components.

Because all processes and activities in portfolio management involve some sort of communication, it could be stated that stakeholder engagement synergizes with all the other performance management domains of this standard.

The key iterative steps of stakeholder engagement and communication are:

- Stakeholder identification and analysis, that consists in identifying and analyzing the

  stakeholders who operate at the strategic level and then setting plans for engagement.

- Stakeholder engagement planning, that focuses on outlining the portfolio management

  principles, processes, and activities to engage stakeholders.

2.3.5 Portfolio Value Management

Portfolio Value Management ensures that investment in a portfolio delivers the required

return as defined in the organizational strategy, which clarifies the stakeholder direction in

defining portfolio components such as projects and programs.

All portfolios are managed to enhance and maintain the value of the organization. In order for

value to be maximized, the organization should adhere to a set of principles to be successful at

the portfolio level such as ensuring that investments in portfolio components are aligned with

the organizational strategy and governance practices and balance the portfolio value against

overall risks.

To effectively manage value, the portfolio manager should:

- Negotiate expected value: the portfolio manager negotiates the expected value to be

  achieved by the portfolio against the required value in order to ensure that the

  immediate goals developed by the strategy do not place the organization at risk of

  significant underachievement.

- Maximize value: given that the required value has already been negotiated, the portfolio

  manager should aim to realize the value required from the portfolio at the lowest, safe

  economic cost. There is an organizational risk that the portfolio focuses too heavily on

  maximizing the return, and not on its true objective, which is to return value.

- Assure value: this purpose ensures that the portfolio can realize the negotiated required

  value, reflected in the plan for execution of the components of the portfolio. Value

assurance is concerned with ensuring that the results remain aligned with the requirements of the overall portfolio design.

- Realize value: ensure that the value required to be realized by the investment in the portfolio is achieved.

- Measure performance: As components, such as programs and projects, begin to deliver, it becomes possible to start making immediate measures of the benefits of those deliverables. The portfolio manager should report, on a continual basis, progress in realizing the benefit against the plan.

- Report value: Portfolio value reporting will provide information about the performance and forecasts of the portfolio.

2.3.6 Portfolio Risk Management

The portfolio risk management enables portfolio managers to allocate current capital and resources within the capacity constraints of the organization, considering organizational risks in order to obtain future benefits. Factors considered include overall risk appetite, frequency, severity and specific risk thresholds.

The primary objective of Portfolio Risk Management is to make sure that portfolio components will achieve the best possible success according to the organization's strategy and business model. This is done through the balancing of risks, either they are opportunities or threats.

- **Managing Risks**: The objective of balancing threat and opportunity is to maximize the potential to deliver optimum value to the organization in the short, medium, and long term. Portfolio risk management differs from project risk management because the goal of project risk management is to minimize threats and maximize opportunities. Instead in portfolio risk management, threats may not be minimized if there is potential

for value by taking on additional negative risks. Hence organizations may choose to

actively embrace appropriate threats if they think they will have a good impact in the

future.

- **Balancing Risk**: The balancing of risks is challenging because of the complex nature
of portfolios and the uncertainty associated with risk. In most cases, the portfolio
manager is faced with several suboptimal solutions where all solutions have various
strengths and weaknesses, but there is not a clear optimized approach.

The four key activities to be implemented in order to manage risks in the most effective

way are stated by the Portfolio Risk Management Framework as follows:

- risk management planning, in which are defined portfolio risk tolerance and portfolio
risk processes

- risk identification, where portfolio risk and portfolio risk owners are identified

- risk analysis, where different indicators as probability, impact, importance, timing,
confidence limits, prioritization of risks, risk trends are assessed

- risk response, that affects portfolio status and trends, balancing of the portfolio,
management of investment choices

Since we are focusing on the Smart City world, we want to investigate how Project

Portfolio Management is implemented in SC related initiatives. Looking for past studies on the

adoption of Portfolio Management in Smart City projects, we found out there is a big literature

gap in this field, since no scientific publication focuses on this point.

Aware of this, we decided to try to fill a small portion of the gap with this work aimed to

understand the maturity of PPM by exploring the implementation of its best practices and

methods in the SC world.

3   METHODOLOGY

In this section we explain the methodology with which this work has been conducted: making-of the survey, selection of questions and how they can answer our research questions. We decided to build the survey with questions that were fundamental and concise, with the objective to gather clear and accurate data from the maximum possible number of respondents. Since our work consist in answering the following 3 research questions,

1)   Do city administrations use bottom-up or top-down approach?

2) Are smart city offices or offices involved in smart city initiatives organized as PMOs?

3) Do city offices responsible for SC projects follow Portfolio Management Methodology?

We decided to split the survey in two parts: the first part aims to answer RQ 1 and 2, while the second one is related to RQ 3.

3.1 Survey Construction (written by Mariano Amico)

3.1.1 First Part of the Survey

The first section is composed by 6 questions as follows.

1. What is your position? *

◯ Manager

◯ Director

◯ Politician

◯ Other…

Survey is addressed to people that have a decision-making role in the city offices involved

in developing and implementing SC projects, so we looked primarily for managers, but also

directors and politicians.

2. How would you describe the approach taken by your city in developing and * implementing SC projects?

○ Purely top-down: The development and implementation of SC initiatives are strictly guided by the city's SC strategic …

○ Purely bottom-up: Private entities, communities and citizens are the main drivers of SC development and implement…

○ Top-down driven bottom-up effort: The city administration guides and enables the development and implementatio…

Second questions aim to understand the business model that city administration adopts:

- top down, in case SC initiatives are strictly guided by city administration

- bottom up, in case private organizations and citizens are the ones who start and propose

    the initiatives

- a mix of the two, that we called top-down driven bottom-up effort, where is the city to

    guide the initiatives proposed by privates

This question answers to RQ 1.

3. Does your city have a dedicated centralized SC office focused on supporting and guiding the development and implementation of SC projects or are different city offices responsible for different types of SC projects?

*

○ Centralized SC office

○ Different offices involve in the development and implementation of SC projects

○ Both

Question number 3 makes a distinction between cities that have a dedicated centralized

office that follows and develops only projects related to the SC world and cities that leave the

responsibility to the single domain office that develops all projects related to that domain, either

classical or smart ones.

4. In which of these SC domains is your city more focused and involved? *

☐ Natural Resources and Energy

☐ Transport and Mobility

☐ Buildings

☐ Living

☐ Government

☐ Economy and People

☐ All of the above

Question 4 asks for domains in which city is more focused by developing SC projects,

using the domains definition of the work by Neirotti et al. (2016). With this question we want

to know which domains are more developed in SC world and if there are differences between

cities on the choice of the ones on which invest more resources.

5. To your knowledge, is the office/offices involved in guiding, enabling and supporting the development of SC projects organized as Project Management Offices (PMOs)? *

PMO is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques.

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

Question 5 focus on the second RQ of this work: in fact, an important objective is to know

whether cities organize their offices involved in the development of projects related to the SC

world as Project Management Offices, either there is a centralized one or not. The answer is

given on a 1 to 5 scale to better understand to which degree offices follows a PMO

organizational structure.

6. To your knowledge, does the office/offices involved in guiding, enabling and supporting the development of SC projects follow a Project Portfolio Management approach? *

Portfolio management balances conflicting demands among portfolio components, allocates resources (e.g., human, financial, assets, and intellectual) based on organizational priorities and capacity, and integrates management principles and sound practices to deliver business value aligned with the strategic objectives.

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

Last question of the first part of the survey is the link between this and the second part

involving Project Portfolio Management. Respondents were asked if in their opinion SC offices

were following a PPM approach and to which degree. We want next to analyze the PPM

standards implementation and look if there are discrepancies between the initial conviction and

the real application of the basic principles.

These six questions aimed to know the working category of respondents, to understand

the organizational approach of the city in SC initiatives and the organizational structure of the

offices involved in projects related to this world. In this way, we consider having sufficient

data to answer in a clear and direct way RQ 1 and 2.

3.1.2 Second Part of the Survey

The second part of the survey was composed by 10 questions: all of these are related to

Portfolio Management standards and processes.

1. Does your city have a formally defined strategic smart city plan? *

○ Yes

○ No

○ Don't know/no opinion

First question aims to know if the city administration has developed a formal strategic Smart City plan in order to state their objectives in this field in the medium-long term. It is developed in a yes/no options since it is a clear and definite data, with the addition of a don't know/no opinion selection to avoid that uncertainty could affect the data.

2. Does your city have a formally defined Portfolio Roadmap? *

○ Yes

○ No

○ Don't know/no opinion

Second question asks if the city has a defined Portfolio Roadmap, a document that shows the temporal sequence of the actions that the administration has in mind to follow in the development of their SC environment. It is developed in a yes/no options since it is a clear and definite data, with the addition of a don't know/no opinion selection to avoid that uncertainty could affect the data.

The following 8 questions focus on the six basic PPM domains and are all asked in a 1 to 5 scale to gather more detailed information on the degree of implementation of each process by the Smart City offices.

3. To your knowledge, to what degree does your city ensure that investments *
and efforts in developing and implementing SC projects are aligned with the
city's strategic plans?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

This is the first question directly related to the PPM processes, asking to which level the

city ensures that investments in the SC world are aligned with their strategic plans. This is the

most important concept of the Portfolio Strategic Management process.

4. To your knowledge, to what degree does your city implement a formally *
structured form of governance for the management of SC projects?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

5. How much is the political/elected administration important in the *
development and implementation of your city strategic Smart City plan?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

Fourth question aims to understand how deeply the city implements a structured form of

governance in the management of projects and it is followed by a question on the degree of

influence of the elected administration in the development of the SC plan. These two questions

determine the degree of adherence to the standards of the process called Portfolio Governance.

6. To your knowledge, to what degree is your city able to assess its
capabilities when managing the development and implementation of SC
projects?   *

A capability is the ability of an organization through its people, processes, and systems to execute an entire portfolio of
initiatives for delivering goods and services.

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

7. To your knowledge, to what degree is your city able to assess its capacities *
when managing the development and implementation of SC projects?

Capacity is the organisations' ability to fulfill aggregate resource demands for successfully executing a planned portfolio
of initiatives.

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

Sixth and seventh questions explore the ability of the city in assessing their capacities and

capabilities in the management of SC initiatives, assessing the level of implementation of the

single macro-process of Portfolio Capacity and Capability Management.

8. To your knowledge, to what degree does your city focus on citizens and,   *
more in general, stakeholder engagement when managing the development
and implementation of SC projects?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

This question has the goal to understand at which level the city focuses on stakeholders

and particularly on the most important one, the citizens, while developing and implementing

SC projects. By this answer we can obtain the respondent's degree of implementation of the

Portfolio Stakeholder Management process.

9. To your knowledge, to what degree does your city focus on value creation *
when choosing and managing the development and implementation of SC
projects?

Value is an indicator of the effect an entity or offering can deliver. That effect can be seen in a number of ways—for
example, as increased revenue, increased profit, or reduced risk.

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

This question focuses on the degree of importance the city gives to the creation of value

while selecting the SC projects to develop, answering the city's focus on the implementation

of the Portfolio Value Creation process.

10. To your knowledge, to what degree does your city focus on the *
identification, assessment and management of risks emerging from the
development and implementation of SC projects?

	1	2	3	4	5	
Not at all	○	○	○	○	○	Completely

Last question investigates the level of adherence to the standards of the Portfolio Risk

Management process, asking for the efforts the city put in identifying and assessing the risks

emerging from SC projects.

3.2 Selection of the Cities (written by Mariano Amico)

Then we created a database of the cities to contact. Since we wanted to select the best cities in the SC world, we analyzed different approved international rankings that listed the cities with the best results in the overall development of their Smart City environment.

The following rankings were chosen:

- IESE Cities in Motion Index 2019 by IESE Business School

- Top 50 Smart City Governments by Eden Strategy Institute

- Smart City Index 2019 by EasyPark Group

As a result, 190 cities all around the world were selected. Cities ranged from medium to big-sized and were geographically distributed as showed in Table 2:
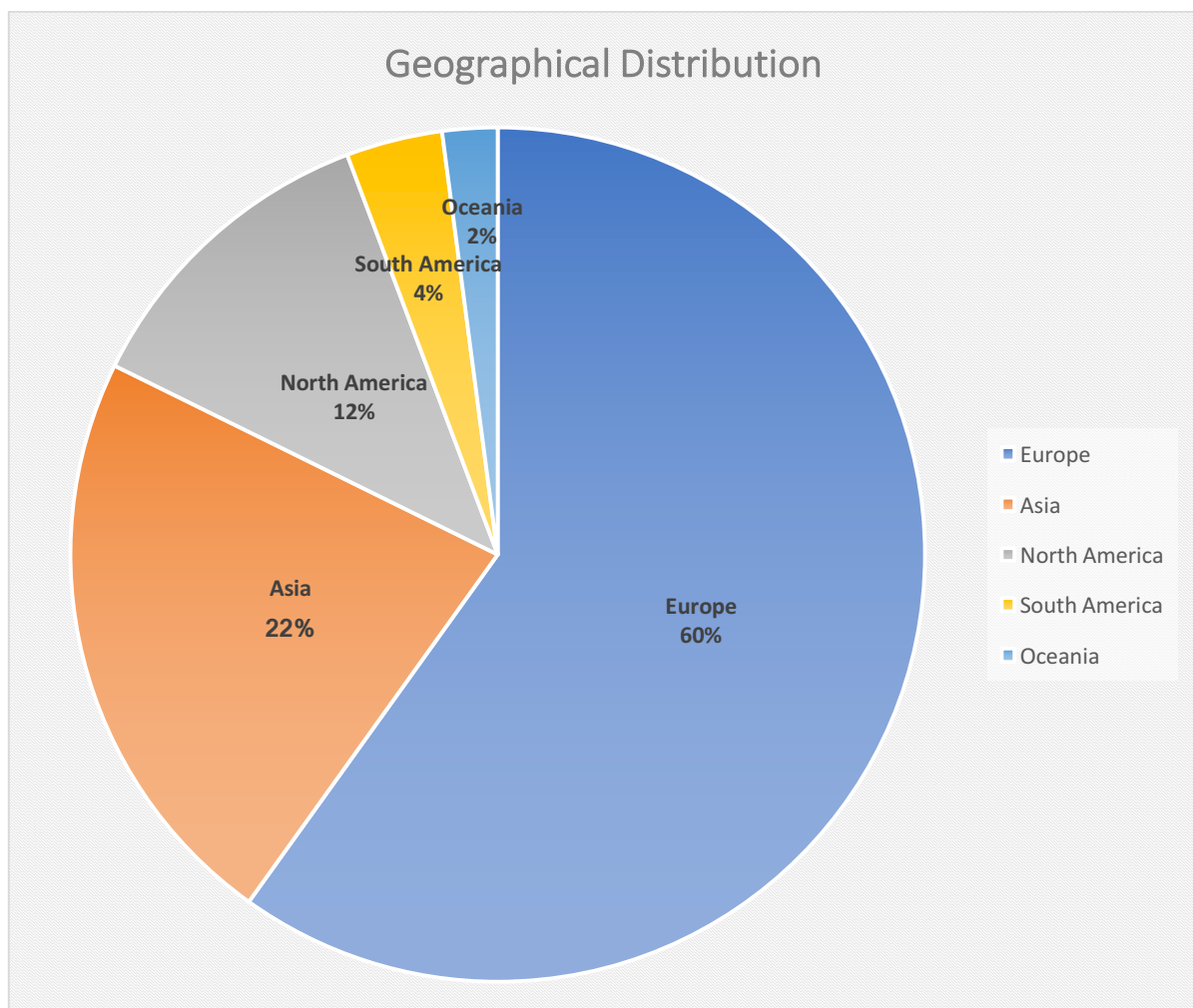
Table 2 shows the geographical distribution of the cities contacted

60% of the cities are from Europe, meaning it is the continent in which the development

of Smart Cities is more advanced. It's interesting to note that Asia and North America have top

cities in the ranking too, but they can compete with Europe only on big metropolis, while

Europe has a large number of medium sized cities that develop and implement SC projects.

