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SMART CITIES, SMARTER MANAGEMENT: DEVELOPING A SMART FRAMEWORK FOR SMART CITY PROJECTS MANAGEMENT IN EUROPE

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ABSTRACT

The smart cities concept is currently considered one of the "hottest topics" in urban development, especially in Europe. Cities around the globe have been promoting and supporting SC projects, reflecting the belief that integrating technology and infrastructure can enhance cities' liveability, sustainability, services and competitiveness. Though a lot of research on the topic has been done, there are still limited insights into the managerial angle. This paper aims to fill this gap by exploring the SC through a lens of management in order to develop a deeper understanding of SC projects. Also, it focuses on the role of smart management in the SC project success by viewing the SC as a unique complex project and identifying SC projects success practices and challenges. Through a quantitative correlational study, the thesis investigates the relationship between smart project management practices and SC project success in different SC projects located in Europe. Based on the analysis, a conceptual framework was proposed setting out a holistic view of SC projects management.

Keywords: *Smart cities, Management, Project management, Smart success practices, Conceptual framework.*

1.Introduction

In recent years, the world has faced some of the most serious economic, environmental, social and technological issues. Since cities are a focal point for these profound issues; the smart city concept has emerged to represent the opportunities and challenges facing cities as they respond to these changes and the problems generated by the urban population growth and rapid urbanization. More than ever before, technology companies realized the big and growing market of smart cities and acted accordingly. According to the latest update of the Navigant Research report, first published in 2013, 250 smart city projects globally in more than 178 cities around the world have been identified with the majority focusing on government and energy initiatives. Moreover, smart cities are foreseen to create tremendous business opportunities with a $2.57 trillion market value by 2025 according to Grand View Research Inc. 2018 report. City leaders and technology and service providers all over the world have set their new focus on adopting the smart city concept by laying-out smart city strategies, demanding for more data-driven policymaking, boosting innovative projects, making smart city development relevant to citizens and their lives and setting standards for driving smart city programs to the next level (Woods et al., 2016).

As mentioned before, creating smarter cities is very attractive to a city, however, it can be a critical task for assorted reasons. First, the Smart City concept is still blurred, and it intersects with multidisciplinary areas. Second, strategies to implement and manage SC projects vary among cities not to mention that due to the cities' complexity, many factors such as human, technological, institutional, etc. make smart city initiatives ineffective (Hartemink, 2016).

One of the crucial factors that lead to the failure of smart city projects is the managerial and organizational challenges (Chourabi et al., 2012). And even though many researchers tend to spotlight the technological sides of the smart city, its organization and policy issues have not gained much attention (Nam and Pardo, 2011b). As a result, there are still limited insights on the barriers and the success factors for effective and efficient management of smart city projects and how can the appropriate practices affect or contribute to the success of smart city projects. Moreover, there is a lack of an integrated smart framework for smart city projects management in different contexts.

Accordingly, this paper aims to define the boundaries of smart cities research from a managerial angle and to fill some of the theoretical and practical gaps by analysing the relevant literature to identify common and different management characteristics in smart

cities projects and highlight the success factors and challenges smart cities projects' managers may face. Also, it proposes a conceptual framework setting out a holistic view of smart city projects management. This translates into the following research question:

How to run smart city projects efficiently and effectively in Europe?

How do smart project management practices influence the project success in Europe?

To illustrate, this study sets the following objectives:

1- Define the smart city concept and develop a better understanding of smart city projects from a managerial point of view.

2- Identify the main challenges and factors that affect smart city projects management.

3- Analyse the impact of smart project practices on project success.

4- Analyse the impact of smart city project size and context on the relationship between smart practices and project success.

5- Establish an integrated smart framework which could be adapted to managing the smart city projects in Europe.

After performing an extensive research in diverse domains like public governance, information technology, we have identified 25 critical factors that form pillar for the management of smart city projects. This research paper is a combination between the project management perspective and the smart city concept which provides a fresh view for smart city projects and defines new several factors that can potentially influence the success of smart city projects. Moreover, the study framework integrates the available knowledge on smart city projects and the research new findings which can provide guidance to organizations and professionals who work in smart city projects.

This paper is organized as follows. Section 2 discusses relevant literature on the smart city and its managerial aspects and identifies the smart practices that undergird the conceptual framework. Section 3 provides a presentation of the paper's data, measures, and methods. Follows in sections 4 and 5, empirical results applying the conceptual framework to smart cities are presented, analysed and discussed. Finally, section 6 draws the relevant conclusions from both theoretical and empirical results, states the managerial implications of this study and the possibilities for further research in this area.

2. Literature review

2.1 Smart city definition

The "Smart city" is a simple label for the complex forces shaping urban life in the 21st century. Even though miscellaneous efforts have been made to academically identify the smart city there is no universally accepted definition of it and the term is still fuzzy, as it means different things to different people with no unified concept or a single template of framing the smart city. The conceptualization of smart city, therefore, varies from city to city, depending on the level of development, ability and willingness to change, resources and the citizen's aspirations (Bhavsar et al., 2016).

There are plentiful definitions for the smart city and its essence. However, most authors emphasize on the infrastructure as the central aspect of the smart city concept while Information and Communication Technology (ICT) is the key driver of the evolution of cities coupled with social, environmental and human capital development. (Monzon, 2015;Borcuch, 2016)

The term "Smart city" was first used in the 1990's where it only focused on the significance of new ICT regarding modern infrastructures within cities. Years later, the amount of publications referring to the smart city has distinctly grown and started to associate with other aspects after it was too technically oriented especially with the emergence of smart city projects and endorsement by the European Union (Albino et al., 2015; Hajduk, 2016).

Innovative governance of large urban systems (IGLUS) explains how smart city operates in three main layers, the infrastructure layer that enables living and working together, the service layer offering services to citizens and customers and the "digital" or "data" layer that emerge from data generated from sensors, cameras, GPS, smartphones and others. The digital layer is what differentiates the smart city from traditional cities and gives a definition to it.

Caragliu et al. (2011) and Giffinger et al. (2007) present less ICT inclusive definition for the Smart city and highlight the interrelationship among infrastructure, ICT, human capital, social capital and other factors.

To sum up, the smart city concept originates from the balanced combination of the technological, human and social factors which implies an innovative approach that is more

intelligent and efficient in the use of resources for achieving urban ecosystem development, sustainable economic growth and improved services that offer a better quality of life and environmental sustainability.

2.2 Why become a smart city?

Cities across the globe are facing significant environmental and urbanization challenges besides other issues such as the ageing infrastructure, the growing global competition and the limited financial resources.While global warming and climate change are dominant on policy agendas across all countries, there is a global challenge to reduce carbon footprint and our environmental impacts.

At the same time, according to the United Nations, the number of people living in cities will increase from 54% to 66% between 2010 and 2050, meaning that 70% of the global population will be urbanized by 2050 (Un.org, 2014). Not to forget the migration crisis with over than a million-migrant arrived in Europe only by 2015 (IOM, 2015).This means that the need for clean water, electricity, homes, efficient transport and city services such as health, education and public safety will increase significantly.

