Impacts of Digitalization: Many Agendas at Different Levels

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Abstract

Contemporary organizations investing in digitalization initiatives aim at enhancing their productivity, streamlining their processes, or just cutting their costs. However, little is known about the impacts of how digitalization initiatives create value, for whom, or where and when these occur. In this paper, we study what kinds of impacts different digitalization initiatives in a mid-sized city create and for whom. We show that they vary for different stakeholders and according to their perspectives. Potential impacts diverge for city employees, decision makers, citizens, organizational activities, and the public sector in general. Our findings show that potential impacts are multifaceted and numerous. This has implications for the assessment of the success and the benefits of digitalization initiatives or information systems investments; they vary according to the stakeholders and their expectations. The distinction between the digitalization experiment with its novelty and uncertain suitability for the purpose and the standardized service is essential.

1. Introduction

The public sector is largely about service provision [1], [2]. At the same time, the public sector faces pressures to reduce costs. Reducing resources, the citizens' increasing expectations for more sophisticated services, and the public pressure to gain more outcomes from different operations form an equation that is very difficult to solve. Public organizations have thus launched various digitalization and smart city initiatives [3]–[5]. Digitalization, referring to "changes associated with the application of digital technology in all aspects of human society" [6, p. 23], may change how people interact with their workplaces and their work objectives and perform their tasks [7]. Optimally, this is an 'everyone wins' situation, giving employees greater personal freedom and creativity at work, increasing productivity in organizations, and providing citizens with improved (self-)services.

A smart city initiative is often an umbrella concept, entailing various schemes and experiments, which all aim at improving a single function or operation or an aggregate of these functions or operations [ibid.]. Quite often, smart city initiatives are localized at the country level or even at the public-entity level [8], [9]. These initiatives range from small-scale experiments in implementing technological or procedural innovations to introducing disruptive ways of delivering services or implementing information systems (IS). For example, a simple video conferencing can be regarded as an innovation when it is implemented in a new situation, similar to an artificial intelligence robot gathering background information from an employment office's customers. The experiments also support organizational learning. All these features and functions emphasize the assessment of the impacts of different kinds of initiatives. In this regard, the role of active change agents is needed [10], [11] and is emphasized in trying out new ideas or suitable ways of innovating. Similarly, illustrating the potential benefits and facilitating the internalization of the basic idea of the change become essential [12].

Public sector organizations and their employees are usually unprepared to utilize new technologies in their services and service provision [13]. Public services are traditionally used and developed in siloes. This means that they serve a single purpose and task, minding little about the adjacent service or the city operations as a whole, for example. The idea of providing extensive services to the whole city and offering a common service platform crossing organizational boundaries is rather novel. The services are consequently individual, isolated, and technologically disintegrated. In turn, this increases the number of services requiring licenses, maintenance, and user training, causing extra costs and hindering the overall development. A unified development scheme becomes impossible due to the lack of resources and centralized development. The impacts of individual digitalization initiatives on the processes, saved

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costs, or heightened productivity remain equally sporadic. This may result in smart city initiatives and digitalization phenomena being considered inefficient and the new way of working being regarded as unsuccessful.

Recognizing, acknowledging, and evaluating the impacts and the success of IS as a whole and digitalization experiments and initiatives in particular are not straightforward [14]. Nonetheless, assessing IS has been studied over the years [15]–[21]. Several factors contributing to the assessment have been identified. For example, various stakeholders have their expectations and objectives when they assess the benefits [22]–[24]. An initially unsuccessful initiative may turn out to be successful when its environment evolves [25]–[27]. This evolution includes changes in the political atmosphere, political decision makers, their agendas, technologies, and citizens and their expectations. Similarly, the processes through which a city administration operates change over time [28], [29]. The simplest example may be the routinization of the city officials' work by utilizing new technology; services improve when the civil servants learn to use new tools. This makes assessing the 'goodness' of a technology or a smart city experiment very difficult. In summary, the impacts and the value of digitalization initiatives remain easily hidden to the observing eye.

