# THE ROLE OF ITIL IN APPLYING PROJECT MANAGEMENT FOR SMART CITIES SERVICE MANAGEMENT

**Mohammad Mahoud**
Mehr Alborz University (MAU), Iran, m.mahoud@mehralborz.ac.ir
**Roberto Bruni**
University of Cassino and Southern Lazio (UNICAS), Italy, r.bruni@unicas.it
**Sinisa Zaric**
University of Belgrade, Serbia, sinisa@ekof.bg.ac.rs
**Marcello Sansone**
University of Cassino and Southern Lazio (UNICAS), Italy, m.sansone@unicas.it

**Abstract:** This paper explores the role of the Information Technology Infrastructure Library (ITIL) framework in project management procedures applied in smart city services. ITIL is a set of IT practices that focus on aligning IT services with the needs of the required organization and specific applications, especially in business contexts.
Working on the ITIL and its flexibility, in this work a switch of the perspective from the business to the smart city context is provided highlighting the limits and benefits of integrating project management and service management through the ITIL framework in the smart city, going toward the Smart City Service Management (SCSM) approach.
ITIL and project management can smartly identify and satisfy city services needs by looking at the different perspectives of multiple stakeholders, optimizing the system of problem detection, sharing the main reasonable proposal and building appropriate project management paths to achieve the expected goals for stakeholders' satisfaction following a value co-creation logic.
The paper is a conceptual contribution that adopts the 'advocating' perspective (MacInnis, 2011) to explain the contribution of ITIL in supporting SCSM through project management.
**Keywords:** Smart City, ITIL, ITSM, Project Management, Service Management, SCSM.

## 1. INTRODUCTION
Heretofore, cities had to cope with and manage limited IT services, usually located only in the municipal authority. With the rise of smart cities, the amount of IT infrastructure has become much higher. Looking at the smart city definition, it is possible to simply refer to the website of the European Commission (EC), making it the official definition of the European Union (EU). The definition reads as follows: 'A smart city is a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business. A smart city goes beyond the use of information and communication technologies for better resource use and fewer emissions. (European Commission Smart Cities, 2018).
Some authors sustain the need to research stakeholders' involvement in city development and in-service management within the city contexts, especially within the smart city contexts (Eskerod and Huemann, 2013), strongly characterized by IT infrastructures. Nowadays, IT infrastructure means all the hardware and software necessary for smart services, networking in the whole city, and related work like monitoring multiple smart devices sending data, processing the data, and much more. Although it was previously possible to manage IT infrastructure and services ad hoc, with the rapid increase of smart solutions the need to better connect smart city services with users increased even thinking about stronger cooperation in service design and development. A systematic methodology is needed to help smart cities with the management of their services. In particular, for every size city, service design, provision and management are a process that should be supported by tools, rules and methodologies useful to identify specific needs, involve stakeholders (Marrone et al, 2018) in designing and providing services and control the processes every day. IT Service Management (ITSM) is a strategic approach to designing, delivering, improving, and overall managing IT services with a focus on customers, or more broadly concerning smart city on stakeholders. Although many have ITSM connected only to the business environment, every organisation that must do anything with IT services is performing their management. ITSM contains the operation of IT services, budgeting for hardware and software, monitoring the services, educating stakeholders, and much more. This also stands true for smart cities. (Rouse and Bigelow, 2015). The most widely adopted and globally recognised approach to ITSM in business is called ITIL. It is a collection of best practices that helps organisations with delivering value to their customers. Therefore, ITIL represents best practices in ITSM.
ITIL offers a systematic approach to the provision and management of IT services as it contains best practices that can help reduce costs, and improve customer satisfaction and productivity within the organisation but also identify

models, methods and key performance indicators useful to get data for activities and performances analysis (Steinberg, 2011). ITIL is based on the service life cycle connected to a project. For this reason, the organizations should focus their efforts to identify and depict their service life cycle. Often the service life cycle is influenced by the quality and stability of processes. In any case, ITIL is not only a set of procedures but it includes information able to explain the way how services and functions within an information technology organisation align and add value to the wider organisation.

Several stakeholders take part in the service implementation from data analysts to developers and programmers to customers. Close collaboration with customers helps ensure that IT services serve the organisation's purposes (Cervone, 2008). The pre-3 version consisted of 9 books that formed the knowledge system of ITIL. The system in version 3 has 5 books (Service Strategy, Service Design, Service Transition, Service Operation, Continual Service Improvement) and covers the main areas of the IT service lifecycle. Traditionally using ITIL it is possible to obtain examples and best practices to identify a service strategy to understand how to decide in terms of service improvement or stopping the processes. At the same time, it is possible to find information about the service projects in terms of costs and effectiveness by looking at the main organization characteristics and their flexibility and agility in terms of change management. ITIL knowledge is even characterized by service characteristics and delivering and service quality control and improvement, looking at specific metrics and measurements to monitor the quality and costs of services.