3.3 Survey Submission (written by Mariano Amico)

In order to submit the questionnaire to people interested in it and with knowledge requisites

to answer the questions without doubts and letting us gather clear and accurate data, we decided

to address it principally to managers, directors and people with a politic role working in city

offices involved in the development of SC initiatives.

First of all, we went through the city administration websites and dedicated SC websites

looking for the contacts of the people with the required job position. We used several ways of

contact to get in touch with the maximum number of people: e-mail, web forms, WhatsApp

municipalities hotlines and LinkedIn requests.

4   RESULTS

4.1   Sample Description (written by Berkay Çalışır)

This section is dedicated to deploy background information of the participants of the survey. To be more precise, this section contains answers of the first two questions of the first part of the survey which are the list of participant cities and the positions of the participants in their local administrations.

To begin with it, as it mentioned in methodology part, first question of the first part of the survey is "Which city are you working for?". Answers given to this question contains the information of the participant cities. Furthermore, some of the participant cities are leading cities in terms of smart city investments and projects according to several different rankings such as Amsterdam, Copenhagen, Vienna, Hong Kong, Los Angeles, Melbourne etc. according to IESE Cities in Motion Index (2019), Helsinki, Montreal, Melbourne, Barcelona etc. according to Eden Strategy Institute (2018) and Copenhagen, Amsterdam, Melbourne, Montreal etc. according to Easy Park Group (2019) which implies that the data received from them can be used for to enlighten major global trends according to smart cities. The list of participant cities categorized by continents can be seen from Table 3 below.

Europe	Asia	North America	Oceania
Amsterdam (Netherlands)	Hong Kong (PRC)	Montreal (Canada)	Melbourne (Australia)
Barcelona (Spain)	Ankara (Turkey)	Los Angeles (USA)	
Copenhagen (Denmark)	Izmir (Turkey)	San Diego (USA)	
Helsinki (Finland)	Bursa (Turkey)		
Istanbul (Turkey)	Antalya (Turkey)		
Vienna (Austria)	Kayseri (Turkey)		
Budapest (Hungary)	Kocaeli (Turkey)		
Valencia (Spain)	Denizli (Turkey)		
Florence (Italy)	Van (Turkey)		
Bologna (Italy)			
Vilnius (Lithuania)			
Leeds (England)			
Linz (Austria)			
Innsbruck (Austria)			
Parma (Italy)			
Trento (Italy)			
Tekirdag (Turkey)			
Tampere (Finland)			
Bergen (Norway)			
Vejle (Denmark)			

Table 3 shows the list of participant cities according to their continents

As it can be seen from the above table, out of 33 participant cities, 20 of them are from Europe, 9 of them are from Asia, in particular from Turkey except Hong Kong, 3 of them are from North America and 1 of them is from Oceania. Therefore, 61% of the participant cities are from Europe, 27% of them are from Asia, 9% of them are from North America and 3% is from Oceania. The distribution of the participant cities regarding to their continents can be seen in Table 4 below.

Percentage of Participant Cities by Continents

Legend:
- Europe
- Asia
- North America
- Oceania

61% — Europe
27% — Asia
9% — North America
3% — Oceania
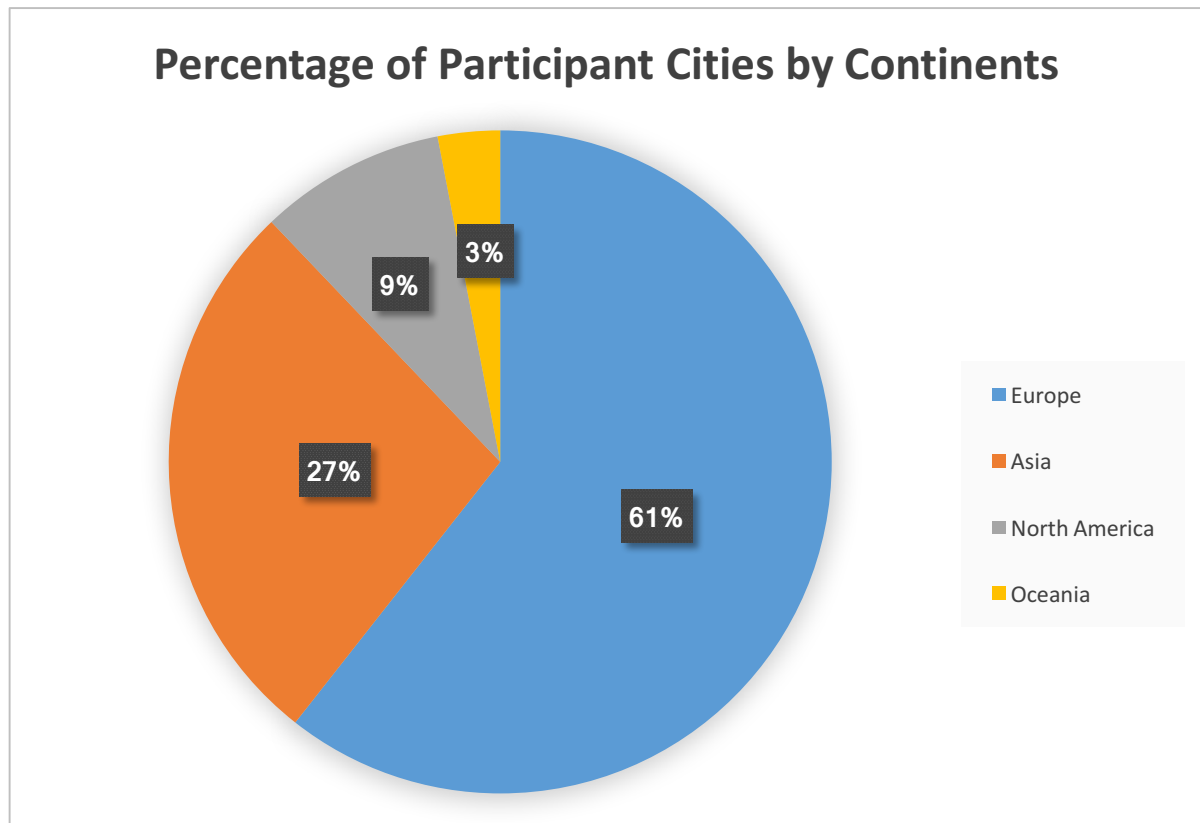
Table 4 shows the percentage of participant cities regarding to their continents

Another issue that has to be spoken about is positions of the respondents of the survey. Even though professionals who are connected with have different backgrounds, some similarities regarding to their positions can be identified easily. For instance, 19 respondents out of 33 are managers, which corresponds to 58% of the total number of respondents. These participants are generally the managers of the Project Management Offices' of their cities. Accordingly, 6 of the respondents are engineers which corresponds to 18% of the total number of respondents, 3 of the respondents are directors which corresponds to 9% of the total number of respondents, another 2 of the respondents are project leaders which corresponds to 6% of the total number of respondents, 1 of the respondents is an advisor which corresponds to 3% of the total number of respondents and lastly, 2 of the respondents is an employee which corresponds to 6% of the total number of respondents. You can see the pie chart which plots the distribution of participants regarding to their positions in Table 5 below.

POSITIONS OF THE PARTICIPANTS

Engineer 18%
Advisor 3%
Director 9%
Project leader 6%
Employee 6%
Manager 58%
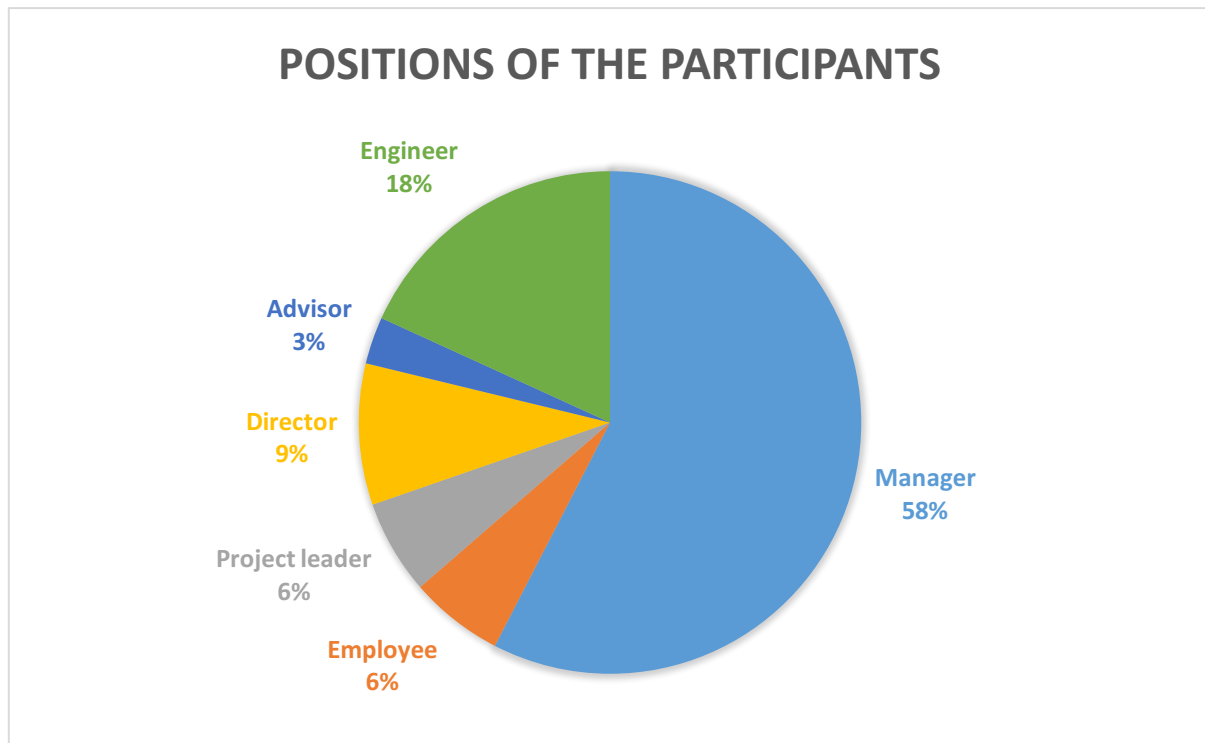
Table 5 shows the distribution of participants regarding to their positions

4.2 Smart City Organizational Approach (written by Berkay Çalışır)

This section is dedicated to deploy the results received from the last five questions of the first part of the survey that were prepared to understand whether the policies of the city administrations are mostly associated to top-down approach, bottom up approach or some sort of mixture of them. Additionally, this section provides the information on whether participant cities have a centralized smart city office or different offices involve in the development and implementation of smart city projects, the domains that participant cities perform in, whether the offices involved in guiding, enabling and supporting the development of smart city projects organized as project management offices or not and whether these mentioned offices follow project portfolio management methodology or not.

Firstly, the first question that will be discussed in this section of the paper is one of the most important questions of the survey. It is a specific question in the survey which directly aims to understand cities' approaches in terms of top-down or bottom-up. The exact question

is "How would you describe the approach taken by your city in developing and implementing

SC projects?". The answers received city by city can be found in Table 6 below.