All the above-cited issues have motivated our paper. We address our research question "What are the impacts of digitalization experiments?" by observing a mid-sized city in Finland. The city set up a digitalization program (*Digiprogram*) to experiment on and test various technologies and practices in different service areas. The city administration aimed at learning from these experiments so that it could assess whether certain technologies and/or practices would merit further development. Furthermore, the need arose to study the impacts of the experiments in order to find out whether they and their execution would support their expansion to a regular service repertoire, and the Tampere university was commissioned to conduct the research. Under the *Digiprogram*, the city needed to evaluate the consequences and the possibilities of various digitalization initiatives and experiments. We were hired to evaluate the *Digiprogram* and illuminate the impacts within and on the city administration. As a result, 20 key stakeholders in the city administration were interviewed for their perceptions on the estimated and the experienced impacts. This qualitative study shows a broad range of impacts, making it very difficult to assess the big picture without explicitly articulated and defined objectives.

In this paper, we proceed as follows: In Section 2, we explain the theoretical background. In Sections 3 and 4, we present the research setting/methods and our findings, respectively. In Section 5, we discuss the results and put them in a broader context and Section 6 concludes the paper.

2. Theoretical background

A city is a complex entity with a multitude of responsibilities and tasks. One way of dividing the entity into areas is to separate four main types of tasks in an administrative organization, as follows: communal, democratic, economic, and wellbeing [30]. In practice, a city administration needs to consider the development schemes from different departments with different aspirations [31]. These aspirations may also be politically inclined because the decision makers often represent political parties. A city has to provide and manage services to a variety of areas, such as the community and the environment, the economy, education and culture, social and healthcare, to name a few [32]. Often, the areas have their own practices, processes, and personnel. These factors demonstrate an ever-varying multitude of requirements for IS and preferred solutions. Finding unified, compatible, and consistent bylaws and solutions becomes a challenge.

Digital transformation often necessitates the renewal of business/service models, consisting of tasks and daily processes and practices. Digital transformation also touches on resource allocation and operational execution and how they could be improved [33]. When the business model or the business logic changes with digital transformation, the effects concern not only direct business-related activities but also their underlying processes. The influence of a simple digitalization initiative thus extends its scope to an organizational culture [34]. For example, digitalization initiatives may result in benefits to non-strategic areas, such as sales and marketing in the private sector [35], [36].

The scale and the coverage of digitalization depend on numerous factors. They include the will and the foresight of a chief information officer (CIO) or a similar driving force, as well as an organization's willingness and ability to participate in and promote experimenting in different areas. Altogether, a positive attitude toward renewal is a critical capability required to succeed in such initiatives [37]. These kinds of organizations may gain competitive advantage and benefit from pioneering and collecting experiences [38].

The resources of the public sector are under constant scrutiny, making it difficult to maintain its current level of services, let alone improve them [39]. Resources are in fact more likely to decrease than to increase. However, the increasing number of functions in various areas requires attention and development, putting pressure on financial issues. At the same time, the services should be improved, redesigned, or (re)invented (ibid.).

Defining and measuring both successes and implications of the digitalization initiatives have turned out to be difficult [40], [41]. Moe et al. [42] focus on the personnel and their attitude toward procurement, that is, their willingness and readiness to adopt the new services that are acquired and implemented. Fox [43] has studied the meaning of better allocation of scarce resources in providing public services. Both perspectives are about improving productivity and increasing the impact of development schemes in the public sector. However, impact seems to be an ambiguous concept, needing closer inspection.

When organizations plan and carry out digitalization experiments, it is assumed that the employees continue being productive members and executing their mundane routines. This point emphasizes appropriate management skills, a deep understanding of the workplace dynamics, and the meaning of the experiments [44], [45]. When planning digitalization initiatives and later introducing them to the organization, the management needs to create and obtain its employees' commitment and willingness to participate in and simultaneously lower potential resistance to the initiatives [46]. Optimally, the results are positive [47], showing significant benefits for the operations [48], [49]. This approach underlines the importance of identifying and appreciating the impacts of the initiatives.