The essence of smart city movement is to address these challenges and deliver better solutions by focusing on sustainability, innovative working life, citizen well-being and economic development.Furthermore, smart cities initiatives aim to improve city efficiency and implement infrastructure management and solutions that can lead to cost-saving and increased revenues. Besides the economical aims and infrastructure modernization, moving towards more environmentally friendly direction; "become greener "is another reason to engage in smart city projects. Furthermore, Smart city projects create a high-quality living and that boost a positive relationship between the city and its citizens. Also, when cities use "Smart" term, it becomes more attractive to both citizens and businesses which enhance the city marketing (Woods et al., 2016). Neirotti presents the value creation in the Smart city for each citizen, public and private sectors. First, cost and time savings in energy, transportations, etc. increase citizen's productivity and empower them. Second, Smart cities create a new market and new revenue opportunities for firms. Lastly, economic development (growth of GDP, employment, exports, foreign direct investment), quality of life, environmental and social sustainability, and less negative externalities are the created value for the public sector and city (Neirotti, 2013).

2.3 What is a smart city project

Many scholars including Giffinger et al. (2007), have set out the smart city main dimensions which are economy, people, governance, environment, mobility and living. Each dimension represents a particular aspect of the city where a smart project aims to achieve smart city goals in efficiency, sustainability and high quality of life. A project is considered smarter when it's associated with a higher number of dimensions (Monzon, 2015).

Van Winden et al. (2016) Assume that smart city projects are those projects which use modern technology to generate economic, social and ecological value, run by multiple organizations as a partnership and include innovation or experimentation.

Fleischmann and Heuser (2015) define the smart city projects as the ones that are driven by institutions which develop the project objectives according to the challenges and key performance indicators (KPIs) of the smart city vision with the involvement of citizens. Two approaches can be identified; the top-down approach (the project is initiated by government or institutions) or the bottom-up approach (the project is initiated by citizens).

ASCIMER (assessing smart city initiatives for the Mediterranean region) has recognized three characteristics for smart city projects that impact and contribute to the smart city. First, innovation where technology should be promoted in smart city projects to solve the old urban issues in a new innovative way. Second, integration where smart city projects should help creating interconnected systems and managing knowledge and information efficiently among them, increase communication between institutions and citizens and increase cooperation between public and private institutions and civil entities. Third, inclusion where some smart city projects engage people in their projects, if not, smart city projects should communicate benefits of the project to citizens.

2.4 Smart city projects' participants

Smart city projects include many different partners and stakeholders that engage together and play different roles to create a smart city.

Leydesdorff and Deakin (2011) introduce the triple-helix model that defines the main three actors in the smart city which are government, industry and universities. Other researchers such as Lombardi et al. (2012) and Aoun (2013) include other actors in the smart city who are citizens as the main actor also, NGOs, utilities, investors, planners and developers who

collaborate to achieve smart city projects. Each stakeholder plays a key role in delivering the vision of the smart city. For instance, governments set policies, provide funds and bring other stakeholders together in innovation programs where city administration and associations act as regulators, set benchmarking and collaboration mechanisms, and engage citizens in smart city projects. Also, investors and financial institutions provide funding to smart city projects where academia provides R&D and knowledge that supports smart city projects. Moreover, industry including private or public sectors and utilities are operators, developers and owners which create solutions, new business models and boost innovation. Finally, citizens and communities provide ideas and feedbacks and engage with city services (The European Commission, 2013).

2.5 Smart City Projects Challenges

Smart city projects challenges include the classic projects' challenges and other specific challenges emerging from the complexity and innovative nature of smart city projects. Smart city projects challenges inspire partners, managers and city leader to come up with innovative solutions. In the following, the challenges that might come across managers are classified.

2.5.1. Technological challenges

Smart city projects depend extremely on technology. However, implementing digital infrastructure is challenging because of the lack of knowledge about ICT systems and compatible software, the security and privacy problems where systems may get hacked or infected by viruses etc., the high cost of installing, operating and maintaining IT systems and the cost of training and hiring IT specialists (Kogan and Lee, 2014).

2.5.2. Financial constraints

Smart city projects require significant financial resources to adapt technology to the city existed infrastructure which is more expensive than building a new smart city. The main challenges are finding who can fund the project, choosing the right investment that will create long-term efficiencies, benefits, and return, the tendency to avoid huge investments that generate long-term benefits and focusing on short-term, and the need for innovative business, operating and finance models in order to transition from pilot projects into full-scale projects (Kogan and Lee, 2014).

2.5.3. Lack of collaboration among different stakeholders and governmental restraints

Smart city projects require collaboration among private organizations, public institutions, NGOs, citizens, etc. which increase the complexity of these projects. The main challenges are poor communication and coordination among these participants, the leadership style, lack of policies for open data that enables sharing across departments and organizations, lack of support from both local government and city administration, the time taken by organizations involved in the project to make decisions and breaking down silos that hinder the success of the project (Woods et al., 2016; Kogan and Lee, 2014).

2.5.4. Managerial and organizational challenges

One of the challenges of smart city projects is their size and scope where two types of projects can be defined; Greenfield projects which are huge, long-term, and usually starts from zero and Brownfield projects which are smaller sized projects, short-term and fast implemented are usually built on existed infrastructure and are preferred by investors for generating fast revenues. Another challenge is leadership style and manager's technical and social skills. Similarly, the lack of understanding solutions that leads to poor decisions. Also, the absence of educated and qualified teams who can work in these complex and high-tech projects, resistance to change and inadequate training are also one the smart city projects challenges. Moreover, the diversity of the project's relevant stakeholders creates conflicts about who will govern and finance or who will capture the created value. Finally, having multiple goals that do not align with the project vision can be challenging, also, miscommunication of the project's objectives to the local community (Chourabi et al., 2012).

2.5.5. Social challenges

Smart city projects need to engage citizens and create a common understanding of the key objectives, opportunities, and challenges among all smart city project participants. The main challenges lie in how to motivate and involve citizens in smart city projects, measure and express the value created by the smart city project for citizens, the digital divide in the city and change the behaviour and thinking of citizens to what's called "smart thinking" (Woods et al., 2016; Kogan, 2014; Ojo et al., 2014).

2.6 Smart City Projects' Management Success Factors

Researchers analysed successful and failed projects so factors that contribute to the project success can be identified. Many general factors are mentioned in the literature such as IT which enables the transformation to the smart city, yet other important factors should be

considered such as policy and organizational elements to guarantee the successful implementation of the project (Rodriguez-Bolivar, 2015).

In a report for European Union (2014) successful initiatives are defined as the following "observable indicators through the life cycle of the initiative: attracting wide support, having clear objectives aligned to policy goals and current problems, producing concrete outcomes and impacts and being imitated or scaled" (Manville, 2014).

Beurden and Andrews (2011); Achaerandio et al. (2012); The Climate Group (2013) argue that smart city initiative needs people, enabler environment and effective management and organization to the project processes.

A report from mapping smart cities in EU (2014) identified factors that contribute to the successful project implementation. These factors are: having a clear vision embedded in a comprehensive city vision, objectives, goals and baseline measurement systems from the beginning of the initiatives, having strong governance, having a sound business case taking into account the local context, having a benefits realization framework which is developed by project management institution (PMI) for organizations to identify benefits and align them with formal strategy in order to ensure that the project benefits are realized, delivered during project execution and sustained after the project ending (PMI,2016). Further, it's important to have a strong local government partner as a key strategic partner and co-founder, form a public-private partnership (PPP) where private partners help with expertise, technology and finance, the involvement of citizens and end-users. Finally, successful projects require successful knowledge management where relevant data are necessary to develop business models (Manville, 2014).

Bhavsar et al. reviews success factors for designing the smart city in the literature. Eight factors concerning managerial and operational aspects are identified as follows: speed of work, labour market flexibility, the availability of workforce, productivity, developed construction management, disaster management and building information modelling (BIM).

Since innovation and learning are important aspects for smart city projects, four success factors are identified in those aspects: innovative spirit, research and development, open-mindedness, ability to develop content and application (Bhavsar et al., 2016).