	Cities	Top Down	Bottom Up	Top-down driven bottom-up effort
EUROPE	Amsterdam (Netherlands)		✅	
	Barcelona (Spain)			✅
	Copenhagen (Denmark)	✅		
	Helsinki (Finland)			✅
	Istanbul (Turkey)			✅
	Vienna (Austria)			✅
	Budapest (Hungary)	✅		
	Valencia (Spain)	✅		
	Florence (Italy)			✅
	Bologna (Italy)		✅	
	Vilnius (Lithuania)			✅
	Leeds (England)			✅
	Linz (Austria)			✅
	Innsbruck (Austria)	✅		
	Parma (Italy)			✅
	Trento (Italy)			✅
	Tekirdag (Turkey)			✅
	Tampere (Finland)			✅
	Bergen (Norway)			✅
	Vejle (Denmark)	✅		
NORTH AMERICA	Montreal (Canada)	✅		
	San Diego (USA)			✅
	Los Angeles (USA)			✅
ASIA	Hong Kong (PRC)			✅
	Ankara (Turkey)			✅
	Izmir (Turkey)	✅		
	Bursa (Turkey)	✅		
	Antalya (Turkey)	✅		
	Kayseri (Turkey)			✅
	Kocaeli (Turkey)	✅		
	Denizli (Turkey)			✅
	Van (Turkey)		✅	
OCEANIA	Melbourne (Australia)			✅

Table 6 shows the approaches of the cities

Moreover, 20 of the participant cities out of 33 stated that they are following a mixed approach which can be called as "Top-down driven, bottom-up effort". This phrase means smart city initiatives mostly leaded by both public organs and private organizations where both of the parties work in a harmony. 10 cities stated that they organized as top-down approach followers and 3 cities reported that they prefer to follow bottom-up approach. If it is preferred to be represented in percentiles, then 20 participants following "Top-down driven, bottom-up effort" approach correspond to 61% of the sample space. 10 top-down approach followers correspond to 30% and 3 bottom-up approach followers correspond to 9% accordingly. The distribution of approaches can be found as a pie chart in Table 7 below.
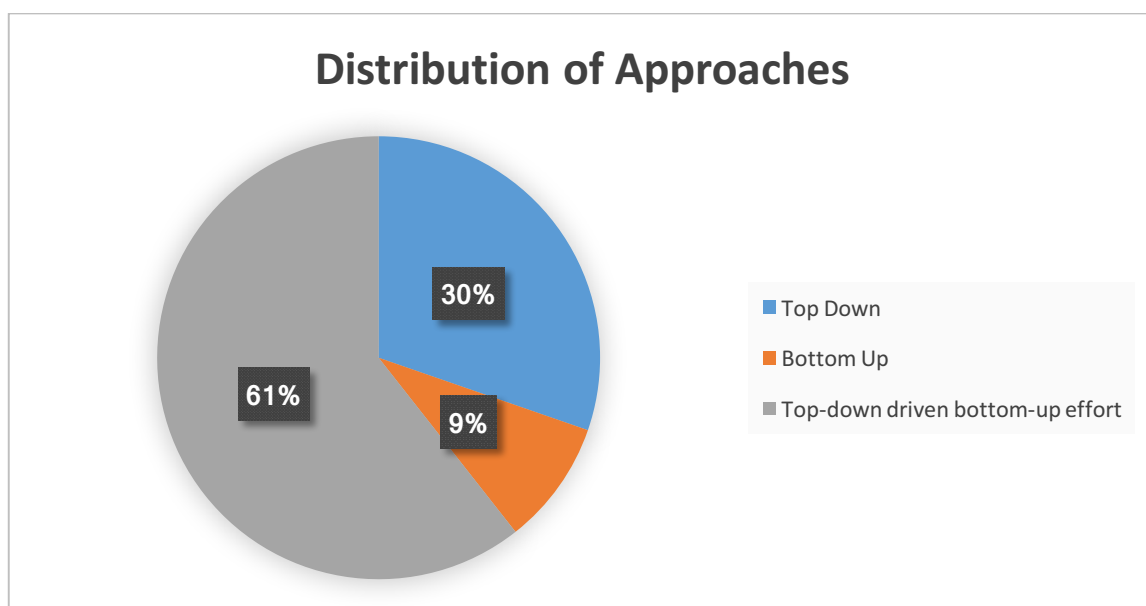
Table 7 shows the distribution of cities regarding to their approaches

To continue with, it has been asked to the city administrations whether they have a dedicated centralized smart city office focused on supporting and guiding the development and implementation of smart city projects or different city offices responsible for different types of smart city projects. 11 of the cities replied as they have a dedicated smart city office that

manages smart city projects exclusively. Other 14 stated that different city offices responsible for smart city projects depending on the type and scope of the project. Interestingly, 8 municipalities expressed that different offices in the municipality might be responsible for managing smart city projects even though they have a dedicated centralized unique smart city office in the organization. Furthermore, this means 33% of the participants stated that their cities have a dedicated unique smart city office and 43% expressed the opposite. Lastly, 24% enounced they are managing projects related to smart city activities by the involvement of both a dedicated unique smart city office and other related offices in the organization.
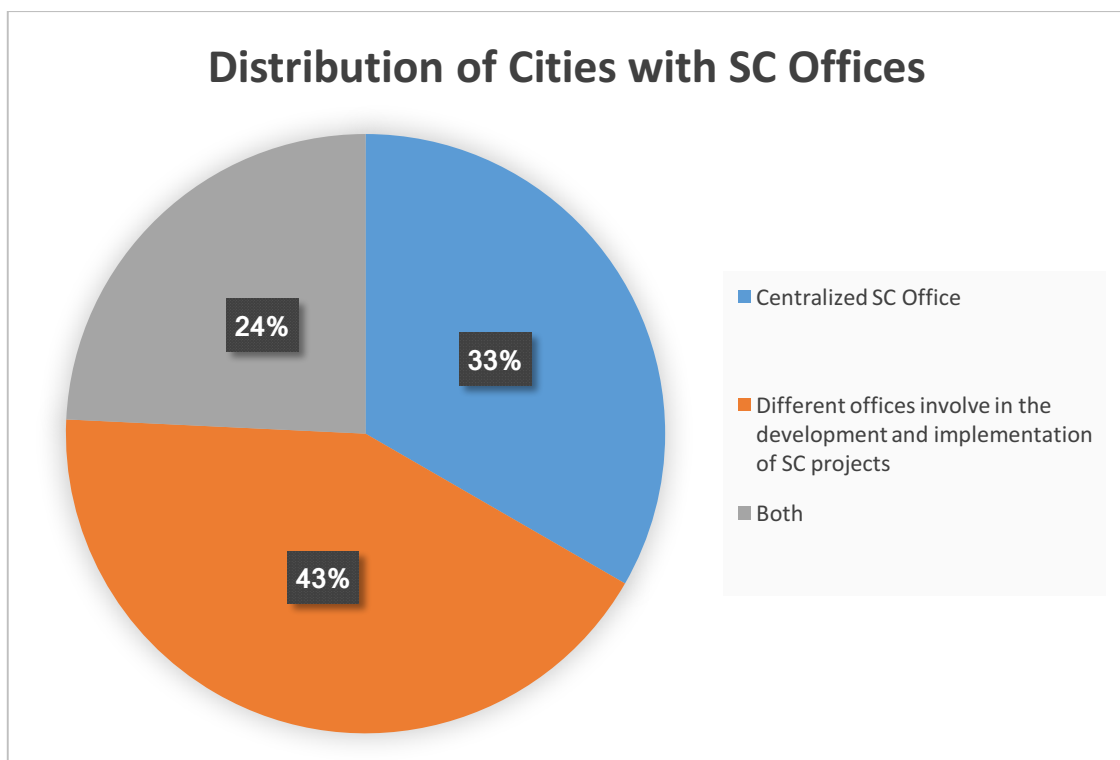
Table 8 shows the distribution of cities with dedicated smart city offices

Next question that had been asked to the participants was in which domains are their cities focused and involved more. The question was consisted of 6 major domains which had been defined by Neirotti et al. (2014). Domains were categorized as follows: natural resources and energy, transport and mobility, buildings, living, government and economy and people. The

most preferred domain stated by cities to operate in is transportation and mobility which is

selected by 31 of the participants which corresponds to 94% of the all participants. Second one

is natural resources and energy with 23 cities corresponding to 70% accordingly. It is followed

by the domain living which is chosen by 22 cities with a correspondence rate of 67%. Buildings

and government domains had the same response rate from the participants with 20 responses

in overall which corresponds to 61%. Lastly, 15 of the participants stated that their cities

operate in economy and people domain which corresponds to 45% of the 33 participant cities.

Graphical representation of the mentioned figures and numbers can be found in Table 9 below.

DISTRIBUTION OF THE SC DOMAINS

Domain	Count	Percentage
NATURAL RESOURCES AND ENERGY	23	70%
TRANSPORTATION AND MOBILITY	31	94%
BUILDINGS	20	61%
LIVING	22	67%
GOVERNMENT	20	61%
ECONOMY AND PEOPLE	15	45%
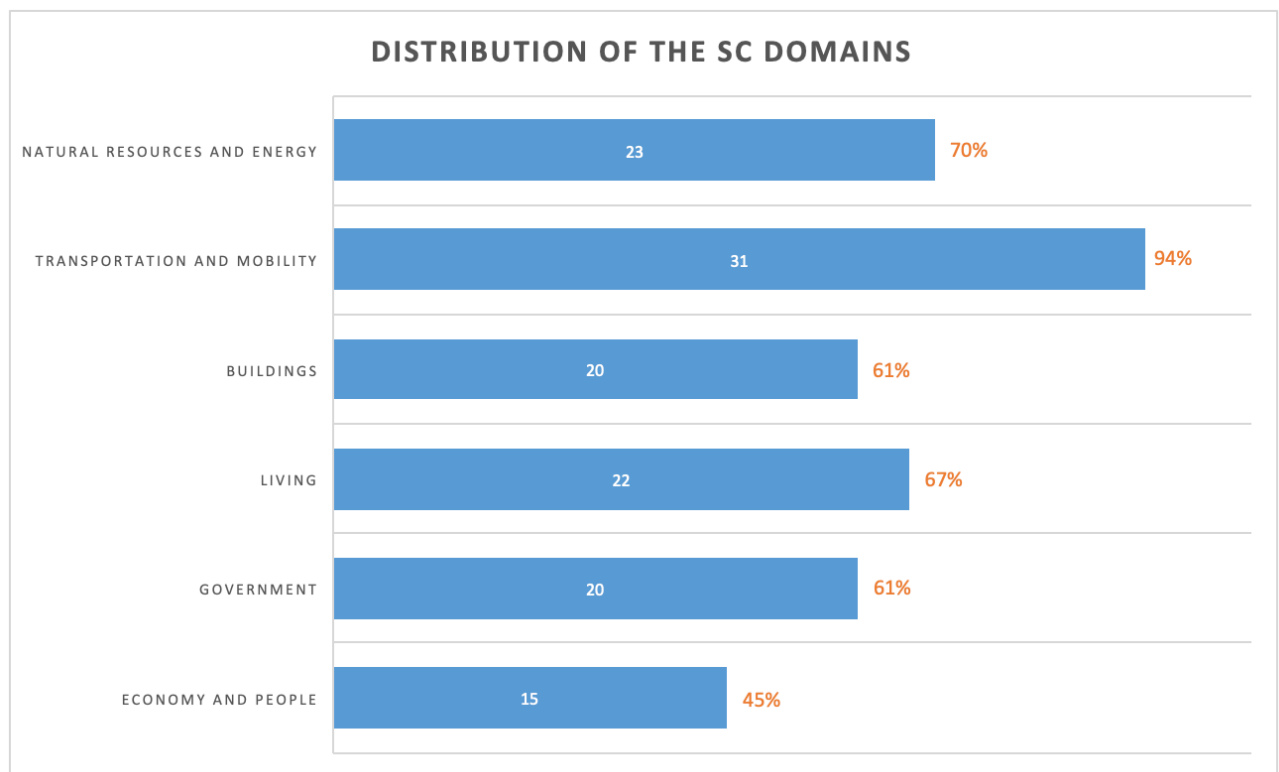
Table 9 shows the distribution of the Smart City domains among the participants

The last 2 questions of the first part of the survey have been asked as scalable questions

where the participants had to choose a number from 1 to 5. Number 1 represents "Not at all",

number 5 represents "Completely" and the other numbers between represents the degree of intensity between these two edges.

The final questions of the first part of the survey are related to project and portfolio management in general and aims to obtain basic information before moving on to second part of the survey which questions project portfolio management approach of the cities more in detail.

First one of the last two questions is whether the offices working in smart city projects in city governments organized as project management offices or not. The purpose of this question is to understand the influence of project management methodologies in smart city related projects. 3 of the participants answered 5 to this question which indicates that the offices involved in smart city projects are organized as project management offices completely. It corresponds to 9.1% of the participants. Additionally, 12 participants preferred to select answer number 4 which means even though all the offices involved in smart city projects aren't organized as project management offices, at least some of them are. It corresponds to 36.4% of the participants.

In the other edge, 4 of the participants stated that the offices that are working in smart city related projects in their municipality haven't been organized as project management offices at all. It resembles to 12.1% of the participants. Moreover, 3 participants preferred to select answer number 2 which resembles 9.1% of the participants. Lastly, 11 participants, corresponds to 33.3%, stated that offices involved in smart city projects in their cities moderately organized as project management offices.

To sum up, 45.5 percent of the participants stated that the offices involved in smart city projects in their cities are mostly organized as project management offices. On the other hand, 21.2% expressed that their cities do not manage smart city projects by using project management offices extensively. And lastly, 33.3% preferred to give a moderate answer stating

that some offices are organized as project management offices and some are not. The exact

question that was asked and graphical representation of the mentioned data can be found in

Figure 7, below.

5. To your knowledge, is the office/offices involved in guiding, enabling and supporting the development of SC projects organized as Project Management Offices (PMOs)?

33 responses
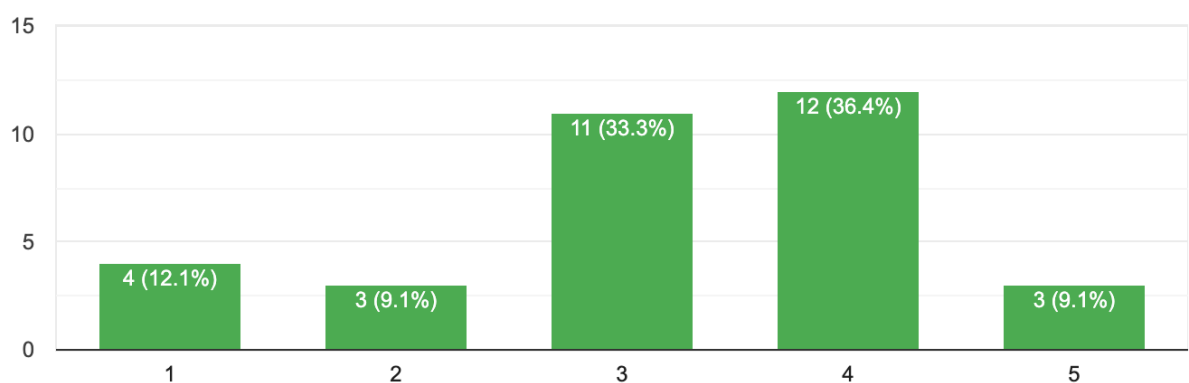
Figure 7 shows the distribution of cities that organized their smart city involved offices

as PMOs

Last question that was asked in the first part is whether the offices working in smart city

projects in city governments follow project portfolio management approach or not. Purpose of

this question is to ponder and examine the knowledge of the participants in project portfolio

management methodology before asking questions related to it more in detail in the second

part of the survey.