Newer ways of working, enhanced by the digital solutions, aim at enhancing and developing customer services, streamlining organizational processes, reducing costs, or making totally new and innovative openings [50], [51]. In other words, they aim to make operations more innovative. However, an organization may not be mature enough or may lack the capabilities to attain maturity. Individuals, tools, technologies, or processes may need to be reinforced or changed before commencing the digitalization initiatives [52]–[54]. People, organizations, and their capabilities need to be developed.

When the organizations are becoming increasingly customer- and service-oriented, their IT units are facing similar challenges of transformation. The service supplier side and the user side converge when the information and communications technology (ICT) service provision is concerned. Such convergence emphasizes the significance of communication between the parties, as well as intensive user involvement [53]. The more traditional ICT governance models are gradually expiring and becoming obsolete [14], [55]. This phaseout is a result of the expanding number of user needs and requirements concerning technical usability, access, information ergonomics, and user experience [56]–[58].

User involvement also brings up the perspective of organizational culture, how and from where novel ideas are received and accepted, and how to spur the experiments [52]. Organizational culture may affect and even dictate the reactions if something fails with experimenting. The reactions, ranging from rewards to punishments, will affect the will and the eagerness to participate in forthcoming experiments. The CIO plays a centric role in forming the organizational culture, possibly promoting a positive attitude toward novel ideas [54].

Managing digitalization initiatives is challenging. Organizational siloes and (semi-)independent areas require a case-specific management approach [59], creating another management challenge. For example, in our case study, the focus was on customer service, employment services, and land use. The digitalization initiative was introduced as a guiding principle to different departments, to be localized in each department. The initiative was accepted in each department and by no means dictated exclusively by the CIO's office. The CIO and his staff facilitated the *Digiprogram* by establishing the program framework, organizing it, and again facilitating the aggregation digitalization schemes in collaboration with each area.

The related literature reports multiple factors and viewpoints affecting the digitalization initiatives [60], [61]. It is thus a difficult task to come up with mutually comparable measures and metrics for assessing the initiatives' impacts, efficiency, and effectiveness [62]. The main challenges are the differences in operations, processes, perspectives, and cultures, making the definitions of the measures local and incomparable. Such variations in turn result in qualitative, often subjective measures, which need to be put in context and interpreted with the appropriate authorities.

3. Research setting

In this paper, we report a single case study [63] involving Tampere, a Finnish city with approximately 230,000 inhabitants and 15,000 employees working in over 2,000 sites. The city CIO's office manages and provides ICT services to different departments and units, ranging from the top management to the city customer service. The stakeholders have different needs and capabilities in using technologies for their work. The number and the complexity of the ICT systems pose constant challenges for users and the management.

The city officials have recognized and acknowledged that existing systems and services are no longer up-to-date or even appropriate. Various development schemes and aspirations about digitalization also exist at the national level. The city has set up a smart city program, of which the *Digiprogram* is a part, to modernize its operations. The *Digiprogram* aims at developing digital services to facilitate the everyday life of the city residents, improve their wellbeing and security, promote smoother migration to and mobility within the city, and

create new businesses by enabling cooperation among various stakeholders [64].

To comprehend the potential impacts of the smart city program as a whole and its *Digiprogram* in particular, we conducted a set of semi-structured interviews to collect qualitative data from different parts of the city. The CIO recommended interviewees from various projects within the *Digiprogram*. Snow-ball sampling [65], that is, asking the interviewees to recommend potential candidates for future interviews, was also used to seek the best sources of information. In total, 20 face-to-face interviews were conducted. A list of the interviewees is presented in Table 1.

Table 1. Interviewees and their positions in the city administration.