Harms proposes six critical success factors for developing smart city strategy that could be applied to smart city projects. First, it's important to define a clear vision for the project. Secondly, focusing on humans instead of technology since humans are what make a smart

city smart. Another factor is focusing on a specific topic where identifying the city's strengths and weaknesses help in creating a stronger city strategy and similarly to the project's strategy. In addition, having a city-wide smart strategy will make small projects contribute to the general smart city strategy. Moreover, organize the work and structure the project strategy by using the smart city strategy framework for the city and adapt it to its projects. Finally, bring all stakeholders together from local governments, businesses and knowledge institutions to citizens in the smart city project (Harms, 2016).

Cardullo and Kitchin (2017) also appraise the citizen's participation in smart city projects, define different forms of participation and the numerous roles that citizens play in these projects and suggest a "citizen-centric"smart city initiatives where citizens can develop solutions and are involved in the decision-making process.

Dameri and Ricciardi point out key issues for smart city success. These factors include selecting smart city projects based on higher-level smart city programs and according to an effective strategic vision, effectively coordinate smart city projects in order to avoid conflicts between projects and Continues assessments for project portfolios (Dameri and Ricciardi, 2015).

Joshi et al. indicate that team skills are important to solve projects size issue and technological challenges such as the lack of understanding new interconnected systems. Also, clear agendas and measurable deliverables are keys to overcoming multiple or conflicting goals. Furthermore, effective communication and mutual trust can solve conflicts and resistance to change. Another crucial factor is to have a strong legal department to deal with any legal or political challenges. Moreover, analysing the project and forecasting its budget to get budgetary approval before the project starts. Finally, managers should control the project's resources and budget to ensure sustainable development of the project (Joshi et al., 2016).

IBI group identified some success factors for smart city strategy in their report as the following: develop a clear strategy based on stakeholder's needs so that it benefits them and result in a measurable outcome, engage citizens in the smart city projects from the beginning of the development of the strategy and get the stakeholders buy-in because that will affect the project budget and acceptance during implementation, align the smart city strategy with the regional development strategies, recognize "early win" in the strategy which should include implementation timescale in order to create awareness and foundation for the smart city

initiative. Since smart city projects are different from other traditional projects, it's important to use public messaging and branding for smart city strategy to support and remind stakeholders with the outcomes and benefits of the smart city project, exchange knowledge and learn from other projects experiences. Moreover, develop key performance indicators (KPIs) to measure performance in a meaningful and understandable way for citizens and businesses in a city. Finally, integrate the implementation of ICT within the organization with the smart city strategy and involve all relevant stakeholders in the development of the strategy (Peters et al., 2017).

BSI (2014) in the smart city framework (SCF) states nine critical success factors for smart city projects which are: strategic clarity, stakeholder engagement, user focus, leadership, skills, supplier partnership, achievable delivery, future proofing (developing methods of minimizing the effects of shocks of future events in order retain value) and benefit realization.

Furthermore, some of the managerial strategies to overcome the projects' challenges are the skill and expertise of the project team especially the IT leader, planning and setting realistic clear goals, identification of relevant stakeholders, effective communication, innovative funding, appropriate training, users involvement, practices review and business process improvement (Gil-Garcia et al., 2005).

It's important to formulate smart city planning and development principles to be used by the city's organizations. However, the local organizational culture of each city and how this culture endorses or refuses innovative services should be considered by managers and policymakers. Therefore, various strategies are available for smart city innovation. First, Enterprise Architecture that helps organizations to design systems and develop ways to achieve their future objectives effectively and changes the traditional bureaucracy by an IT infrastructure that supports business processes. Second, appropriate cross-organizational management to enable information and knowledge sharing within or across different organizations and governments which is essential for smart city innovation. Third, the leadership role that in this context extends to leading not only a team or a single enterprise but a network of organizations. This leadership role is crucial in the success of innovation and implementation of smart city initiatives where centralized governance is recommended at an early stage of smart city development and decentralized one during the growth stage (Nam and Pardo, 2011).Another important sub-dimension for promoting smart city projects is forming a specialized and skilled team that is acknowledged by all institutions in the city and

oversees the planning, development and management processes and performance measurements in smart city projects.

While many studies identify success factors for the smart city in a broad view, other studies focus on the factors affecting smart city strategy development. Therefore, they share most of the success factors. However, more specific studies are needed from a project management perspective. In effect, several approaches and mechanisms can be adapted to smart city projects management in different project lifecycle in order to increase success for these projects. For example, leadership models, risk management mechanisms and innovation management. Also, it's necessary to formulate clear organizations policies that support cross-department/organization working and open-data policies to ensure the success of smart city projects.

3. Conceptual framework

The study conceptual framework was built on the literature review/analysis. This framework evaluates the impact of smart management practices on project success and identifies the relationships between smart project management practices and project success. Also, it considers the effect of the project size and context (city, industry, partnership) (Moderated variables) on the relationships between smart planning practices, smart organizing practices, smart leading practices and smart controlling practices (dependent variables) and project success (independent variables). 23 critical smart city practices were identified and categorized according to the four management functions.

The project success is estimated according to cost, quality, time, sustainability (the project is sustainable in terms of people, profit and planet or what's called TBL) and the created value (benefits to all stakeholders and generated new knowledge).

Research Hypothesis:

- H1-4: There is a statistically significant positive relationship between smart management practices (planning, organizing, leading and controlling) and project success.
- H5-8: The impact of smart practices (planning, organizing, leading and controlling) on project success is moderated by project size and project context.

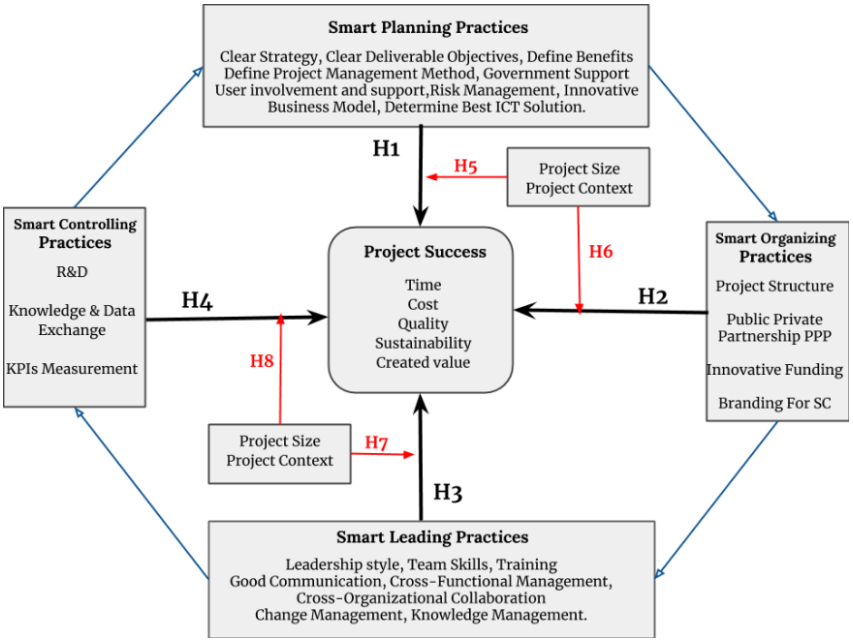

Fig. 1. Conceptual framework of smart project management practices and smart project success.

4.Methods

First, a literature review was conducted where most of the relevant contents about smart city concepts, smart city frameworks, smart city projects critical success factors and challenges in the smart city projects implementation were included.