ITIL 4 represents an evolved model where processes are changed with practices and the system can involve the service receiver (Berger et al, 2020). The organization that is applying ITIL is strictly involved in the value co-creation process supported by an agile approach. Indeed, generally, ITIL is applied in business contexts but in this work limits and benefits are presented in applying ITIL to Smart City Service Management. Particularly, project management is presented as a tool supporting value co-creation processes in smart city service management.

Results of the work suggest that it is useful to interpret smart cities services by looking at a layered model to apply project management following the agile logic within the framework of ITIL projects involving several actors in smart cities.

## 2. MATERIALS AND METHODS

The paper is a conceptual contribution that, follows the 'advocating' perspective (MacInnis, 2011). The 'advocating' perspective is generally used to endorse a way of seeing or, to support, justify or suggest an appropriate path. This article has the goal to debate the application of ITIL in a layered smart city model (Walletzky et al, 2018) looking at benefits and limits and focusing on the role of project management in improving value co-creation practices for Smart City Service Management (SCSM).

The work integrates previous research contributions and provides limits and benefits in a smart city scheme where ITIL is supported by a project management framework to encourage value co-creation processes and stakeholders' involvement in Smart City Service Management.

A typical scenario where Project Management methodologies are applied in IT projects. Typical projects include the deployment of a new application, a deployment of new technology, or for an IT Service Provider, the deployment of a new customer with specific needs, eventually characterized by a network of stakeholders like a smart city. In these projects, the results are usually quite precisely predetermined. The project has certain requirements, budget and time frame where the project should stay in. Sometimes projects include Agile characteristics when, e.g., instead of deploying an off-the-shelf software, new software is developed and customized during the project to align the goals and the features to integrate the project within the multiple actors (stakeholders) involved in the whole system (organization). That is possible to involve stakeholders to cooperate in project management even following a value co-creation logic. An example of off-the-shelf software would be antivirus software. In larger enterprises, implementation of new antivirus software would be a rather laborious IT project. Even though the basic functionality would be provided by the software, significant configuration work would be needed to be useful.

## 3. RESULTS

The results of this work are briefly presented below after a selection of contributions coming from literature and practical experiences. In particular, we found that ITIL V4 can guide IT service management by following a value co-creation logic even in complex contexts and it can be applied in smart cities.

Nowadays, many companies and cities are involved in providing services and a significant portion of these services are digital because the digital environment provides so many opportunities to enrich the services being produced. Cloud services and infrastructure are everywhere and leveraging opportunities of digitalization gives successful organisations a significant competitive advantage. Thejendra (2014) has referred to the term IT Service Management

as a professional methodology, where an IT department follows a methodology to deliver support for information systems efficiently and reliably, which meets customer's business requirements.

As a service is not necessarily best suited to be managed as a project or something that an Agile team would produce, a practice of IT Service Management has been established. The ITIL V4 guide claims that ITIL is the world's most widely adopted guideline on IT Service Management (ITSM). Project Management and Agile methodologies are closely related to running various IT services (ITIL Foundation, 2019) and ITIL V4 also claim to include Agile principles. Generally, ITIL is used in business contexts; the model can be adapted in the complex context of smart cities where several stakeholders operate, sometime cooperating, sometimes conflicting (Ma et al, 2016), in any case working in an IT environment. Although the most advanced version of ITIL is characterized by an advanced system of activities based on actors' involvement in a value co-creation logic, always the model considers the basics of service design, development and provision and that is useful in smart cities because each service can be considered at different levels of maturity. For this reason, it is necessary to clearly understand if it is possible to apply advanced or basic processes in specific areas. ITIL V4 is an advanced model useful in a context characterized by advanced stakeholders able to cooperate and co-create value.

In this research, we found that the most common structure of smart city services is depicted as flat, where every service is interconnected with all of the other services. This division supports the findings of Lee (2014), that smart city services have the same or very similar classification as the structure of a city's government. It is not only a graphic problem but it is a conceptual approach that considers people (users) as part of the system where there are no differences between service providers, users, and service structures (like means for providers and users). Thinking about the organization of each smart actor identified in figure 1 it is possible to understand that each smart element is organized and connected to the whole smart city system. The model is not able to represent the resource integration between users, providers and useful means. Therefore, the citizens are on the same level as infrastructure or energy. For the city, it is just another category it has to look after instead of citizens being their partners and clients co-creating the value.