Position
CIO
Program manager
Productivity controller
ICT manager (AK)
Service designer
Enterprise architect
Digimarketing manager
Development manager (city planning)
Development manager (customer service mgmt)
Development manager (employm. services, SO)
Project manager (city concept)
Project manager (city planning)
Project manager (customer service)
Project manager (early education, pre-school HK)
Project manager (employment services, JT)
Project manager (employment services, MV)
Project manager (grammar school)
Project manager (infrastructure; tram)
Project manager (space allocation, JS)
Project manager (town planning)

The interview themes were discussed with the CIO and some of his key staff members. The themes were based on the city strategy and reflected the program objectives. After the initial talks, the objectives were formulated into themes and subsequently questions. A plan on how to execute the interviews was made. The interviews focused on the initial phase and the foundations of the *Digiprogram*, including its resources and participants, but still focusing on its effectiveness and impacts. Additionally, questions about the process itself and the communication were included. The interviews, each lasting 60 minutes on average, were audio-recorded and transcribed.

The data analysis followed the interpretive research approach [66]. The first author acquainted himself with the material to form an overview of the topic and each interview. The issues identified as potential impacts were labeled and listed for later use. Process diagrams and stakeholder maps were also drawn and iterated with the city representatives to see how they corresponded to the eventual issues. All findings were collaboratively discussed among the authors and with the city representatives to ensure the accuracy of the interpretations and the conclusions. Finally, the findings were compared with those of the existing literature.

The *Digiprogram* is an umbrella-like concept consisting of several projects from various operations and units. In this paper, we focus on three departments: the city land-use office, customer service, and employment services. The land-use office handles all issues related to city planning, where the idea is to redesign its processes. For example, the office staff considered 3D-modeling for the construction sites. This was a groundbreaking idea and a demanding experiment. The experiment turned out to be successful as it illustrated new technological and operational requirements for the office staff. From the customer service perspective, a more customer-centered process needed to be adopted. However, scheduling (an appointment) is central for customer service situations, making the adoption perhaps a little easier. This was supported by the officials' pro-experiment mindset and the obvious potential benefits. The employment services experimented with robotic process automation. This was considered a success because the automatic gathering of the customers' background information relieved the officials from holding time-consuming interviews. The time savings were significant, causing the new way of working to be perceived as a major improvement. However, the project managers were uneasy about the use of the time saved for customer service. Using it as a measurement of success showed some distrust toward the city administration.

4. Findings

Tight cooperation among all parties is required when aiming at the successful implementation of a novel experimenting culture. Similarly, benefiting from the various innovations requires communication and cooperation. The experiments comprised both technological and operational innovations. This meant that the ambiguous concept of digitalization manifested itself in many shapes and forms. For example, in some departments,

using Skype for teleconferencing was considered digitalization, while in others, the process itself was regarded as playing with the idea of digitalization and pondering digitalization possibilities. The benefits of the smart city program were primarily the experiences from experimenting—how the experiment addressed the city operations, whether any other operations needed to be touched, and where the implementation of the actual system, after the experiment, would first occur.

Digitalization aims to benefit and ease the lives of the citizens and make the work of the city employees more interesting and meaningful [67], [68]. In the studied cases, the experiments only touched on this issue. A senior member of the ICT unit expressed it in this way: *"Currently, there are very few direct impacts on the citizens. Perhaps they will emerge later [...]. Currently, the everyday life will not get any better as we are still lacking scalability."*

By interviewing different parties (see Table 1), we were able to identify five levels of digitalization impacts, as follows:

- inhabitants and their daily lives,
- city employees and civil servants and their routines,
- the departments where the employees worked,
- city processes and operations, and
- a larger entity, from a regional or even a nationwide angle.

Some interviewees claimed that the citizens might experience direct benefits from the smart city initiative and the experiments. For example, this experience might take place when contacting the city customer service department. An interviewee said, *"We have new openings toward customer orientedness... one of our starting points is customer experience."* Similarly, digitalization may reduce customers' waiting times, thus freeing city officials' time to perform other tasks. This outcome was already experienced in the experiments, as noted by an interviewee, *"We may offer better service according to the needs... and also develop our knowhow."*

However, opposite opinions were also articulated. It was said that these benefits would be realized only after scaling up the service and standardizing it into a regular service offering. *"In the future, these things may get better; now we're just trying out new possibilities."*