11 of the participants, which corresponds to 33.3% of the participants and biggest group

among them, stated that their cities follow project portfolio management approach moderately

by choosing answer number 3. Only 2 participants, corresponds to 6.1%, selected option

number 5 and 10 participants, corresponds to 30.3%, selected option number 4.

In like manner, only 3 respondents, which corresponds to 9.1% of the total respondents, selected the option number 1 in the other edge. Additionally, 7 participants, correspond to 21.2%, selected option number 2.

As can be seen, 36.4% of the participants stated that their city offices tend to follow project portfolio management methodology extensively. Moreover, 33.3% of the participants expressed that administration of their cities follow project portfolio management approach to a certain extent. Ultimately, 30.3% of the participants enounced that their cities do not follow project portfolio management approach at all. The question that was asked and graphical illustration of the mentioned data can be seen in Figure 8, below.

6. To your knowledge, does the office/offices involved in guiding, enabling and supporting the development of SC projects follow a Project Portfolio Management approach?

33 responses
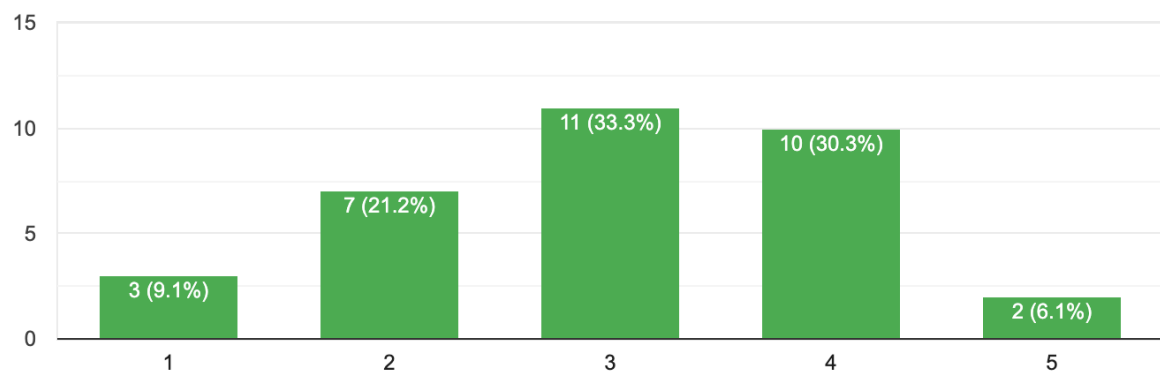
Figure 8 shows the distribution of cities that follow project portfolio management approach

4.3 Project Portfolio Management (written by Mariano Amico)

In this section results of the survey part related to Project Portfolio Management processes and standards implementation are presented and analyzed question by question.

1)   Does your city have a formally defined strategic Smart City plan?

The percentage of respondents that assured their city has a formally defined strategic Smart City plan and the ones who said it doesn't have is roughly the same. In fact, 17 out of 33 cities has developed a Smart City plan, as shown in Table 10.
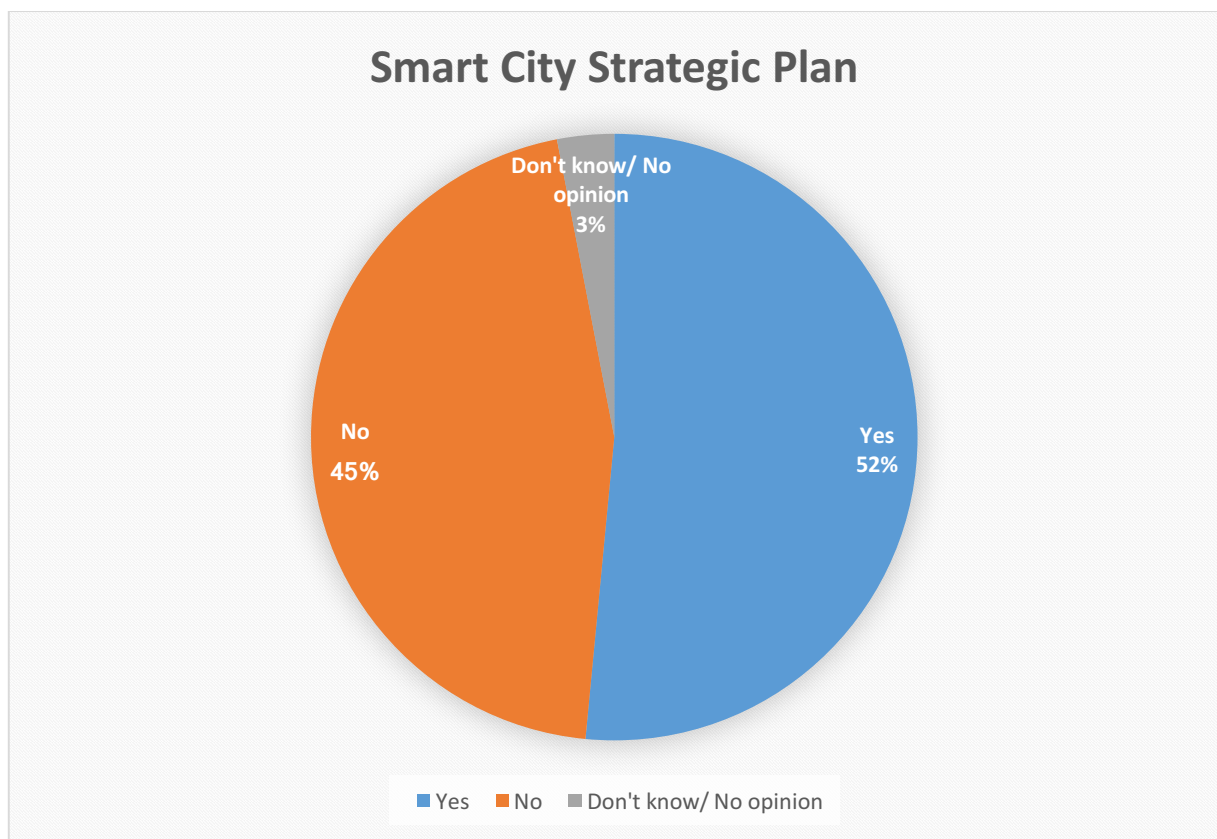
Table 10 shows the distribution of cities that develop a Smart City Plan

Cities with a formal SC Plan	
Melbourne	Kayseri
Istanbul	Copenhagen
Valencia	Helsinki
Leeds	Los Angeles
Trento	Van
Bologna	Barcelona
Florence	Vienna
Vilnius	Bergen
Budapest	

Table 11 shows the list of cities which develop a Smart City Plan

2) Does your city have a formally defined Portfolio Roadmap?

Only the 18% of the cities analyzed claimed to have a formal Portfolio Roadmap, meaning

that it is a document that city administrations usually don't develop. 27% of respondents didn't

even have an opinion about that, so we can say it is not a basic common knowledge of it.
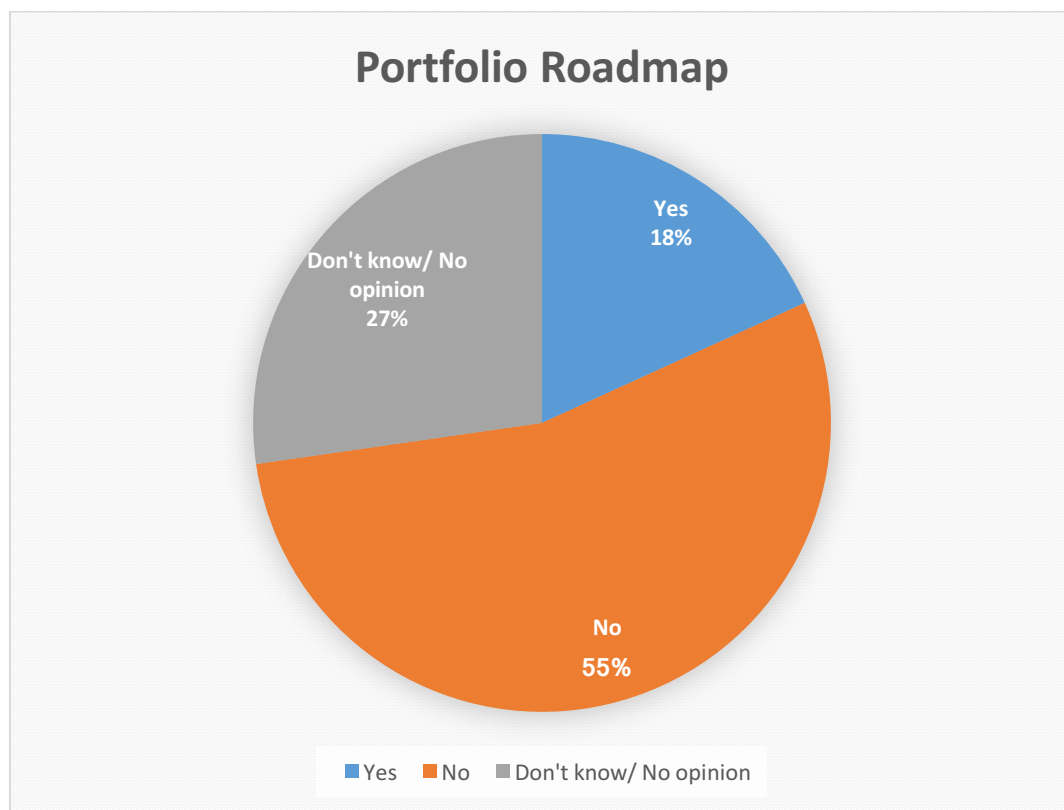
Table 12 shows the distribution of cities that develop a Portfolio Roadmap

In the Table 13 we can find the 9 cities that developed a formal Portfolio Roadmap.

Cities with Portfolio Roadmap	
Montreal	Trento
Vejle	Florence
Valencia	Barcelona
Izmir	Vienna
Leeds	

Table 13 shows the list of cities that develop a Portfolio Roadmap

4.3.1 Portfolio Strategic Management

3. To your knowledge, to what degree does your city ensure that investments and efforts in developing and implementing SC projects are aligned with the city's strategic plans?

33 responses
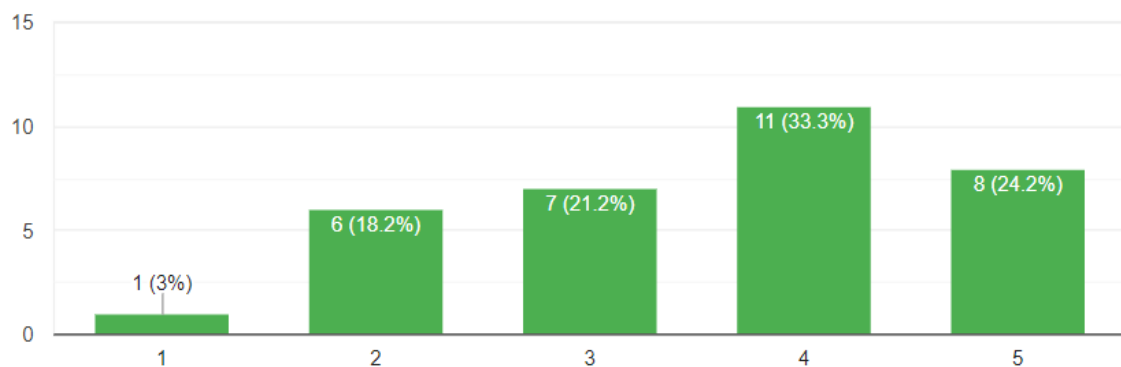
Figure 9 shows the distribution of cities that aligns SC projects with city strategy

Cities that put the best effort in making sure the development and implementation of Smart City projects are aligned with city's strategic plan are Montreal, Istanbul, Valencia, Trento, Vilnius, Ankara and Vienna. As we can see in the Table 14 more than half of the 33 respondents answered with 4 or more to this question and only 7 cities assigned 2 points or less, meaning

Portfolio Strategic Management is a process well implemented in city offices that deal with SC

projects.

Rank	City	Strategic Management	Rank	City	Strategic Management
1	Montreal	5	8	Barcelona	4
1	Istanbul	5	8	Bergen	4
1	Valencia	5	20	Vejle	3
1	Trento	5	20	Bologna	3
1	Vilnius	5	20	Innsbruck	3
1	Ankara	5	20	Amsterdam	3
1	Vienna	5	20	Tampere	3
8	Melbourne	4	20	Los Angeles	3
8	Leeds	4	20	Hong Kong	3
8	Florence	4	27	Tekirdağ	2
8	Parma	4	27	Linz	2
8	Budapest	4	27	Copenhagen	2
8	San Diego	4	27	Antalya	2
8	Kayseri	4	27	Denizli	2
8	Helsinki	4	27	Van	2
8	Izmir	4	33	Kocaeli	1
8	Bursa	4			

Table 14 shows the rank of cities regarding Portfolio Strategic Management

4.3.2 Portfolio Governance

4. To your knowledge, to what degree does your city implement a formally structured form of governance for the management of SC projects?