Second, since the objective of this study is to assess how project management smart success practices influence project success, quantitative methodology where a nonexperimental correlational form of research was found to be the most appropriate design to describe and measure the relationship between the variables. In addition, the study was cross-sectional in that data was collected across several projects at one point in time.

4.1 Study population and sample

The study population of this research consists of professionals working in the smart city projects within Europe covering smart energy, water, mobility, buildings and governmental sectors. The reason why countries of the EU-28 were selected in this study relates to the fact that Europe has the largest number of smart city projects around the world according to a new study conducted by Navigant Research in 2017. Moreover, the study included both successful and failed projects because each project status represents a valuable practical experience and knowledge for this research. On the other

hand, project managers, developers, supervisors, project professionals in the field of information technology, business and financial services, engineering and construction, telecommunications, industrial processes and other members who have different roles in the smart city projects were considered in the population because each individual can have an impact on the smart city project success, have different roles and responsibilities and possess valuable practical knowledge. Therefore, the population presents a wide type of projects which enable its potential to be applicable to several organizations and projects types. Also, it includes a variety of projects size and complexity which helps to minimize the sampling variance of estimates.

Since the complete list of the population was not available, it was not possible to give participants the equal chance of being "selected in relation to their proportion within the total population". Therefore, a non-probability convenience sampling has been chosen as the sampling method. The minimum sample size should be 90 based on the calculation of the minimum sample size since the study population is unknown. Thus, 100 participants were selected as a sample from a wide range of projects in multiple sectors in Europe covering a variety of professionals with different backgrounds and experiences. Consequently, a purposive sampling has been chosen because the respondent's group were selected under the judgment that these groups "will best be able to help answer the research question and meet the objectives"

4.2 Questionnaire design

This study utilized a survey methodology employing an online questionnaire as an instrument for data collection due to the geographic dispersion of respondents, its easy administrative, time and cost saving and its efficiency in data delivering. An online survey service; qualtrics.com, was used to host the questionnaire and an invitation to participate was sent by email and LinkedIn.

The construction of the questionnaire is adopted from the PMEC which was designed by Morisson and Brown (2004) to measure the effectiveness of project management practices (the independent variables). Moreover, items from the theoretical research framework were added to the questionnaire to cover all of the variables being investigated since the study is fairly new besides the lack of an appropriate instrument for assessing practices in the smart city projects context. Also, to summarize the

characteristics of the sample, demographic questions were included in the survey. This research questionnaire used closed-ended questions answered by reference to Likert scale in order to support statistical analysis.

Finally, the study been approved by an ethics committee (88083623-044-3212).

5. Data analysis and results

5.1 Reliability

Reliability analysis was conducted for each construct to verify the internal consistency of the research instrument used for this research. The results of Cronbach Alpha for smart planning practices, smart organizing practices, smart leading practices, smart controlling practices and project success is .828, .836, .865, .749, .813 respectively which is above the threshold value of 0.7 for a reliable scale. Also, Cronbach Alpha for the overall survey tool for 48 items with 23 excluded missing cases in various variables is .941. Therefore, the instrument is found highly reliable for this research.

5.2 Descriptive analysis

The descriptive analysis was conducted to investigate the smart practices, smart success criteria and the profiles of the respondents and projects. Based on the mean values, The important practices were identified. The summary of the descriptive statistics of the questionnaire is presented in Table 1.

As demonstrated by the results, overthree-quartersoftherespondentshavearound 1-5 years of experience in smart city projects. Most of the smart city projects are joint (PPP) projects with medium size and ongoing status. Another evident feature is a large proportion of missing values so that only 39% answered the full questionnaire. This is an indication that knowledge and practice regarding the management of smart city projects have not been reached to the maximum. Thus, more research in this area is encouraged to gain more knowledge concerning smart cities project management.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ownership	44	1	3	2.32	.883
Size	41	1	3	2.05	.740
Status	41	1	3	1.39	.666
Experience	45	1	3	1.40	.688

SPP	100	1.00	4.20	2.0627	.49833
SOP	87	1.00	4.75	2.1365	.63356
SLP	84	1.00	4.25	1.8998	.53785
SCP	80	1.00	4.20	1.9525	.62783
Project Success	78	1.00	3.50	1.7067	.45398
Valid N (listwise)	39				

Table 1: Descriptive statistics.

Further, the study identifies the most important smart management practices that affect project success as the following.

Smart planning practices

The majority of respondent 88% agreed that the projects should have a clear strategy and deliverable objectives, 75% coincided that the project's stakeholders and the local government should support the project and involve users in the project, 76% corresponded that benefits for stakeholders should be defined at the project start-up, 68% agreed that the project risk should be identified and managed, and project management method and business model is defined. Other practices as the reliance of project on ICT and using innovative business models, the respondents were neutral about them.

SPP	Smart Planning Practices	Minimum	Maximum	Mean	Std. Deviation
P1	Project goals are clearly defined at start-up	1	4	1.71	.795
P2	Project goals are made clear to all participants	1	4	1.64	.746
P3	Project has clear deliverable objectives	1	5	1.90	.870
P4	Project benefits are identified for all stakeholders at start-up	1	4	1.91	.854
P5	Project risk is identified	1	4	2.08	.872
P6	Customers/users are involved in the project	1	5	1.82	.947
P7	Project management method is defined	1	5	2.20	.921
P8	Business model is well determined	1	5	2.12	.998
P9	Project sponsors strongly support the project	1	5	1.88	1.008
P10	Local government supports the project	1	5	1.81	.940
P11	Citizens support the project	1	5	2.02	1.054
P12	Available policies don't encounter with the project agenda	1	5	2.38	.993

P13	The project relies on ICT solutions	1	5	2.72	1.026
P14	Project size affects the planning function	1	4	2.39	.827
P15	Project context affects the planning function	1	5	2.36	.894

Table 2: Descriptive analysis for smart planning practices.

Smart organizing practices

The study identifies 4 important Smart organizing practices that affect project success. 90% of the respondents agreed that team responsibilities should be clarified, 77% concurred with defining the project structure and activities, 66 % answered the collaboration between private and public sectors increases the project success, where the use of innovative funding and branding for the smart city were less important factors.

SOP	Smart Organizing Practices	Minimum	Maximum	Mean	Std. Deviation
O1	Project structure is defined	1	5	1.85	.829
O2	Team responsibilities are clarified	1	5	1.70	.701
O3	Partnering between public and private businesses	1	5	2.02	1.023
O4	Use of innovative funding for project	1	5	2.47	1.032
O5	Activities are well defined	1	5	1.99	.921
O6	A smart city project brand is developed	1	5	2.51	1.055
O7	Project size affects the organizing function	1	4	2.30	.878
O8	Project context affects the organizing function	1	4	2.25	.930
O1	Project structure is defined	1	5	1.85	.829
O2	Team responsibilities are clarified	1	5	1.70	.701
O3	Partnering between public and private businesses	1	5	2.02	1.023
O4	Use of innovative funding for project	1	5	2.47	1.032

Table 3: Descriptive analysis for smart organizing practices.

Smart leading practices

Eight important Smart leading Practices affecting the project success were identified. Most of the respondents 90% agreed on the positive effect of communication, collaboration and knowledge sharing among smart city project team members and stakeholders, 80% corresponded that the appropriate project manager should be assigned where 70% agreed on the importance of team member's experience and tanning and taking advantage of the past projects experience whether they failed or

succeeded. Other factors such as defining the leadership style and adopting change management practices were also important for 60% of respondent's agreement answers.