In some cases, digitalization forced the city's civil servants to unlearn their previous ways of working, which they had to rethink and renew, emphasizing the work processes and their technological support. This put pressures to change the attitudes and the mental models of the people involved. Nevertheless, some interviewees mentioned that the overall understanding about the tasks became clearer and broadened with the experiments. According to a project manager, *"The way of conducting business is changing [...]. It is clearer what needs to be done, besides one single point."*

This change was viewed as an instant benefit. Increased transparency and visibility of the city strategy were regarded as improvements. The connections between the strategy and the individual tasks and among the tasks themselves were perceived as clearer and more justified. The understanding of the operations was similarly enhanced, as a better perspective overall was gained. This improvement influenced the individual project managers' motivations.

The digitalization puts the departments in a position where they may, and need, to rethink their processes and procedures [69], [70]. In our case, this point was supported by a comprehensive view while simultaneously understanding the whole operations, both the digitalization and the actual city's operations, from a slightly different perspective. This thinking pattern evolution needs to occur both among the managers and their faculty. A project manager said, *"In general, better working, on and for all sides [...], a new culture of doing things."*

The connection to the bigger picture was perceived as a major impact. It helped individual departments to understand their roles and importance among all departments, which improved the employees' motivation. However, this outcome was more the result of working on a specific project in the *Digiprogram* than the actual digitalization features. Still, communication within the city improved with new resources assigned to the initiative. This increased the general awareness about the *Digiprogram* and its different projects, improving transparency, participants' motivation, and subsequently their performance. This awareness required communication with others. The project managers were encouraged to let others know about their projects and what was going on, yet this turned out to be a double-edged sword. The increasing pressure to inform others about the progress and the activities within a project made some project managers uneasy, specifically what to tell and what to omit, as they were unfamiliar with the practice. This was not exactly what and how they were accustomed to do in their everyday work. The sentiment behind this was spiced with an increasing awareness of the other experiments' results, the pressure to produce and exceed them, and a jealousy of others.

The interviewed city employees thought that the direction of the initiative was right, well justified, and indeed necessary for updating the city to catch up with the 21st century. Simultaneously, it would improve the image of the public sector and the civil servants working in it. According to a project manager, *"The operation [of the city] is simply better up-to-date, forward looking, and more risk taking."*

The expectations from the *Digiprogram* were internalized well. The project managers were in agreement that the individual projects contributed to the whole program and that the program was justified and beneficial. The project managers stood behind the initiative and stated that the whole initiative was worth commencing. As an overarching theme, digitalization was welcomed.

Some experiments were able to provide experiences that could be scaled up from a certain department. For example, the employment services' experiences with the time savings raised interest at the national level and gained the attention of the appropriate ministry. It was notified of the initiative's progress so that similar actions could be implemented in other cities.

The interviewees pointed out their reservations about possible negative implications, for instance, what the impact would be on the service quality experienced by the citizens or how the situation before and after the experiment would differ. Both the citizens and the city employees formed heterogeneous groups with varying attitudes and ICT capabilities. This issue can be addressed through training. Different impacts on each department's performance were considered as well. New ways of working may have side effects and unintended consequences at the departmental level. For example, time savings or employee performance may result in personnel replacements or layoffs or uncertainties about what to do if a person lacks the appropriate skills and knowhow or the ability to acquire them.

The issue of the experiment's impacts can be extrapolated to a higher level—another department, the city, or even the national level. The citywide scale may refer to whether the *Digiprogram* objectives are met or whether its individual projects and actions correspond to the city's strategic objectives. The mere possibility of the experiment exerting an influence on the national level was seldom mentioned. This was partly due to the experiments themselves; they were local instantiations aiming to support learning there, not to provide immediate benefits on a broader scale. Scaling up the experiment was simply the focus. In all cases, an interviewee's prior notion of not necessarily receiving immediate benefits should be remembered. By this, the interviewee meant that the experiments at this point were intended to serve as sources of experiences, not to produce benefits per se for the parties involved.