33 responses
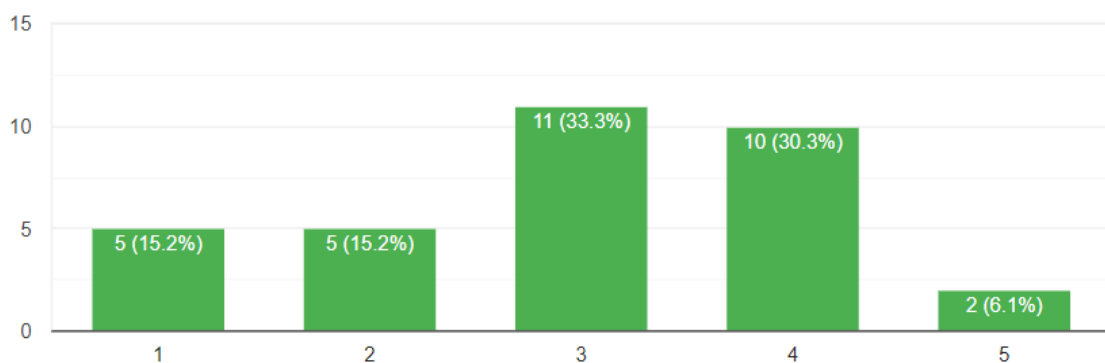
Figure 10 shows the distribution of cities that implement a structured governance for SC

Only 2 cities assigned the maximum score to this questions, Trento and Vilnius. 21 answers, around two third of the sample were in the range 1-3. We can deduce that it is not common for SC offices having a structured form of Portfolio Governance for managing projects.

5. How much is the political/elected administration important in the development and implementation of your city strategic Smart City plan?

33 responses
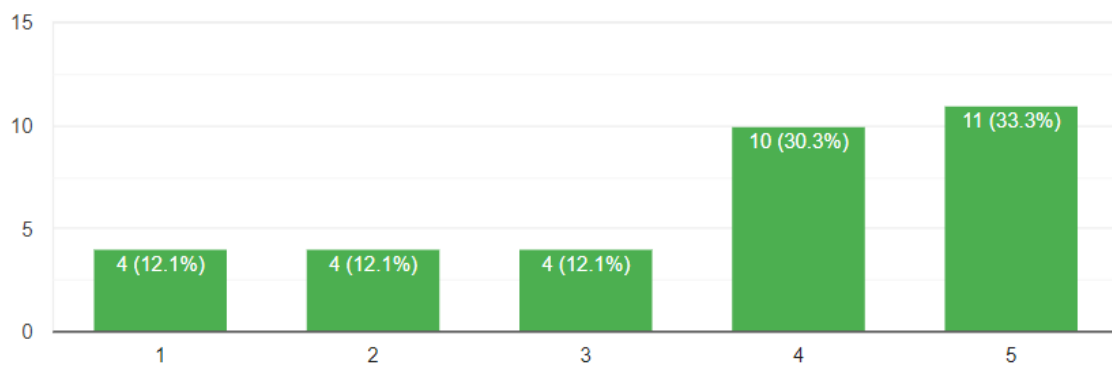
Figure 11 shows the distribution of cities that implement a structured governance for SC

On the contrary, 11 cities answered with a 5 to this question and 9 with a 4, meaning that the elected administration often plays a center role in the development and implementation of the strategic plan related to SC activities.

The average of the two answers regarding fundamental aspects of Portfolio Governance was calculated to assign a single score to this process. As stated in Table 15, Trento resulted the best city, the only one giving maximum points to both questions. Melbourne, Montreal, Florence, Parma, Vilnius and Budapest obtained a high 4,5 score too.

Rank	City	Portfolio Governance	Rank	City	Portfolio Governance
1 Trento		5	14 Ankara		3,5
2 Melbourne		4,5	19 San Diego		3
2 Montreal		4,5	19 Kayseri		3
2 Florence		4,5	19 Antalya		3
2 Parma		4,5	19 Helsinki		3
2 Vilnius		4,5	19 Denizli		3
2 Budapest		4,5	19 Van		3
2 Bursa		4,5	25 Vejle		2,5
9 Istanbul		4	25 Tampere		2,5
9 Valencia		4	25 Vienna		2,5
9 Bologna		4	28 Bergen		2
9 Los Angeles		4	29 Tekirdağ		1,5
9 Barcelona		4	29 Copenhagen		1,5
14 Leeds		3,5	29 Hong Kong		1,5
14 Linz		3,5	32 Amsterdam		1
14 Izmir		3,5	32 Kocaeli		1
14 Innsbruck		3,5			

Table 15 shows the rank of cities regarding Portfolio Governance

4.3.3 Portfolio Capacity and Capability Management

6. To your knowledge, to what degree is your city able to assess its capabilities when managing the development and implementation of SC projects?

33 responses
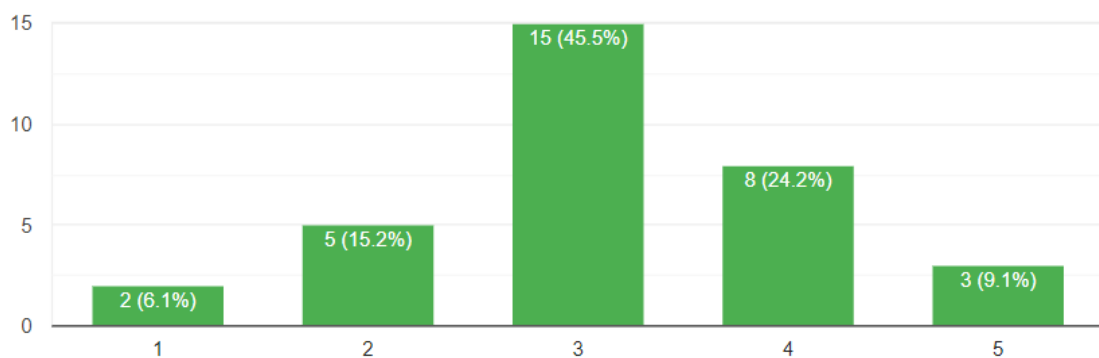
Figure 12 shows the distribution of cities that assess capabilities in SC

Parma and Valencia were the ones to grant the highest importance to the assessment of

capability in the development of SC related projects. Half of the respondents assigned a

medium score, meaning that most cities have sufficient ability in this field, but only few of

them are able to take it to the highest level.

7. To your knowledge, to what degree is your city able to assess its capacities when managing the development and implementation of SC projects?

33 responses
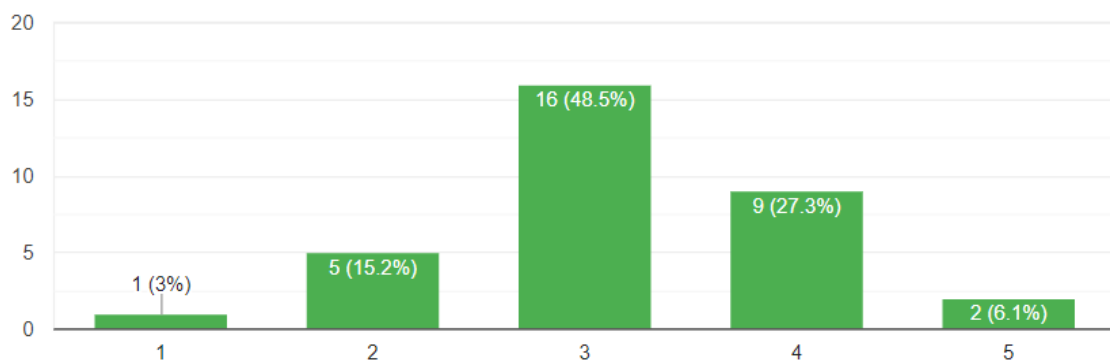
Figure 13 shows the distribution of cities that assess capacities in SC

Valencia was the unique city considering itself able to assess capacity at the best possible

standard, while also cities like Melbourne, Parma, Trento, Vilnius, Budapest and Helsinki

assigned a good score to this particular activity.

Last two questions regarded both the same process of the Portfolio Management standards,

the Capacity and Capability Management. The simple average of the answers was calculated

in order to assign a single score and to make possible a unique ranking of the process.

As shown in Table 16, Valencia resulted the top city, assigning the maximum score to both

questions and receiving the best possible result. Parma followed closely in second position and

cities as Trento, Vilnius, Budapest, Helsinki and Vienna obtained a very good score of 4, giving

much importance to the assessment of capacities and capabilities in their SC offices.

Rank	City	Capacity and Capability Management	Rank	City	Capacity and Capability Management
1	Valencia	5	14	Linz	3
2	Parma	4,5	14	San Diego	3
3	Trento	4	14	Amsterdam	3
3	Vilnius	4	14	Denizli	3
3	Budapest	4	14	Bursa	3
3	Helsinki	4	14	Ankara	3
3	Vienna	4	14	Los Angeles	3
8	Melbourne	3,5	14	Barcelona	3
8	Montreal	3,5	26	Copenhagen	2,5
8	Istanbul	3,5	26	Tampere	2,5
8	Florence	3,5	28	Innsbruck	2
8	Kayseri	3,5	28	Kocaeli	2
8	Van	3,5	28	Bergen	2
14	Vejle	3	28	Hong Kong	2
14	Leeds	3	32	Tekirdağ	1,5
14	Izmir	3	32	Antalya	1,5
14	Bologna	3			

Table 16 shows the rank of cities regarding to Portfolio Capacity and Capability Management

4.3.4 Portfolio Stakeholder Engagement

8. To your knowledge, to what degree does your city focus on citizens and, more in general, stakeholder engagement when managing the development and implementation of SC projects?

33 responses
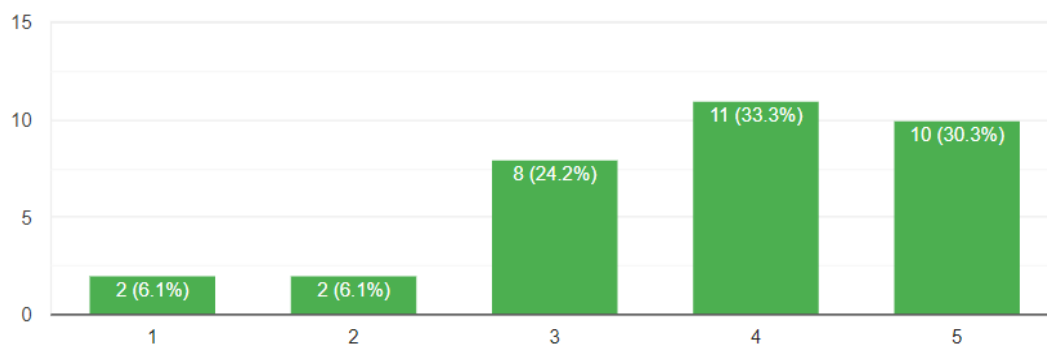
Figure 14 shows the distribution of cities that focus on stakeholder engagement

The question regarding the level at which the city focuses on the engagement of stakeholder, especially on citizens, was the one with the highest number of respondents giving a score of 4 or more. In fact, 21 out of 33 cities ensured putting a very strong effort in this process, meaning that in the development of SC projects citizens and other stakeholders are always in the spotlight.

As shown in Table 17, the top cities in this field resulted Montreal, Valencia, Leeds, Bologna, Florence, Parma, Los Angeles and Barcelona, while only the Turkish cities of Tekirdağ and Antalya stated they couldn't guarantee sufficient performance in Stakeholder Engagement.

City	City	Stakeholder Engagement Management	City	City	Stakeholder Engagement Management
1	Montreal	5	10	Kayseri	4
1	Valencia	5	10	Kocaeli	4
1	Leeds	5	10	Helsinki	4
1	Bologna	5	10	Ankara	4
1	Florence	5	22	Vejle	3
1	Parma	5	22	Innsbruck	3
1	Vienna	5	22	Amsterdam	3
1	Los Angeles	5	22	Copenhagen	3
1	Barcelona	5	22	Denizli	3
10	Melbourne	4	22	Tampere	3
10	Istanbul	4	22	Bursa	3
10	Trento	4	22	Bergen	3
10	Vilnius	4	30	Van	2
10	Linz	4	30	Hong Kong	2
10	Budapest	4	32	Tekirdağ	1
10	Izmir	4	32	Antalya	1
10	San Diego	4			

Table 17 shows the rank of cities related to Portfolio Stakeholder Engagement Management

4.3.5 Portfolio Value Management

9. To your knowledge, to what degree does your city focus on value creation when choosing and managing the development and implementation of SC projects?
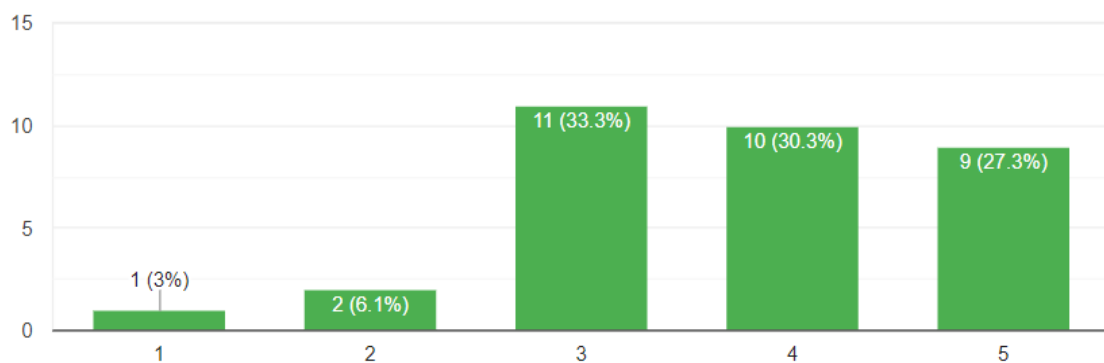
33 responses

Figure 15 shows the distribution of cities that focus on value creation

Nine cities gave the top score to this question: Montreal, Istanbul, Valencia, Leeds, Vilnius, Vienna, Los Angeles, Ankara and Bursa. Ten more cities assigned a 4. This means that value creation is one of the goals of the development of SC projects and a process in which SC offices focus a lot. Only Turkish city of Tekirdağ gave the lowest importance to this aspect, while also Linz and Bergen with 2 points revealed that effort in the creation of value is not their priority.

But as can be seen in Table 18, Value Creation Management is the process with most answers of 3 or more, actually 29 out of 33, confirming his fundamental importance in developing projects.