SLP	Smart Leading Practices	Minimum	Maximum	Mean	Std. Deviation
L1	Appropriate project manager is assigned	1	5	1.70	.847
L2	Leadership style is defined	1	5	2.23	.923
L3	Team members are well experienced in their position	1	4	2.01	.925
L4	Training is provided for all project team members	1	5	2.10	.900
L5	Communication among all stakeholders	1	5	1.46	.702
L6	Change management practices are taken by the project leader	1	4	2.10	.845
L7	Project is taking advantage of previous projects experience	1	5	1.95	.904
L8	Knowledge is shared among team members	1	5	1.65	.784
L9	Collaboration is effective among team members	1	4	1.54	.702
L10	Collaboration among stakeholders	1	5	1.76	.845
L11	Project size affects the leading function	1	4	2.17	.819
L12	Project context affects the leading function	1	5	2.13	.929

Table 4: Descriptive analysis for smart leading practices.

Smart controlling practices

The study identified three important Smart Controlling practices which affects the project success. Most of the respondents 89% agreed that the continuous R&D, knowledge exchange and KPI's measurement can lead to project success.

SCP	Strategic Project Controlling	N	Minimum	Maximum	Mean	Std. Deviation
C1	Project monitoring and reporting mechanisms	81	1	5	1.81	.868
C2	Continues data and knowledge exchange	80	1	5	1.70	.848
C3	Research and development are continuing process in the project	81	1	5	1.85	.882
C4	Project size affects the controlling function	81	1	4	2.15	.923
C5	Project context affects the controlling function	81	1	5	2.20	.928

Table 5: Descriptive analysis for smart controlling practices.

Smart success criteria

For the Smart Success Criteria, the important attributes are the benefit of the project to all stakeholders (S4, mean=1.62), positive impact on people (S5, mean=1.37), positive impact on the environment (S6, mean=1.39) and positive impact on the economy (S71, mean=1.51) are found as important success attributes. However, the project completion on time (S2, mean=2.11) and completion in a proper budget (S1, mean=2.03) gained less preference by respondents.

PS	Smart Success Criteria	N	Minimum	Maximum	Mean	Std. Deviation
S1	The project is completed with the planned budget	79	1	4	2.04	.759
S2	The project is completed with the planned time	79	1	4	2.11	.768
S3	The project delivered and meets all specification in the planning stage	78	1	4	2.03	.702
S4	The project result benefits all stakeholders	79	1	4	1.62	.722
S5	Project creates a positive impact on people	79	1	4	1.37	.603
S6	Project creates a positive impact on environment	79	1	4	1.39	.587
S7	Project creates a positive impact economically	79	1	4	1.51	.677
S8	Project generated new knowledge	79	1	4	1.59	.707

Table 6: Descriptive analysis for smart success creteria.

5.3 Inferential Statistics; Correlations and Regressions

The study used the bivariate correlation to affirm the correlation between dependent and independent variables. Pearson's correlation coefficient points to the positive correlation between independent variables and the dependent variable (correlation coefficient above 0.4, as shown in Table 6). The test results showed that Project Success construct was significantly correlated with the smart management practices and with each of its variables. Therefore, we can conclude that research hypotheses have been confirmed ($p < 0.01$). Reading the Pearson's correlation matrix in Table 7, it was observed that the highest value was attributed to the SOP (0.586), which means that it has the strongest connection to the dependent variable. Other independent variables: SPP, SLP and SCP also have high coefficient values (0.457, 0.465, 0.516 respectively), with $p < 0.01$.

Correlations

		SPP	SOP	SLP	SCP	Project Success
SPP	Pearson Correlation	1	.649**	.614**	.592**	.457**
	Sig.(2-tailed)		.000	.000	.000	.000
	N	100	87	84	80	78
SOP	Pearson Correlation	.649**	1	.757**	.798**	.586**
	Sig.(2-tailed)	.000		.000	.000	.000
	N	87	87	84	80	78
SLP	Pearson Correlation	.614**	.757**	1	.707**	.465**
	Sig.(2-tailed)	.000	.000		.000	.000
	N	84	84	84	80	78
SCP	Pearson Correlation	.592**	.798**	.707**	1	.516**
	Sig.(2-tailed)	.000	.000	.000		.000
	N	80	80	80	80	77
Project Success	Pearson Correlation	.457**	.586**	.465**	.516**	1
	Sig.(2-tailed)	.000	.000	.000	.000	
	N	78	78	78	77	78

**. Correlation is significat at the 0.01 level (2-tailed).

Table 7: Correlational analysis.

To further explore the collected data and validate earlier inferences about correlations, 87linear regression tests were conducted. Summarised results of linear regression are presented in Table 8 whereas the first column of this table gives the reference to the corresponding Research Hypothesis. Some key findings from Table 8 are as follows:

a) Smart organizing practices SOP explained 34.4% of the variance in Project Success, with a significant relationship explained by F values and Beta values ($F = 39.829$, $\beta = 0.415$, $p < 0.001$).

b) Smart planning practices SPP, Smart leading practices SLP and Smart controlling practices SCP also explained at least 20% variances individually in Project Success (each with significant relationship having $p < 0.001$, high F values and Beta values of 0.423, 0.385 and 0.370 respectively).

c) The best fit of the regression model is verified with the analysis of variance test. The ANOVA results for SOP are an indication of regression value of 5.457 with residual of 10.413. However, a strong value of F is 39.829 with a significant p-value of .000. The p-value is found much below than the threshold of .05, therefore, the results are significant, and regression is found best fit for the relationship.

Table 8:Summarised results of hypotheses testing using linear regression.

Ref	Independent variable	Dependent Variable	R	R Square	Adjusted R Square	Mean Square	F	Sig.	Unstandardized Coefficients		Standardized Coefficients	
									B	Std. Error	Beta	t
H1	Constant	Project							.831	.201		4.141
	SPP	Success	.457	.209	.199	3.319	20.098	.000	.423	.094	.457	4.483
H2	Constant	Project							.820	.147		5.597
	SOP	Success	.586	.344	.335	5.457	39.829	.000	.415	.066	.586	6.311
H3	Constant	Project							.970	.167		5.804
	SLP	Success	.465	.217	.206	3.436	21.005	.000	.385	.084	.465	4.583
H4	Constant	Project							.991	.145		6.810
	SCP	Success	.516	.266	.256	4.168	27.202	.000	.370	.071	.516	5.216

5.4 Moderator multiple regression

The moderator variables of project size, project ownership and project status are used to validate the relationships of dependent and independent variables. Moderator multiple regression (MMR) method was applied to determine the relationships of variables on the presence of moderator variables. In these moderator variables, project size and project context are used. The project context is the representation of project ownership and project status in this analysis. The dummy variables for project size (small), project status (on-going) and project ownership (public) were used for comparison of results.The dependent variables interaction with all three dummy variables was separately calculated and some key findings from Table 9 are as follows:

The impact of smart planning practices (SPP) on project success is moderated by project size and project context because the value of R-square for SPP showed a slight positive increase from .247 to .253. Therefore, a net change of R-square resulted as .007. This change is small but quite significant as the F-value in both cases is more than zero and significant with values below the threshold of .05. Hence, the impact of smart organizing practices (SOP), smart leading practices (SLP) and smart controlling

practices (SCP) on project success is moderated by project size and project context is proved similarly.