All the interviewees agreed that the *Digiprogram* increased their awareness of digitalization and its possibilities, as well as improved the city administration and the smart city program's transparency. These improvements were largely the results of the very good support by the CIO office and its employees. Similarly, communicating the initiatives and addressing their achievements to the city employees at large were properly taken care of. The communication specialist of the city administration, who also offered direct support to the project managers, was in charge of different channels.

"The support was good. She [the city communications officer] *also wrote stuff but helped us to do so, too. Even when it comes to the content, what to point out and how..." (project manager).*

Communication and peer support were available and well facilitated. Additionally, the *Digiprogram* was well resourced; the project managers and the development managers dedicated a day per week solely to it. This not only helped individual projects but also forced people to gather and discuss relevant issues and share experiences, as well as receive training on different issues.

5. Discussion

The largest impact of the *Digiprogram* was that the city and its departments were learning a new culture. This was a culture where (technical) innovations were viewed as positive actions and the attitude toward experimenting was equally positive [71], [72].

Experimenting requires not only knowledge and technical skills but perhaps more importantly, also a vision and an understanding of the comprehensive situation of the city and its surroundings [73], [74]. In siloed public organizations, this has not been common, but a new culture to support appropriate new actions is needed [75]. First, a vision of what and how an organization should proceed needs to be clear. This enables learning new ways of working, which begins by unlearning the older, outdated practices [76], [77]. This was the main impact of the *Digiprogram*. Its different impacts are summarized in Table 2.

As shown in Table 2, the impacts were numerous. One of the main effects was the service experience becoming quicker, better, and more customer oriented, allowing the focus to be shifted to more personal matters. The impact was considered equally significant by both the citizens and the civil servants delivering the service.

Another effect was the fit with the city's strategy, giving guidelines and action plans to its different departments. The members of the *Digiprogram* reported the improved transparency of the city operations, both at the city and the program levels, and the overall understanding about the city operations became clearer. This improvement allowed different stakeholders to relate to and position themselves in the city operations more easily.

Obviously, there remains issues to be improved and developed further. One is the uncertainty on how individual tasks could and should be measured. The individual projects' connection to the whole city organization was also not entirely clear for all parties because of their

varying positions, roles, and situations. This issue had impacts on understanding the future directions, clarifying the goals, creating and agreeing on an action plan, and then assessing the progress. For example, the objectives and the expectations were not clear for every project manager.

In our study, this question constantly emerged: "What does it mean to digitalize something?" The perceptions on what could and could not be digitalized varied between the processes and the mere tools used in 'normal' business actions. Such differences made the comparison of experiments and their experiences difficult because what actually was done and why they were done were unknown.

managers since their understanding about the whole program varied under its umbrella.

The experiments were unique combinations of technological features, with the prevailing attitudes to create innovations. The adoption of the innovations can be eased, and the resistance to change can be relieved by actively and purposefully ensuring the personnel's commitment to the initiative. Their engagement can be developed by planning well, forming the organization to support the initiative, and providing intensive communication [78]–[80]. The *Digiprogram* did not perfectly succeed in this case because the goal setting was not completed in a satisfactory way. Some dissatisfied voices shadowed the otherwise successful initiative.

Table 2. The impacts of digitalization.

	Service experience	**Novel attitude**	**Work input, task management**	**Relation to strategy**
Citizen	+ shorter waiting times, automated and/or independent services, more flexibility - insecurity of technology	+ customer-friendly service experience, positive attitude toward the service	+ quicker handling of the main issue - uncertainty in using technologies	+ consent to city's more technology-oriented strategy
City employee	+ more situational contents, less routines, quicker customer service, ability to receive feedback	+ better customer experience, more meaningful work content, positivity toward innovation - unlearning the old practices	+ possibility to influence the content, clearer connection to surroundings through increased visibility and transparency, new tools and technologies - insecurity	+ learning new skills corresponding to the smart program, innovation favorableness
City department	+ more motivated employees, more satisfied customers - resistance to change	+ improved job satisfaction - uncertainty and insecurity about the future	+/- changed employee dynamics, new tools and technologies	+ updating the services according to the smart city program
City	+ better brand and acceptance - risk of inequality among citizens due to their varying levels of technical skills	+ modern image, better and more feedback, courage to innovate	+/- allocation of resources, dealing with personnel issues, planning, training, savings	+ matching the national policy of modernizing the field of services to a smart society
Nation	+ example of modern public administration	+ experiences with using modern tools and innovation		+ matching the national policy of modernizing the field of services to a smart society