Rank	City	Value Creation Management	Rank	City	Value Creation Management
1	Montreal	5	10	Kocaeli	4
1	Istanbul	5	10	Barcelona	4
1	Valencia	5	20	Bologna	3
1	Leeds	5	20	Innsbruck	3
1	Vilnius	5	20	San Diego	3
1	Bursa	5	20	Amsterdam	3
1	Ankara	5	20	Copenhagen	3
1	Los Angeles	5	20	Antalya	3
1	Vienna	5	20	Helsinki	3
10	Melbourne	4	20	Denizli	3
10	Vejle	4	20	Tampere	3
10	Trento	4	20	Van	3
10	Florence	4	20	Hong Kong	3
10	Parma	4	31	Linz	2
10	Budapest	4	31	Bergen	2
10	Izmir	4	33	Tekirdağ	1
10	Kayseri	4			

Table 18 shows the rank of cities related to Portfolio Value Creation Management

4.3.6 Portfolio Risk Management

10. To your knowledge, to what degree does your city focus on the identification, assessment and management of risks emerging from the development and implementation of SC projects?
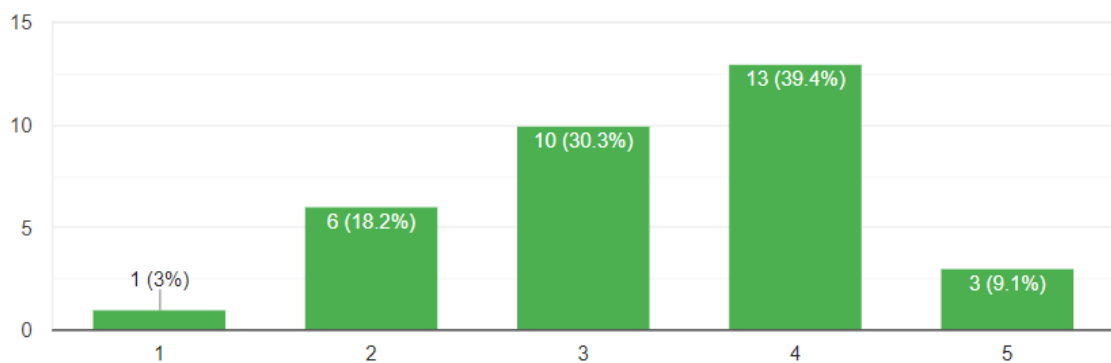
33 responses

Figure 16 shows the distribution of cities that focus on risk identification

Three respondents, Trento, Los Angeles and Kayseri assigned the highest score to this

question, and guaranteed they put lots of resources to manage risks deriving from development

and implementation of SC initiatives. 17 out of 33 cities answered with 3 points or less, so

most of cities effort in the identification and management of risks is not more than average, as

they prefer giving more importance to other process. Once again, city of Tekirdağ ranked last,

confirming his poor implementation of Portfolio Management standards.

Rank	City	Risk Management	Rank	City	Risk Management
1	Trento	5	16	Vejle	3
1	Kayseri	5	16	Bologna	3
1	Los Angeles	5	16	Florence	3
4	Melbourne	4	16	Innsbruck	3
4	Istanbul	4	16	San Diego	3
4	Valencia	4	16	Amsterdam	3
4	Leeds	4	16	Copenhagen	3
4	Parma	4	16	Ankara	3
4	Vilnius	4	16	Bergen	3
4	Budapest	4	27	Linz	2
4	Kocaeli	4	27	Antalya	2
4	Helsinki	4	27	Denizli	2
4	Bursa	4	27	Tampere	2
4	Barcelona	4	27	Van	2
4	Vienna	4	27	Hong Kong	2
16	Izmir	3	33	Tekirdağ	1
16	Montreal	3			

Table 19 shows the rank of cities related Portfolio Risk Management

5   DISCUSSION AND INTERPRETATION

5.1 Smart City Organizational Approach (written by Berkay Çalışır)

This section contains discussions and interpretations that have been made considering the results obtained and deployed in the previous section. It will try to answer the initially decided research questions and evaluate the degree of the success in terms of objective achievement.

There are 3 research questions and 3 objectives which gave rise to this research paper. 2 of those questions and objectives are related to organizational approaches and organizational structure of the city governments. Questions regarding to those aspects were asked to participants of the survey in the first part of the survey and answers received were deployed in the previous results section. First research question this thesis tries to answer is "Do city administrations use bottom-up or top down approach?" to satisfy the first objective which is to find out whether smart city projects are initiated by local governments or private organizations. Accordingly, second research question is "Are smart city offices or offices involved in smart city initiatives organized as project management offices?" to satisfy the second research objective which is to determine whether city offices involved in smart city initiatives are organized as project management offices or not. Results were received and shared for both of these questions but they will be discussed more in detail in this section.

To begin with, a list, Table 20, contains different information gathered together is shared below. The figure contains the preferences of the participant cities in terms of top-down bottom-up approaches, presences or absences of project management offices and presences or absences of centralized smart city offices. The question regarding to project management were asked as a scaled question. On the other hand, Table 20 contains binary results where every city has either a project management office or not. To convert answers from 1 to 5 to binary results, answers below 3 accepted as an indication of lack of a project management office.

Answers equal and above 3 accepted as presence of a project management office and conversion was done accordingly. Similarly, the question regarding to centralized smart city office is a 3 optioned question. Participants had to choose among 3 possible answers where possible answers were centralized smart city office, different offices involve in the development and implementation of smart city projects and both. Answer "both" evaluated as centralized smart city office since this answer states there is a centralized smart city office which is not responsible for every smart city project of the city, but still there is a centralized smart city office. After giving these information, Table 20 can be seen below.

	Cities	Top Down	Bottom Up	Top-down driven bottom-up effort	PMO	Centralized Smart City Office
EUROPE	Amsterdam (Netherlands)		✓		✓	
	Barcelona (Spain)			✓	✓	✓
	Copenhagen (Denmark)	✓			✓	
	Helsinki (Finland)			✓	✓	✓
	Istanbul (Turkey)			✓	✓	✓
	Vienna (Austria)			✓	✓	✓
	Budapest (Hungary)	✓			✓	
	Valencia (Spain)	✓			✓	✓
	Florence (Italy)			✓	✓	✓
	Bologna (Italy)		✓		✓	
	Vilnius (Lithuania)			✓	✓	✓
	Leeds (England)			✓	✓	✓
	Linz (Austria)			✓	✓	
	Innsbruck (Austria)	✓				✓
	Parma (Italy)			✓	✓	✓
	Trento (Italy)			✓	✓	✓
	Tekirdag (Turkey)			✓		
	Tampere (Finland)			✓	✓	
	Bergen (Norway)			✓	✓	✓
	Vejle (Denmark)	✓			✓	✓
NORTH AMERICA	Montreal (Canada)	✓			✓	✓
	San Diego (USA)			✓		
	Los Angeles (USA)			✓	✓	✓
ASIA	Hong Kong (PRC)			✓		
	Ankara (Turkey)			✓	✓	✓
	Izmir (Turkey)	✓			✓	
	Bursa (Turkey)	✓			✓	✓
	Antalya (Turkey)	✓			✓	
	Kayseri (Turkey)			✓	✓	✓
	Kocaeli (Turkey)	✓				
	Denizli (Turkey)			✓	✓	
	Van (Turkey)		✓			
OCEANIA	Melbourne (Australia)			✓		✓

Table 20 shows preferences of the participant cities in terms of their organizational approaches, PMOs and centralized smart city offices

First critical issue that has to be discussed is preferences of the cities regarding to their business approaches. As it is expressed in the previous section, 10 of the participants such as Copenhagen, Budapest and Montreal stated that they are following top-down approach which means initiation of the smart city projects are made by local authorities and governments instead of private entities and project diffusion occurs from top to down. Only 3 of the participant cities expressed that they are following bottom-up approach which means initiation of the smart city projects are made by private organizations and duty of local governments is mostly consulting and auditing. In this case, diffusion starts from the bottom and move towards up. 20 of the participants which include important cities in terms of smart city initiatives such as Barcelona, Helsinki, Melbourne and Istanbul stated that their cities are following a top-down driven bottom-up effort approach. This approach can be stated as unique mixture of both top-down and bottom-up approaches. It allows a more balanced division of responsibilities between local governments and private organizations and requires the involvement of both type of entities.

The data shows that 30% of the participant cities prefer a pure top-down approach and even though 61% of them allows some autonomies to private entities, they still prefer to govern the smart city initiatives. Only 9% of the participant cities governments prefer not to be involved in smart city initiations extensively and applies free-market competition in this brand-new advancing sector.

Interestingly, 2 out of 3 cities which stated to follow a bottom-up approach can be considered as cities with successful smart city initiatives and hold a high place in some global smart city rankings. One of the cities that follows bottom-up approach is Amsterdam. It holds 3rd place in 2019 global smart city index after London (UK) and New York (USA) according to the "IESE Cities in Motion Index" published by IESE Business School (2019). Addition to this, it holds 4th place in global smart city ranking according to Joss, Sengers, Schraven,

Caprotti and Dayot (2019). Second city that stated to follow bottom-up approach is an Italian city, Bologna. Despite of the fact that Bologna is not one of the leading smart cities in the world, it is still one of the most successful cities in terms of smart city initiatives in Italy. On national level, Bologna holds the first place in smart city rankings according to Ernst & Young's "Report of Smart City Index 2016". Although, Bologna lost its first place and shifted down to third place according to Ernst & Young's "Report of Smart City Index 2018", it is still one of the leading smart cities in Italy.

Moreover, all these cities which follows bottom-up approach also doesn't have a centralized smart city office. It is a logical result since, as it is mentioned before, bottom-up approach is a type of approach where private organizations fund and initiate smart city projects more independently comparing to other two approaches and it doesn't require a centralized smart city office like the other two approaches. Considering top-down approach, there might be a need of centralized smart city office since local governments are the primary administrators of the projects. On the other hand, bottom-up approach allows companies to enter profitable markets more autonomously so the presence of a centralized smart city office is not necessary.

Furthermore, 2 out of 3 cities which prefers bottom-up approach organized their smart city offices as project management offices. These 2 cities are Amsterdam and Bologna. This is an interesting result since a correlation can be made.

According to this information, there is an obvious correlation between having a bottom-up approach, having a project management office and having a centralized smart city office. You can see the 3 related cities below, in Table 21.

City	Approach	SC Office	PMO
Amsterdam	Bottom-up	Decentralized	Yes
Bologna	Bottom-up	Decentralized	Yes
Van	Bottom-up	Decentralized	No

Table 21 shows the list of cities uses Bottom-up approach

As it is discussed before, Amsterdam and Bologna are one of the most successful cities regarding to their rankings and conditions. Free market competition proved its efficiency with capitalism and liberalism already. Bottom-up approach can be considered as related methodology in the universe of smart city business approaches. Adding a decentralized smart city office which means different city offices involved in the development and implementation of smart city projects also strengthens the mentioned condition. Lastly, organizing these offices as project management offices obviously increase the efficiency of the outputs. Apparently, this formula brings the success. Van only differentiates from Bologna and Amsterdam in terms of organizing its offices as project management offices. It indicates that if Van organizes the smart city related offices as project management offices, it can become a promising member of the bottom-up approach preferred cities and might become a successful smart city where private organizations tend to invest in. Of course, different variables such as economical and geographical position of the city or having a good human capital etc. effects the success of a city but these are out of our scope of research.

To sum up, bottom-up approach seems like a promising approach based on the literature review and empirical study that have been made. As Breuer et al. (2014) stated, "We argue that collaboration between the public sector, private actors and citizens, and all those players amongst themselves, is the key for making cities smarter" (pg. 161). Our study on the issue shows that bottom-up approach satisfies the mentioned condition sufficiently and should be given a chance. There isn't a lot of cities around the world which tries to apply this approach. The ones which applies this approach, combines it with decentralization of smart city offices

and follows project management methodology seems to have extraordinary results. The cities

which are willing to implement smart city solutions around the globe have to observe and

analyze the success of these cities, Amsterdam and Bologna, and their approaches towards

smart city projects.

5.2 Portfolio Management (written by Mariano Amico)

5.2.1 Portfolio Management Domains

In order to understand the overall importance that cities give to the standard Portfolio Management processes and to know the ones on which city administration put most effort and resources we calculated the arithmetic average of the scores assigned to each process.

While every process has a result between 3 and 4, as shown in Table 22 Stakeholder Management and Value Management are the top ones with a 3.72 average. In third position we find Strategic Management, followed by Risk Management and Governance. Capacity and Capabilities Management had the worst average result of 3.11.

Difference between the best and worst process is not big, meaning that there is not one or more domain which is rated as low important by offices involved in Smart City projects development and implementation. So, we can say that every basic process of Portfolio Management has a fundamental role when adopting a Portfolio approach and almost all of the cities implement with more or less focus all of them.

For this reason, we decided to assign the same weight to every process in order to elaborate an overall city ranking on the adherence to Portfolio Management standards.

	Answer Average	Process	Process Average
SC projects aligned with city's strategic plans	3,53125	Strategic Management	3,53125
Formally structured governance	2,9375	Governance	3,27
Elected administration's influence	3,59375		
Capabilities assessment ability	3,09375	Capacity & Capability Management	3,11
Capacities assessment ability	3,125		
Focus on stakeholder engagement	3,71875	Stakeholder Management	3,71875
Focus on value creation	3,71875	Value Management	3,71875
Focus on identification, assessment of risk	3,3125	Risk Management	3,3125

Table 22 shows the average answers of the different portfolio processes

5.2.2 Ranking of the Cities

We then calculated the final ranking of cities in order to understand which are the ones that implement a Portfolio approach following in the closest way the PMI international standards.

As shown in Table 23, Valencia resulted the best city out of the 33 respondents to our survey. Valencia scored a high 4.67 score, stating its top effort in adopting a Project Portfolio Management approach in the development and implementation of Smart Cities initiatives. Trento and Vilnius followed on the podium with respectively 4.60 and 4.42.

In total, 13 cities managed to obtain a 4 or higher final average and we can consider these

the ones who are really focusing on PPM methods in their SC offices. 11 cities didn't reach the

3 points average and the worst ones resulted Hong Kong, Antalya and Tekirdağ with lower

than 2.5 points, with the last one the only to not even reach the 2 points mark. We can conclude

these cities are following different approaches in developing and managing projects related to

the SC world.