Ref	Independent variable	Dependent Variable	Moderator Variables	Model	R	R Square	Adjusted R Square	Change	F	Sig.
H5	SPP	Project Success	Project size and context	1	.497	.247	.205	.247	5.974	.000
				2	.503	.253	.178	.007	3.509	.003
H6	SOP	Project Success	Project size and context	1	.607	.369	.334	.369	10.666	.000
				2	.637	.406	.346	.037	6.832	.000
H7	SLP	Project Success	Project size and context	1	.523[a]	.273	.234	.273	6.865	.000
				2	.533[b]	.284	.213	.011	3.969	.001
H8	SCP	Project Success	Project size and context	1	.533[a]	.284	.244	.284	7.125	.000
				2	.565[b]	.320	.250	.036	4.629	.000

Table 9: Summarised results of hypotheses testing using multiple regression.

6. Discussion

The purpose of the study was to know whether there is a relationship between the smart project practices and the smart city project efficiency and effectiveness. Another purpose is to identify the smart practices and the smart success criteria. Based on the results, a smart framework for smart city projects management was developed. To prove the efficiency and application of the framework developed for this study, several hypotheses related to the framework were tested.

To answer the study RQ1, a conceptual framework for examining the smart practices that affect the smart city projects success has been described. The framework suggests that smart city projects success is influenced by smart management (i.e., Smart planning, Smart organizing, Smart leading and Smart controlling). In turn, each smart management factor includes several practices (i.e. Clear project goals, support of all stakeholders, collaboration among project teams, etc.). The framework was tested through the analysis of the relationship between key variables related to the planning, organizing, leading, controlling and project success. The relationship between the different variables through their specific factors confirms the framework for smart city projects management. Moreover, a combination of 8 hypotheses were used to describe and define the framework for smart city projects management. To answer RQ2 all the variables were tested for significant correlations. The results obtained provide a good

understanding of the importance of smart management practices that affect the success of smart city projects.

In terms of Smart Management Practices, 4 variables were tested. These include Smart Planning Practices, Smart Organization Practices, Smart Leading Practices and Smart Controlling Practices. The influence of each Smart Management Practice on the project outcome was identified using correlation and regression analysis from the gathered data. The study found that there is a positive correlation between these smart practices and project success. The results of the data analysis indicate the main smart management practices for effective and smart planning, organizing, leading and controlling. When organizations implement these practices, they can improve the success of the smart city projects significantly. Identifying these Smart Practices help the project managers to focus their effort on the appropriate practice to get the desired outcome. Consequently, improving the poorly performed tasks or processes and improving/increasing the chance of project success.

This study meant to identify the Smart success criteria for smart city projects by applying the classical project success factors and adding special (smart) factors for smart city projects. The finding indicates that sustainability and created value whether it's a positive impact on people, environment, knowledge and economy can be indicators of project success where 90% of the respondents agreed on this. It's important to note the classical indicators in terms of quality, time and cost can be applicable to smart city projects but are not enough to indicate whether the smart city project is successful.

The other work done in this study is investigating the effect of project size and context on the relationship between the Smart Management Practices and project success. The results show that project size and context have a significant positive impact on the relationship between the Smart Management Practices and project success as hypothesized. The results demonstrate clearly that the way project managers are managing the smart city project is influenced by how large or how small the project size or the project context.

Furthermore, the study included two questions which are linked with additional practices and new success criteria in the smart city projects. The reason for adding these questions is to retrieve the input of respondent's real-life practices and ground realities of the projects beyond the factors discussed in theory or in previous research. Therefore,

a qualitative analysis was conducted and the results ascertained the list of practices and factors developed in this research. Even though other practices were identified, they weren't generalizable to the study because they described the individual's opinions.

Finally, this study interconnects the smart city concept and project management perspective and develops a framework based on that, therefore, it approaches the smart city concept from a unique angle. The Smart City Project Management Framework is shown in figure 2.

Managerial recommendations

The study findings provide a solid evidence that strong positive correlations exist between the Smart management practices and aspects of project management effectiveness, efficiency and the project success. Thus, smart city projects professionals may wish to ensure that projects are not subjected to unrealistic targets and deadlines. Also, projects are regularly evaluated to guarantee their success. Furthermore, the findings implied the importance of having strong experienced smart city project managers to define clear project goals and benefits at the initiation phase. Projects managers/leaders ensure that stakeholders realize the project goals and the project team members are fully aware of their roles and committed to achieving the project objectives. Furthermore, communication and collaboration among team members are important to come up with innovative solutions. Also, the continuous R&D and knowledge sharing are encouraged to learn from the previous project's experiences.

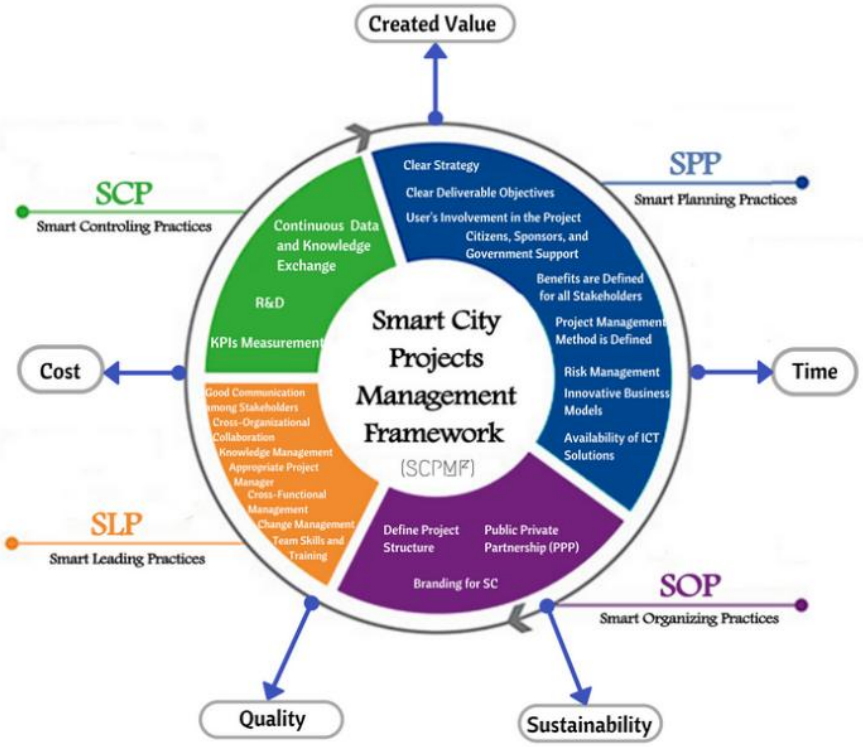

Fig. 2: The Smart City Projects Management Framework (SCPMF).

Limitations and challenges

The smart city concept is quite new, therefore only a little research is available especially in the literature concerning smart city projects management. As a result, this allowed to explore many different aspects of the smart city concept, however, the lack of peer-reviewed research may possibly have minimized the identified factors under which the framework functioned.

Further, the scope of study involves the identification of smart practices for smart city projects implementation in Europe. Therefore, the generalization that arose from the research had to be limited to the context of Europe. Moreover, there were missing data because of unanswered questions. Missing data were a consequence of the fact that many professionals didn't have the sufficient knowledge to answer each aspect since this study context is fairly new. Finally, in the research methodology, convenience sampling was chosen so there might be a possibility of sampling bias that can detract from the quality of this research. Therefore,the generalizability of this study is within the population who was willing to participate in it and other population with the characteristics of this study population.

Future research

The smart city concept includes many research areas that can be further investigated from many perspectives. This research focused on the management and organizational aspects. Thus, it opens possibilities for further research in this area.