The traditional structure model seen in Figure 1 is inspired by Giffinger (2010) together with other elements of a city which can be seen in, e.g. Frost & Sullivan smart city service (2019). Different approaches need to be taken for developing each of the services, not to mention that the smart people category is not even a service. Rather, people use the services. Moreover, the smart people category is essential for other services to be smart because smart service without smart users is not smart. According to Walletzký (2018) the explicit dependencies are also not illustrated in the flat structure, even though they should be.

**Figure 1.** *Smart city in flat representation*
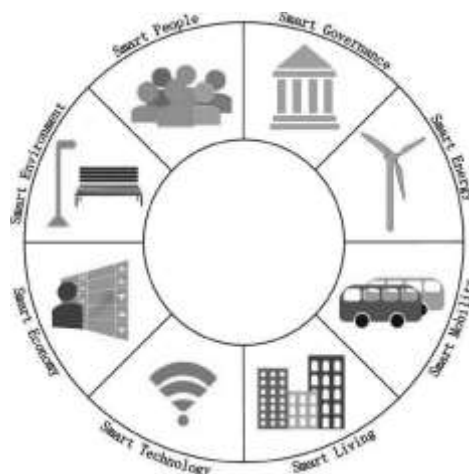


Representing smart cities following this specific approach is not useful to the present work. With the flat representation is complex to highlight the service management system and for this reason, it is impossible to clearly understand how the ITIL and project management can contribute to improving contacts and optimising, designing and providing services.

Differently, it is interesting the layered model for smart city services (Walletzký et al, 2018) that separates the technical and other supporting services from the functional ones that bring value to the citizens, and in general, to the primary stakeholders in a smart city. Figure 2 illustrates the hierarchy of the layered model. This concept of layers originates in Software Architecture.

The lowest layer is comprised of Software and Hardware ICT. These are very similar if not the same to IT Services described above. ICT is an essential part of a smart city, and other services are built upon it. Hardware services can be e.g. sensors, networks, servers, and the whole physical infrastructure. Software services use hardware services. Software IT services create the foundation for other services above this layer to operate.

Above hardware and software, there is a layer of Supporting Services. These Supporting Services are not able to bring value directly to the stakeholders and hence serve as a carrier of newly created value to the higher layers. Supporting Services can be, e.g. management of transport, control of temperature, or traffic monitoring. Figure

**2. *Smart city services in hierarchical layers***
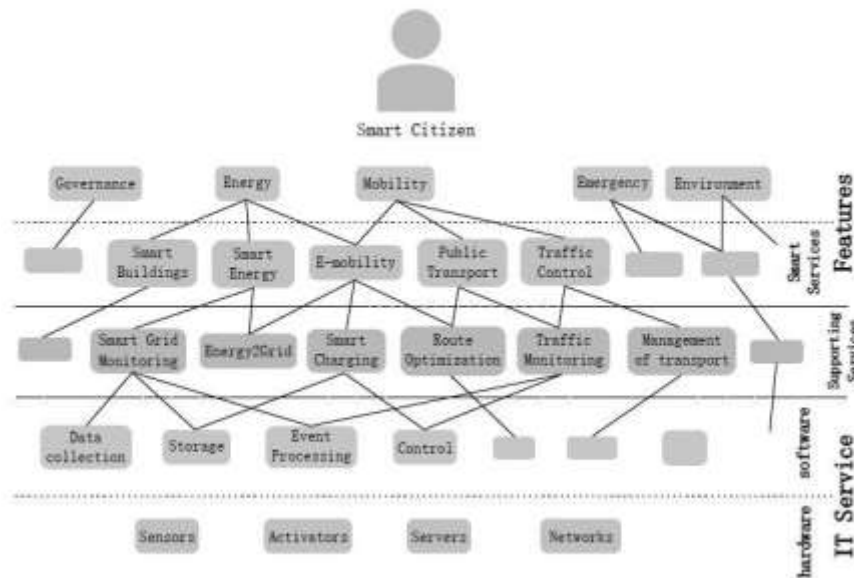


The top layer is named Features. These features consist of Smart Features and a sub-layer called Smart Services. Smart Services, similarly to Supporting Services, combine several services from the layer below, creating a more complex service to create more value for the highest layer to use and provide to the stakeholders. Smart Services are necessary because stakeholders are not motivated enough to use them directly. Also, providing Smart Features would be hard without them. Only smart features can propose value to stakeholders and therefore are directly used by them. The provider of Smart Features is the city alone or city-designated companies. (Walletzký et al, 2018)

Building on this model it is possible to make some considerations about the role of ITIL and agile project management in intersections among layers, in particular, between features and support services.