Rank	City	Processes Avg	Rank	City	Processes Avg
1	Valencia	4,67	18	Helsinki	3,67
2	Trento	4,50	19	Bologna	3,50
3	Vilnius	4,42	20	San Diego	3,33
4	Parma	4,33	21	Vejle	3,08
4	Montreal	4,33	22	Innsbruck	2,92
6	Istanbul	4,25	23	Linz	2,75
6	Vienna	4,25	24	Denizli	2,67
8	Los Angeles	4,17	24	Tampere	2,67
9	Budapest	4,08	24	Amsterdam	2,67
9	Leeds	4,08	24	Bergen	2,67
11	Melbourne	4,00	24	Kocaeli	2,67
11	Florence	4,00	29	Van	2,58
11	Barcelona	4,00	30	Copenhagen	2,50
14	Kayseri	3,92	31	Hong Kong	2,25
14	Ankara	3,92	32	Antalya	2,08
14	Bursa	3,92	33	Tekirdağ	1,33
17	Izmir	3,85			

Table 23 shows the rank of cities related to implementation of SC processes

Cities with a result of 4 or more are assigned to the Top group colored in green, cities that

obtained a score between 3 and for to the yellow Mid group, and the worst ones with a lower

than 3 average are allocated to the Low group characterized by the red color

Analyzing the rankings, we can extract some information and make interesting hypothesis:

- Taking into consideration the dimension of city given by its population, we can observe that the population range of the 33 respondents is very large: the smallest city is Vejle with 107,000 inhabitants, while the biggest one is Istanbul, counting a population of more than 15 million people. If we calculate the average population of the cities regrouped by performance in PPM implementation, we observe a difference in dimensions between the top ranked cities and the others: as shown in the Table 24, the top ones are 2.5 times bigger on average population than the worst ones. However, since the sample is not so big, there is a noise represented by the city of Istanbul: in fact, by taking the city out of the sample the average goes down from 2.5 million to 1.5 million. So, we can say that there are not big differences in cities dimensions between the ones that adopt with success a Portfolio management approach and the ones who don't.

Performance in PPM implementation	Average Population
Top	2.595.835
Mid	1.813.246
Low	1.089.367

Table 24 shows the average populations of the different performance groups in PPM

- In the Figure 17 we have an immediate visual comprehension of the different population sizes of the cities in our sample and their performance in PPM implementation resulted in our study. Size of the bubble indicates the population of the city and the color its PPM performance group it was assigned before.
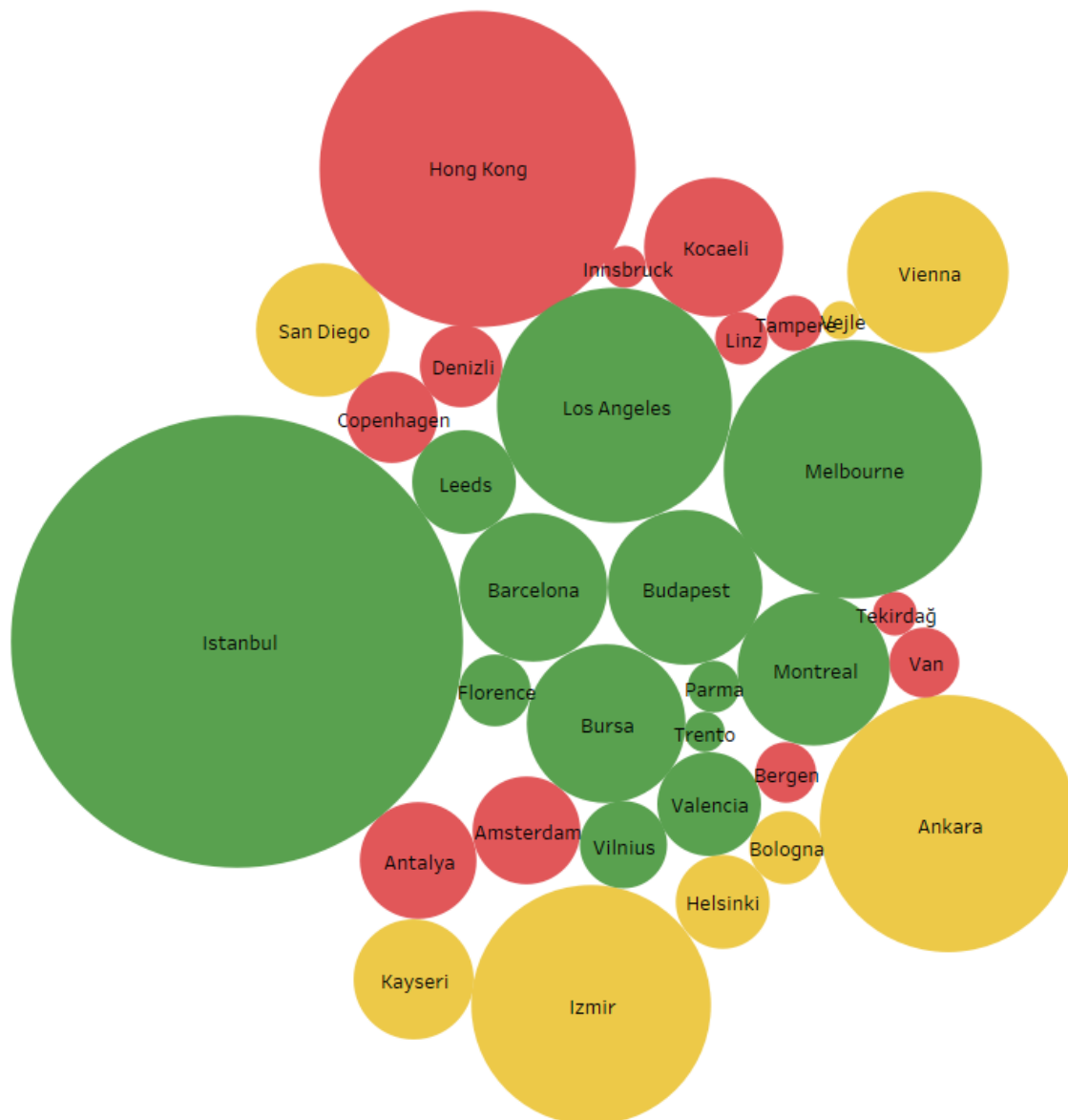
Figure 17 shows the correlation between the cities' performance in PPM and their population

- There are some interesting aspects to be analyzed about the maturity of PPM approach. Cities that obtained top results in the PPM implementation also ranked in a good position in the general Smart City rankings: in fact, out of 11 cities that got a score of 4 or higher, 8 of them were in the top 100 world SC either in the IESE Cities in Motion Index 2018 or in the EasyPark Smart Cities Index. Two of the excluded 3 were the Italian cities of Trento and Parma that were not considered in those studies, but ranked

among the top 6 Italian cities in the Ernst and Young Smart City Index Report on

Italian cities. All of these cities, except Budapest, have a centralized SC office, and

only one of them, Melbourne, doesn't organize its SC offices as PMOs.

-       In the group of cities with the worst performance in PPM implementation, only 3 out

of 12 are among the top 100 world cities in the considered studies. However, these 3

cities are top performers in the SC world: Amsterdam, Copenhagen and Hong Kong.

It is interesting to see that none of these cities has a centralized SC office; furthermore,

Amsterdam follows a purely bottom-up approach and Hong Kong doesn't even

organize its city offices as PMOs. We observe that these cities decided to take different

approaches that didn't include a Portfolio Management implementation, but they are

very strong cities adopting their own strategies in a very successful way.

Performance in PPM implementation	% of Cities in a good SC ranking position
Top	91%
Mid	25%
Low	25%

Table 25 shows the correlation between PPM performance groups and SC rankings

Our results hence suggest that cities that have a centralized Smart City office or, having

different offices involved in SC initiatives still organize them as PMOs, benefit from the

implementation of Portfolio Management processes.

To conclude, we encourage the adoption of a Portfolio Management approach to manage

SC projects, especially for cities that develop their SC initiatives through a dedicated office:

from observing and analyzing current trends, we believe that in this way they can improve their

performance and efficiency in the creation of the best Smart City environment.

5.3 Limitations (written by Berkay Çalışır)

To begin with, as it mentioned in the methodology part, despite communication has been made excessively and repeatedly with more than 190 cities around the world through different communication channels such as e-mails, websites, communication forms, LinkedIn and even WhatsApp hot lines, only 33 cities participated to the survey which approximately corresponds to 17% reply rate. Although it can be considered as a relatively low reply rate, the information gathered from the participant cities is still sufficient enough to make some inferences related to the research questions of this thesis since some of the participant cities are leading cities according to important smart city rankings which have been referred before.

Possibility of bias responses can be considered as another limitation for our research. Although the people communicated are professionals working in local governments and likely experienced in smart city projects, their views can still be biased. Since it is already hard to find someone who works in local governments, experienced in smart city projects and willing to fill the survey, we didn't have a chance to cross check the provided information.

Lastly, obtained data can be considered as geographically biased either. There isn't enough number of responses to reach generalized results for certain regions and continents which prevented to obtain reliable outcomes. For example, only one city responded the survey from Oceania and it is impossible to generalize whole continent with just one example. Same condition applies to Asia as well. Hong Kong is the only participant city from Asia excluding the Turkish cities. Although, Turkish cities are in Asia geographically, it is very likely that they don't demonstrate the same features with East Asian cities. Turkey is a European Union candidate state and its' cities more likely to demonstrate European standards instead of Asian ones.

6 CONCLUSION

This work aimed at answering 3 research questions:

1) Do city administrations use bottom-up or top-down approach?

2) Are smart city offices or offices involved in smart city initiatives organized as PMOs?

3) Do city offices responsible for SC projects follow Portfolio Management Methodology?

As it is mentioned before in literature review part, literature is insufficient to answer these research questions. As a consequence, a survey was conducted to obtain the data required to answer these questions. With the data gathered from the survey submitted to cities administrations, it was possible to give a reliable answer to each of them. It was understood that 61% of the cities follow a mixed approach where initiatives are mostly started by private organizations, but the city administration provides guidance and assistance in their development and implementation. On the other hand, it was seen that the cities preferred bottom-up approach such as Amsterdam and Bologna are successful cities in terms of independent rankings mentioned before which shows organizational approach is promising.

78.8% of the SC offices, either centralized or domain dedicated are organized as PMOs and this facilitates the adoption of a Portfolio Management approach in the management of projects. However, it was found out only one third of the participants really implement the Portfolio Management in their SC offices, following most of its best practices. This ratio is not high, but the overall performances of these cities in the SC field are very good as they are among the best cities in the various rankings made by independent organizations which shows that they benefit from the adoption of a Portfolio approach.

Furthermore, it was observed that there are cities that decided not to implement PPM, but are among the best in the SC world: they have the common characteristic to not have a centralized SC office and it is though that this is the reason for their choice.

With this information, it is believed that this work can be a useful guide for cities that are looking for methods to improve their performance in the management of SC initiatives: the adoption of Portfolio Management best practices especially for cities that develop SC initiatives in a centralized office is encouraged, as this can be a trigger to improve their performance and ratings in the rapidly growing environment of the Smart City. It is also suggested that cities should consider bottom-up organizational approach since the data gathered shows that it has a huge potential for success.

7   REFERENCES

Albino, V., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. Journal of Urban Technology, 22(1), 3–21.

Angelidou, M. (2014). Smart city policies: A spatial approach. Cities, 41, S3–S11.

Anthopoulos, L.G. (2017). Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick? Public Administration and Information Technology 22, DOI 10.1007/978-3-319-57015-0_2

Anthopoulos, L., & Fitsilis, P. (2014). Smart cities and their roles in city competition: A classification. International Journal of Electronic Government Research (IJEGR), 10(1), 67–81.

Anthopoulos, L., & Reddick, Ch. (2015). Understanding electronic government research and smart city. Information Polity, 21(1), 99–117. doi:10.3233/IP-150371.

Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., et al. (2012). Smart cities of the future. European Physical Journal Special Topics, 214, 481–518.

Bemelmans-Videc ML, Rist RC, Vedung E. Carrots, Sticks and Sermons. (1998). Policy Instruments and Their Evaluation. New Brunswick: Transaction Publishers; 1998.

Berrone, P., Ricart, J. E., Duch, A., & Carrasco, C. (2019, May 06). IESE Cities in Motion Index. Retrieved June 2019 from <https://media.iese.edu/research/pdfs/ST-0509-E.pdf>

Breuer, J., Walravens, N., & Ballon, P. (2014). Beyond Defining the Smart City. Meeting Top-Down and Bottom-Up Approaches in the Middle. TeMA - Journal of Land Use, Mobility and Environment. Retrieved May 2019 from <https://doi.org/10.6092/1970-9870/2475>

Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. Journal of Urban Technology, 18(2), 65–82.

Cellary, W. (2013). Smart governance for smart industries. The Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance (ICEGOV '13), October 22–25 2013 (pp. 91–93). Seoul: Republic of Korea.

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J.R., Mellouli, S., Nahon, K., et al. (2012). Understanding smart cities: An Integrative Framework. In The Proceedings of the 45th Hawaii International Conference on System Sciences (HICSS) (pp. 2289–2297).

Clegg, S.R., Pitsis, T.S., Rura-Polley, T., Marosszeky, M. (2002). Govern mentality matters: Designing an alliance culture of inter-organizational collaboration for managing projects. Organization Studies 2002; 23(3): 317–337.

Cocchia, A. (2014). Smart and digital city: A systematic literature review. In R. P. Dameri & C. Rosenthal-Sabroux (Eds.), Smart city, how to create public and economic value with high technology in urban space. U.S.: Springer.

Crawford, J.K. & Cabanis-Brewin, J. (2011). The strategic project office (2nd ed.). Boca Raton, FL: CRC Press.

Dameri, R. P., & Cocchia, A. (2013). Smart city and digital city: Twenty years of terminology evolution. In X Conference of the Italian Chapter of AIS, ITAIS (pp. 1–8).