First, further development for the suggested framework may be added by empirically validating the smart practices that have a major effect on the success of smart city projects. Also, practical testing of the conceptual framework will be beneficial in understanding the value that project managers and other professionals should place on different characteristics in promoting the smart project practices. The second avenue of research is to identify additional factors that may influence project success. Also, specific studies should be undertaken to develop smart city projects success indicators. Moreover, each smart practice can be examined individually taken into account the uniqueness of each city and project to create an integrated guide for these projects. For example, what type of leadership should be adopted for project success? What skills should smart city managers have? etc. Another interesting research can be comparing the classical project management frameworks with the smart city ones. Finally, since this thesis scope included European smart cities only, other smart cities on a global level should be examined and contrasted with European smart cities to gain knowledge how these cities approach the concept of smart cities projects management and develop similar frameworks which can be applied for these cities. Lastly, it's important to conduct a research for identifying barriers to smart city implementation in developing countries.

7. Conclusions

Smart city projects sound really attractive for a city, yet they can bring a lot of challenges to their development and management. The main research questions of this study were "How to run smart city projects efficiently and effectively in Europe?" and "How smart project management practices influence the project success in Europe?".

To answer these questions, a combination of the theoretical and empirical study was conducted. First, the theoretical section outlined the relevant literature about the smart city concept, the approaches for defining the smart city projects and identified the challenges and the success factors for smart city projects management. It's important to

note that the lack of available studies approaching the smart city concept from a managerial perspective justifies this study objective.

Second, a framework for Smart management practices and projects success criteria was built on the literature's findings. This framework consists of two parts. The first one includes the management functions which are planning, organizing, leading and controlling. Each function includes smart practices which can affect the project success.

The second part of the framework includes the smart success criteria for projects. In other words, indicators for smart city projects success. The above-mentioned practices and criteria were identified from the combination of classical project management studies and the smart city research.

Subsequently, to test the framework and the research hypotheses survey data was used in the empirical section to explore the critical smart success on project success using quantitative methods. The questionnaire was sent to managers, leaders and professionals who work in smart city projects in different sectors in Europe.

The quantitative study findings backed up the research hypotheses and elucidated that a significant positive relationship does exist between Smart project practices and project success.

Finally, based on the analysis, the proposed conceptual framework can be generalized in the European context setting out a holistic view of smart city projects management.

The study framework is a combination between the project management perspective and the smart city concept which provides a fresh view for smart city projects and defines new various factors that can potentially influence the success of smart city projects. Moreover, the study framework integrates the available knowledge on smart city projects and the research new findings which can provide guidance to organizations and professionals who work in smart city projects.

In conclusion, Smart cities around the world need to develop new operating models that drive innovation and collaboration across the vertical silos. This study contributes a small step to a deeper understanding of smart city projects management.

8. Conflict of interest

The authors declare no conflicts of interest.

9.References

Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, *22*(1), 1–19. https://doi.org/10.1080/10630732.2014.942092.

Anthopoulos, L. G., Ipsilantis, P., & Kazantzi, V. (2016). The project management perspective for a digital city. In Project Management: Concepts, Methodologies, Tools, and Applications (pp. 793-811). IGI Global.

Andrews, D, Nonnecke, B & Preece, J. (2003). 'Electronic survey methodology: A case study in reaching hard-to-involve Internet users', *InternationalJournal of Human-Computer Interaction, vol. 16, no. 2,* p. 185-210.

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *International Journal of Project Management*, *17*(6), 337–342. https://doi.org/10.1016/S0263-7863(98)00069-6

Benefits Realization Management Framework | PMI.(2016). Pmi.org. Retrieved 25 January 2018, from https://www.pmi.org/learning/thought-leadership/series/benefits-realization/benefits-realization-management-framework.

Borcuch, A., & Piłat-Borcuch, M. (2016). The Importance of Selected Factors in Smart City Development: The Student's Perspective, *2*(6), 604–611.

BSI. (2014). *Smart City Framework – Guide to establishing strategies for smart cities and communities. Report*. *The British Standard Institution*.

Caragliu, A., del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, *18*(2), 65–82. https://doi.org/10.1080/10630732.2011.601117.

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., … Scholl, H. J. (2012a). Understanding smart cities: An integrative framework. In *Proceedings of the Annual Hawaii International Conference on System Sciences* (pp. 2289–2297). https://doi.org/10.1109/HICSS.2012.615

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J. R., Mellouli, S., Nahon, K., … Scholl, H. J. (2012b). Understanding smart cities: An integrative framework. *Proceedings of the Annual Hawaii International Conference on System Sciences*, (June 2015), 2289–2297. https://doi.org/10.1109/HICSS.2012.615.

Climate Action Plan Strategies & Resources.(December 12, 2013). [City of Boulder Colorado web portal]. Retrieved from: https://bouldercolorado.gov/pages/climate-action-plan-strategies-resources.

Cardullo, P., & Kitchin, R. (2017). Being a 'citizen'in the smart city: Up and down the scaffold of smart citizen participation.

Dameri, R. P., & Ricciardi, F. (2015). Journal of Intellectual Capital Smart city intellectual capital: an emerging view of territorial systems innovation management Smart city intellectual capital: an emerging view of territorial systems innovation management. *Journal of Intellectual Capital Journal of Intellectual Capital Iss Journal of Strategy and Management Iss*, *16*(3), 860–887. Retrieved from http://dx.doi.org/10.1108/JIC-02-2015-0018%5Cnhttp://dx.doi.org/10.1108/JIC-03-2015-0027%5Cnhttp://dx.doi.org/10.1108/JSMA-03-2015-0030

Dameri, R. P., & Ricciardi, F. (2015). Smart city intellectual capital: an emerging view of territorial systems innovation management. *Journal of Intellectual Capital*, *16*(4), 860–887. https://doi.org/10.1108/JIC-02-2015-0018

Fleischmann, A., Fleischmann, A., & Fleischmann, A. (2015). systems Society requirements and acceptance of the smart city programs Final review.

Giffinger, R. (2007). Smart cities Ranking of European medium-sized cities. *October*, *16*(October), 13–18. https://doi.org/10.1016/S0264-2751(98)00050-X

Gil-García, J. R., & Pardo, T. A. (2005). E-government success factors: Mapping practical tools to theoretical foundations. *Government Information Quarterly*. https://doi.org/10.1016/j.giq.2005.02.001.

Gleeson, B. and Low, N. (2000) 'Cities as consumers of worlds environment', in N. Low, B. Gleeson, I. Elander and R. Lidskog (eds.) Consuming Cities: The Urban Environment in the Global Economy after the Rio Declaration, pp. 1–29. London: Routledge.

Grand View Research Inc, (2018) *Smart Cities Market Size Worth $2.57 Trillion By 2025 | CAGR: 18.4%*. (2018). *Grandviewresearch.com*. Retrieved 22 April 2018, from https://www.grandviewresearch.com/press-release/global-smart-cities-market

Hajduk, S. (2016). The Concept of a Smart City in Urban Management. *Business, Management and Education*, *14*(1), 34–49. https://doi.org/10.3846/bme.2016.319

Harms, J. R. (2016a). Critical Success Factors for a Smart City Strategy. In *25th Twente Student Conference on IT* (pp. 1–8).

Harms, J. R. (2016b). Critical Success Factors for a Smart City Strategy. *25th Twente Student Conference on IT*, 1–8.

Hartemink, N. A. (2016). Governance Processes in Smart City Initiatives: Exploring the implementation of two Dutch Smart City Projects: TRANSFORM-Amsterdam and TRIANGULUM-Eindhoven.

Harms, J. R. (2016, July). Critical Success Factors for a Smart City Strategy. In Proceedings of 25th Student Conference on IT (July 1, 2016).