## 4. DISCUSSIONS

The expected objectives and results of this research are to introduce the ITIL framework in applying project management for service management and find if it is possible to adapt it to a smart city environment. Furthermore, this research suggests the first steps for implementing IT service management in the case of a particular smart city. Without the proper knowledge, a city cannot create services that are useful for anyone, therefore wasting resources. Moreover, to manage the services accordingly and effectively, they must be classified from the points of view of all stakeholders and the city itself.

From the results, it is possible to underline some benefits coming from the integration of ITIL and project management within the smart city context. At first layered smart city model can be considered a useful scheme to identify the relevant relations among actors and IT systems. This is useful to have a wide vision of the services' complexity and to identify processes and actors able to support ITIL and project management, even looking at the smart city dimension and maturity.

Secondly, the layered model offers a vision of the hierarchy of needs regarding service design, management and provision. For example, SCSM cannot be entirely supported by ITIL and PM because of the high levels of costs in terms of implementation and the time-consuming processes based on the value co-creation project management approach. Selecting the right services to manage within the smart city is a benefit for the organization. In service selection, it is necessary to think about providers' and users' characteristics and needs. If users are primary stakeholders with specific needs (like citizens, internal companies, and authorities) of course the ITIL and project management are useful application which deserves to be taken care of in detail and deserves a greater investment of time to define projects that yield shared and satisfactory results.

Looking at Fig. 2 ITIL can support project management in a value co-creation logic for the service level included within the smart services area and, in particular, in the context of services directly related to the end users. Users in a value co-creation logic will be active actors in identifying new needs and shaping the service characteristics during the time optimizing performances.

Some limits emerge. First of all, city authorities should be able to open the service design and management to the stakeholders losing direct control and decision. The value co-creation logic is based on mutualistic relationships and contributions should come from several actors.

Second, ITIL and project management in the context of value co-creation is a time-consuming system of processes. Particularly it is more expensive than traditional project management activities.

Third, involved actors should be ready to participate in the smart city evolution process. Of course, stakeholders should have the will to be involved and, at the same time, they should have the right knowledge to participate and even a clear and long period vision about their needs in smart city services.

## 5. CONCLUSIONS

This conceptual article presents the opportunities to apply ITIL V4 to smart cities going beyond the application to the business context and it is the first step for the next research in the smart cities research stream. Cities are complex systems and their services should be managed by thinking about the most convenient means to regulate relationships among the multiple stakeholders involved. The advanced emergent logic is on the value co-creation approach encouraged by technology and the step ahead with ITIL is the switch of thought from the research of efficiency and satisfaction (business context) to the flexibility and adaptation of services to cooperate following a value co-creation logic.

Working on the layered model of smart cities this article presents the role of ITIL V4 in helping smart cities by involving actors to cooperate in designing, developing and providing services and sharing resources and ideas. This is one of the main problems of this kind of organization.

Smart Cities are real service systems that integrate numerous services for citizens from transport to energy, from housing to city governance. For this reason, the management of services has to be designed, implemented and controlled in the most integrated way possible. Although it is possible to devolve many of the functions of monitoring, and control of services to technology, many integrated services managed by different authorities need to share rules and codified processes. Certainly, each manager and each authority will have the freedom to manage its activities autonomously, but the connection between the many and varied activities must be homogenised to set up a virtuous process of defining Smart City Service Management (SCSM) following the value co-creation approach. For this reason, some efficient best practices may be useful, to allow the parties to understand, design, dialogue and build a shared knowledge capable of aligning the goals of each to the generation of wellbeing for the city's stakeholders, also with the support of project management models. In any case, it is interesting to quote that service design, provision and management should be supported by agile project management activities to co-create value. These practices are useful for implementing models in practical activities from the design phase to use and control. If more actors participate in the design of the service, they will have a better chance of understanding, using and appreciating it. For this reason, on the one hand, ITIL provides practices for immediate use to simplify the process of service design and implementation, but on the other hand, in its integrated version with project management, it encourages the sharing of values underlying service design and implementation thinking by involving and empowering users and authorities.

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