De la Peña, B. (2013), The Autocatalytic City. In: T. E. D. Books (ed.), City 2.0: The Habitat of the Future and How to Get There (Ebook). TED Conferences.

Desouza, K. C., & Flanery, T. H. (2013). Designing, planning, and managing resilient cities: A conceptual framework. Cities, 35, 88–89.

Dijkstra, L. & Poelman, H. (2012). Cities in Europe: The New OECD-EC Definition (Brussels: European Commission, 2012) Retrieved May 2019 from <http://ec.europa.eu/regional_policy/sources/docgener/focus/2012_01_city.pdf>

Easy Park Group (2019). Smart Cities Index 2019. Retrieved March 2019 from <https://www.easyparkgroup.com/smart-cities-index/>

Eden Strategy Institute (2018). Top 50 Smart City Governments. Retrieved April 2019 from <https://static1.squarespace.com/static/5b3c517fec4eb767a04e73ff/t/5b513c57aa4a99f62 d168e60/1532050650562/Eden-OXD_Top+50+Smart+City+Governments.pdf>

Giffinger, R. C., Fertner, H., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). Smart cities: Ranking of European medium-sized cities. Retrieved May 2019 from <http://www.smart-cities.eu/download/smart_cities_final_report.pdf>

Gil-Garcia, J., Ramon, J. Zhang, & Puron-Cid, G. (2016). Conceptualizing smartness in government: An integrative and multi-dimensional view. Government Information Quarterly, forthcoming. doi:10.1016/j.giq.2016.03.002.

Gil-Garcia, J. R., Pardo, T. A., & Nam, T. (2015). What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization. Information Polity, 20(1), 61–87.

Gil-Garcia, J., Ramon, N. Helbig, & Ojo, A. (2014). Being smart: Emerging technologies and innovation in the public sector. Government Information Quarterly, 31(S1), I1–I8.

Giraudo, L. & Monaldi, E. (2015). PMO evolution: from the origin to the future. Paper presented at PMI® Global Congress 2015—EMEA, London, England. Newtown Square, PA: Project Management Institute.

Greenfield, A. (2012), The City is Here For You to Use: 100 easy pieces, Adam Greenfield's Speedbird. Retrieved June 2019 from <http://speedbird.wordpress.com/2013/05/07/on-augmenting-reality/>

Hemment, D., & Townsend, A. (2013), Here Come the Smart Citizens. In D. Hemment & A. Townsend (Eds.), Smart Citizens (Vol. 4). Manchester: FutureEverything Publications.

Heng, T., & Low, L. (1993). The intelligent city: Singapore achieving the next lap: Practitoners forum. Technology Analysis & Strategic Management, 5(2), 187–202.

International Standards Organization (ISO). (2016). Sustainable development in communities. Retrieved May 2019 from <http://www.iso.org/iso/iso_37101_sustainable_development_in_communities.pdf>

International Standards Organization (ISO). (2014a). ISO 37120:2014: Sustainable development of communities—indicators for city services and quality of life. Retrieved May 2019 from <https://share.ansi.org/ANSI%20Network%20on%20Smart%20and%20Sustainable%20Cities/ISO%2B37120-2014_preview_final_v2.pdf>

International Standards Organization (ISO). (2014b). Smart cities Preliminary Report 2014. Retrieved May 2019 from <http://www.iso.org/iso/smart_cities_report-jtc1.pdf>

International Telecommunications Union (ITU). (2014). Smart sustainable cities: An analysis of definitions. Retrieved May 2019, from www.itu.int/en/ITU-T/focusgroups/ssc/Documents/Approved_Deliverables/TR-Definitions.docx

Ishida, T. (2017). Digital city, smart city and beyond. In The Proceedings of the 26th World Wide Web International Conference (WWW17), Perth, Australia. doi:http://dx.doi.org/10.1145/12345.67890

Jałocha, B., Krane, H.P., Ekambaram, A., Prawelska-Skrzypek, G. (2014). Key competences of public sector project managers. Procedia - Social and Behavioral Sciences 2014; 119: 247–256.

Joroff, M. (2008), Reshaping the Cities of the 21st Century, MIT School of Architecture and Planning. Retrieved May 2019 from <http://sap.mit.edu/resources/portfolio/reshaping_cities/>

Joss, S., Sengers, F., Schraven, D., Caprotti, F., & Dayot, Y. (2019). The Smart City as Global Discourse: Storylines and Critical Junctures across 27 Cities. Journal of Urban Technology, 26(1), 3-34. doi:10.1080/10630732.2018.1558387

Klakegg, O.J., Williams, T., Shiferaw, A.T. (2015).Taming the 'trolls': Major public projects in the making. International Journal of Project Management 2015.

Komninos, N. (2002). Intelligent cities: Innovation, knowledge systems and digital spaces (1st ed.). London: Routledge.

Koolhaas, R. (2011), Interview with Star Architect Rem Koolhaas, Spiegel Online, 16 December. Retrieved May 2019 from <http://www.spiegel.de/international/zeitgeist/interview-with-star-architect-rem-koolhaas-we-re-building-assembly-linecities-and-buildings-a-803798-2.html>

Lee, J. H., Hancock, M. G., & Hu, M.-C. (2014). Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco. Technological Forecasting and Social Change, 89, 80–99.

Lindsay, G. (2011), Not-So-Smart Cities, New York Times, 24 September. Retrieved June 2019 from <http://www.nytimes.com/2011/09/25/opinion/sunday/not-so-smart-cities.html?_r=0>

Lourenço, J., Santos-Pereira, C., Rijo, R., Cruz-Correia, R. (2014). Service Level Agreement of Information and Communication Technologies in Portuguese Hospitals. Procedia Technology. 2014. 16: 1397-1402.

Maceta, Berssaneti, Monteiro de Carvalho (2016). Project Portfolio Management in the Public Service: A Literature Review

Martinsuo, M. & Dietrich, P. H. (2002). Public sector requirements towards project portfolio management

Meijer, A., & Rodríguez Bolívar, M. P. (2016). Governing the smart city: A review of the literature on smart urban governance. International Review of Administrative Sciences, 82(2), 392–408.

Neirotti, P., De Marco, A., Cagliano, A. C., & Mangano, G. (2014). Current trends in smart city initiatives: Some stylised facts. Cities, 38, 25–36.

O'Reilly, T. (2011), Government as a Platform, Innovations: Technology, Governance, Globalization, 6(1), 13–40.

Pansini F., Terzieva M., Morabito V. (2014). The path towards discovering PMO: an exploratory analysis of the Italian banking sector. International Journal of Information Systems and Project Management 2014; 2(2): 27-40.

POLIS 4.0 Rapporto Smart City Index 2018. (2018). Retrieved June 2019, from <https://www.ey.com/Publication/vwLUAssets/Smart_City_Index_2018/$FILE/EY_SmartCityIndex_2018.pdf>

POLIS 4.0 Rapporto Smart City Index 2016. (2016). Retrieved June 2019, from <https://www.ey.com/it/it/newsroom/news-releases/cs-2016-italia-smart>

Project Management Institute. (2013). A guide to the project management body of knowledge (PMBOK® guide) – Fifth edition. Newtown Square, PA: Author.

Santos, V., & Varajão, J. (2015). PMO as a Key Ingredient of Public Sector Projects' Success – Position Paper. Procedia Computer Science, 64, 1190-1199. doi:10.1016/j.procs.2015.08.546

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart cities and the future internet: towards cooperation frameworks for open innovation, the future internet. Lecture Notes in Computer Science, 6656, 431–446.

Shepard, M., & Simeti, A. (2013), What's So Smart About the Smart Citizen? In: D.
    Hemment & A. Townsend (eds.), Smart Citizens (Vol. 4). Manchester: FutureEverything
    Publications.

The standard for portfolio management, 4th edition. (2017). Newtown Square, PA: Project
    Management Institute.

Top-down and bottom-up design. (2019, May 02). Retrieved July 2019, from
    <https://en.wikipedia.org/wiki/Top-down_and_bottom-up_design>

Top-Down vs. Bottom-Up Approach. (2019, June 19). Retrieved July 2019, from
    <https://www.smartsheet.com/top-down-bottom-up-approach>

UN Department of Economic and Social Affairs, P. D. (2018), World urbanization prospects:
    the 2018 revision. New York, N.Y.: United Nations Publications. Retrieved May 2019
    from <https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf>

United Nations. (2005). Demographic yearbook 2005. Retrieved May 2019 from
    <http://unstats.un.org/unsd/demographic/sconcerns/densurb/Defintion_of%20Urban.pdf
    >

United Nations Human Settlements Programme. (2012), STATE OF THE WORLD'S
    CITIES 2012/2013. Nairobi, Kenya: UNHABITAT. Retrieved May 2019 from
    <http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3387>

ANNEX: SURVEY

COVER LETTER

Dear Participant,

The research program from Politecnico di Torino **"CityFIT - Smart City Finance&Technology Research Program"** (https://www.researchgate.net/project/CityFIT-Smart-City-Finance-Technology-Research-Program), directed by professor **Alberto De Marco** (https://it.linkedin.com/in/alberto-de-marco-1259706), has the overall objective of exploring the relationships between project management practices and how cities develop, implement, and manage their Smart City efforts, with the goal of collecting best practices and supporting cities and private organizations in their decision-making processes.

As a stepping stone in pursuing these ambitious objectives, we would like to ask for your help and collaboration by proposing you a brief survey. The goal of this survey is to understand the management strategies and approaches adopted by the major players in the SC world and evaluate their maturity in relationship with international standards.

We are going to use your answers to assess the best practices adopted by cities worldwide in developing, implementing, and managing Smart City projects. We will then analyze the maturity of these approaches and evaluate their impact. The results of this extensive analysis will be distributed to all participants with the goal of providing a useful benchmark and tool for supporting your city's decision-making processes in the management of Smart City projects and initiatives.

The online survey attached below will take an approximate 5 to 10 minutes to complete. All data will be collected anonymously and treated in compliance with privacy laws and regulations. We would also kindly ask you to share this survey with all the colleagues you believe may be interested in participating in this study to improve its coverage and accuracy.

Thank you in advance for your time and your precious help.

Best Regards,

Berkay Çalışır
Mariano Amico
MSc Candidates

Smart City Management

The goal of this survey is to understand the management strategies and approaches adopted by the major players in the SC world and evaluate their maturity in relationship with international standards.

* Required

1. **Which city are you working for ? ***

   _____

2. **What is your position ? ***
   Mark only one oval.

   ( ) Manager

   ( ) Director

   ( ) Politician

   ( ) Other: _____

3. **How would you describe the approach taken by your city in developing and implementing SC projects? ***
   Mark only one oval.

   ( ) Purely top-down: The development and implementation of SC initiatives are strictly guided by the city's SC strategic plan, driven by the direct involvement of the city administration, and enabled by public funding

   ( ) Purely bottom-up: Private entities, communities and citizens are the main drivers of SC development and implementation with minimal involvement of the city government

   ( ) Top-down driven bottom-up effort: The city administration guides and enables the development and implementation efforts of private organizations, citizens and communities

4. **Does your city have a dedicated centralized SC office focused on supporting and guiding the development and implementation of SC projects or do different city offices responsible for different types of SC projects? ***
   Mark only one oval.

   ( ) Centralized SC office

   ( ) Different offices involve in the development and implementation of SC projects

   ( ) Both

5. **In which of these SC domains is your city more focused and involved? ***
   Check all that apply.

   [ ] Natural Resources and Energy

   [ ] Transport and Mobility

   [ ] Buildings

   [ ] Living

   [ ] Government

   [ ] Economy and People

   [ ] All of the above

6. **To your knowledge, is the office/offices involved in guiding, enabling and supporting the development of SC projects organized as Project Management Offices (PMOs)? ***

PMO is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques.
Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

7. **To your knowledge, does the office/offices involved in guiding, enabling and supporting the development of SC projects follow a Project Portfolio Management approach? ***

Portfolio management balances conflicting demands among portfolio components, allocates resources (e.g., human, financial, assets, and intellectual) based on organizational priorities and capacity, and integrates management principles and sound practices to deliver business value aligned with the strategic objectives.
Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

Smart City Project Portfolio Management

Purpose of this section is to evaluate the maturity of the cities' Project Portfolio Management approaches by asking questions about the six main categories of Portfolio Management issued by Project Management Institution. These six categories are strategic management, governance, capacity and capability management, stakeholder engagement, value management and risk management.

8. **Does your city have a formally defined strategic smart city plan ? ***

Mark only one oval.

◯ Yes

◯ No

◯ Don't know/no opinion

9. **Does your city have a formally defined Portfolio Roadmap ? ***

Mark only one oval.

◯ Yes

◯ No

◯ Don't know/no opinion

10. **To your knowledge, to what degree does your city ensure that investments and efforts in developing and implementing SC projects are aligned with the city's strategic plans? ***

Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

11. **To your knowledge, to what degree does your city implement a formally structured form of governance for the management of SC projects?** *

Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

12. **How much is the political/elected administration important in the development and implementation of your city strategic Smart City plan?** *

Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

13. **To your knowledge, to what degree is your city able to assess its capabilities when managing the development and implementation of SC projects?** *

A capability is the ability of an organization through its people, processes, and systems to execute an entire portfolio of initiatives for delivering goods and services.
Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

14. **To your knowledge, to what degree is your city able to assess its capacities when managing the development and implementation of SC projects?** *

Capacity is the organisations' ability to fulfill aggregate resource demands for successfully executing a planned portfolio of initiatives.
Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

15. **To your knowledge, to what degree does your city focus on citizens and, more in general, stakeholder engagement when managing the development and implementation of SC projects?** *

Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

16. **To your knowledge, to what degree does your city focus on value creation when choosing and managing the development and implementation of SC projects?** *

Value is an indicator of the effect an entity or offering can deliver. That effect can be seen in a number of ways—for example, as increased revenue, increased profit, or reduced risk.
Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

17. **To your knowledge, to what degree does your city focus on the identification, assessment and management of risks emerging from the development and implementation of SC projects?** *

Mark only one oval.

	1	2	3	4	5	
Not at all	◯	◯	◯	◯	◯	Completely

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