Heuser, L. and Fleischmann, A. (2015). Investigation of the future smart city concepts, technologies and systems. Society requirements and acceptance of the smart city programs. [online] SMARTPOLIS. Available at: http://smartpolis.eit.bme.hu/sites/default/files/D3.1_Soc.%20req.%20and%20acceptance%20of%20the%20smart%20city%20programs.pdf [Accessed 26 Feb. 2018].

International Organization for Migration. (2015). Irregular Migrant, Refugee Arrivals in Europe Top One Million in 2015: IOM. [Online] Available at: https://www.iom.int/news/irregular-migrant-refugee-arrivals-europe-top-one-million-2015-iom [Accessed 26 Feb. 2018].

J.H. Lee, M.G. Hancock, and M. Hu, Towards an effective framework for building smart cities: Lessons from Seoul and San Francisco, Technological Forecasting and Social Change, in press, 2013.

Lee, J. H., & Hancock, M. G. (2012). Toward a framework for smart cities: A comparison of Seoul, San Francisco and Amsterdam. INNOVATIONS FOR SMART GREEN CITIES: WHAT'S WORKING, WHAT'S NOT, WHAT'S NEXT? Oberndorf Event Center, 26-27.

Joshi, S., Saxena, S., Godbole, T., & Shreya. (2016a). Developing Smart Cities: An Integrated Framework. In *Procedia Computer Science* (Vol. 93, pp. 902–909). https://doi.org/10.1016/j.procs.2016.07.258

Joshi, S., Saxena, S., Godbole, T., & Shreya. (2016b). Developing Smart Cities: An Integrated Framework. *Procedia Computer Science*, *93*(September), 902–909. https://doi.org/10.1016/j.procs.2016.07.258

Kehoe, M., Cosgrove, M., De Gennaro, S., Harrison, C., Harthoorn, W., Hogan, J., … Peters, C. (2011). Smarter Cities Series: A Foundation for Understanding IBM Smarter Cities. *IBM Redguides for Business Leaders*, 1–30. https://doi.org/10.1147/JRD.2010.2048257

Khan, Z., Dambruch, J., Peters-Anders, J., Sackl, A., Strasser, A., Fröhlich, P., … Soomro, K. (2017). Developing knowledge-based citizen participation platform to support smart city decision making: The smarticipate case study. *Information (Switzerland)*, *8*(2). https://doi.org/10.3390/info8020047

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, *79*(1), 1–14. https://doi.org/10.1007/s10708-013-9516-8.

Kogan, N., & Lee, K. J. (2014). Exploratory Research on the Success Factors and Challenges of Smart City Projects. *Asia Pacific Journal of Information Systems*, *24*(2), 141–189. https://doi.org/10.14329/apjis.2014.24.2.141

Leydesdorff, L., & Deakin, M. (2011). The triple-helix model of smart cities: A neo-evolutionary perspective. *Journal of Urban Technology*, *18*(2), 53–63. https://doi.org/10.1080/10630732.2011.601111

Lombardi, P., Giordano, S., Farouh, H., & Yousef, W. (2012). Modelling the smart city performance. *Innovation*. https://doi.org/10.1080/13511610.2012.660325.

Manville, C., Cochrane, G., Cave, J., Millard, J., Pederson, J. K., Thaarup, R. K., … Kotterink, B. (2014). *Mapping smart cities in the EU.European Parliament: Policy Department, Economic and Scientific Policy*. https://doi.org/10.1007/s13398-014-0173-7.2

Monzon, A. (2015a). Smart Cities and Green ICT Systems (SMARTGREENS), 2015 International Conference on. *Smart Cities and Green ICT Systems (SMARTGREENS), 2015 International Conference on*, 1–11. https://doi.org/10.1007/978-3-319-27753-0_2

Monzon, A. (2015b). Smart cities concept and challenges: Bases for the assessment of smart city projects. In *Communications in Computer and Information Science* (Vol. 579, pp. 17–31). https://doi.org/10.1007/978-3-319-27753-0_2.

Mordor Intelligence LLP, "Global Smart Cities Market - Growth, Trends and Forecasts (2014-2020)," Sep-2015. [Online]. Available: https://www.reportbuyer.com/product/3281852/global-smart-cities-market-growth-trends-and-forecasts-2014-2020.html. [Accessed: 08-Feb-2018].

Nam, T., & Pardo, T. A. (2011c). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times - dg.o '11* (p. 282). https://doi.org/10.1145/2037556.2037602.

Nam, T., & Pardo, T. A. (2011d). Smart city as urban innovation. In *Proceedings of the 5th*

International Conference on Theory and Practice of Electronic Governance - ICEGOV '11 (p. 185). https://doi.org/10.1145/2072069.2072100

Navigant Research (n.d.) Smart City Tracker 1Q13: Global Smart City Projects by World Region, Market Segment, Technology, and Application. Available online at: http://www.navigantresearch.com/research/ smart-city-tracker-1q13 [Acessed 26 February 2018].

Neirotti, P. (2013). New business model in smart cities: Emerging trends and methods of analysis. Master. Politecnico di Torino.

Ojo, A., Curry, E., & Janowski, T. (2014). *Designing Next Generation Smart City Initiatives-Harnessing Findings And Lessons From A Study Of Ten Smart City Programs*. *Twenty Seond European Conference on Information Systems*. Retrieved from http://aisel.aisnet.org/ecis2014/proceedings/track15/12/ORGANISING Lessons from Amsterdam. (2016), (November).

PETERS, B. and Harper, J. (2017). IBI GROUP'S TOP 10 Smart City Strategy Success Factors. [online] IBI Group. Available at: https://www.ibigroup.com/wp-content/uploads/2017/10/Smart-Cities-Bruno-White-Paper.pdf [Accessed 26 Feb. 2018].

The European Commission. (2013). European Innovation Partnership on Smart Cities and Communities: Operational Implementation Plan- First Public Draft. *European Innovation Partnership on Smart Cities and Communities*, 111. Retrieved from http://ec.europa.eu/eip/smartcities/files/sip_final_en.pdf

Un.org. (2014). World's population increasingly urban with more than half living in urban areas | UN DESA | United Nations Department of Economic and Social Affairs. [online] Available at: http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html [Accessed 26 Feb. 2018].

Van Winden, W., Oskam, I., van den Buuse, D., Schrama, W., va Dijck, EJ., & Frederiks, M. (2016). *Organising smart city projects lessons from Amsterdam*. *Lessons for Amsterdam*. Retrieved from https://admin.dezwijger.nl/wp-content/uploads/2016/11/AUAS-Organising-Smart-City-Projects-Amsterdam.pdf

Woods, (2013). "Smart Cities. Infrastructure, Information, and Communication Technologies for Energy, Transportation, Buildings, and Government: City and Supplier Profiles, Market Analysis, and Fore-casts, Pike Research".

Woods, E., Alexander, D., Rodriguez Labastida, R., & Watson, R. (2016). UK Smart Cities index. uk: Commissioned by Huawei From Navigant Consulting, Inc. Retrievedfromhttp://wwwfile.huawei.com//media/CORPORATE/PDF/News/Huawei_Smart_Cities_Report_FINAL.pdf?la=en.CC

Yin, R. K. (2009). *Case Study Research: Design and Methods*. *Essential guide to qualitative methods in organizational research* (Vol. 5). https://doi.org/10.1097/FCH.0b013e31822dda9e

Yin, R. K. (2012). A (VERY) BRIEF REFRESHER ON THE CASE STUDY METHOD The. *Applications of Case Study Research*, 3–20. https://doi.org/10.1080/07388940701860318

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