This set of issues regarding digitalization thus emphasizes the need to agree on the concepts and the goals of the *Digiprogram* as a whole and those of every project. Similarly, the vagueness about when something is "good enough" or "what is enough" confused the project

The initial idea behind the *Digiprogram* was to internalize the city's strategy, communicate it to the project personnel, and simultaneously formulate a digitalization mission for individual agencies and departments. The mission was refined into an action plan from which

the objectives were drawn. The action plan was supposed to define an answer to the question of digitalization, which was not concretized. For instance, in the employment services, it was unclear whether the focus should be on the job seekers and helping them in their job self-seeking or on the employees who tried to find jobs for these applicants. Defining digitalization at the city level would have facilitated the identification of the most promising candidates for the experiments. This definition was assigned to no one. The ownership was not set.

6. Conclusions and contributions

In this paper, we have studied what kinds of impacts different digitalization initiatives create and for whom in the context of a mid-sized city. We have shown that the impacts vary according to the stakeholders and the perspectives, being multifaceted and numerous, as Table 2 illustrates. The potential impacts diverge for city employees, decision makers, citizens, organizational activities, and the public sector in general. This variedness has implications for the assessment of the success and the benefits of the digitalization initiatives; they differ according to the stakeholders and their expectations and perspectives.

Our interviews have provided a view of what occurs in the smart city endeavors when they aim to have beneficial impacts. The city's scarce resources and their allocation frame how actions are prioritized and carried out. In this case, they were collected under the *Digiprogram* umbrella so that experiences could be learned. However, the project comparison was not possible due to ill-defined goals and actions. As the *Digiprogram* is slowly drawing to its end, it remains to be seen how these issues will be addressed later on, how the experiments will be continued, which of them will be standardized and institutionalized, and how these will diverge from their original ideas.

Despite these shortcomings at the *Digiprogram* level, its individual projects illustrate the possible directions of their impacts. These are summarized in Table 2. We consider this information our main contribution since it demonstrates the objectives of the impacts and some examples of how they emerge. Obviously, the examples are context dependent, so they will vary among the situations. Nonetheless, our study illustrates the different impacts of digitalization. There seems to be many agendas at different organizational levels, each pulling toward its own direction.

7. References

[1] H. De Vries, V. Bekkers, and L. Tummers, "Innovation in the public sector: A systematic review and future research agenda," *Public Adm.*, vol. 94, no. 1, pp. 146–166, 2016.

[2] B. Higgins, *Reinventing human services: Community- and family-centered practice*. Routledge, 2017.

[3] T. Bakıcı, E. Almirall, and J. Wareham, "A smart city initiative: the case of Barcelona," *J. Knowl. Econ.*, vol. 4, no. 2, pp. 135–148, 2013.

[4] J. V. Denhardt and R. B. Denhardt, *The new public service: Serving, not steering*. Routledge, 2015.

[5] N. Taylor Buck and A. While, "Competitive urbanism and the limits to smart city innovation: The UK Future Cities initiative," *Urban Stud.*, vol. 54, no. 2, pp. 501–519, 2017.

[6] E. Stolterman and A. C. Fors, "Information technology and the good life," in *Information systems research*, Springer, 2004, pp. 687–692.

[7] P. Parviainen, M. Tihinen, J. Kääriäinen, and S. Teppola, "Tackling the digitalization challenge: How to benefit from digitalization in practice," *Int. J. Inf. Syst. Proj. Manag.*, vol. 5, no. 1, pp. 63–77, 2017.

[8] O. Herranen, "Uusi julkisjohtaminen ja valtion tuottavuusohjelman kova ydin," *Hallinnon Tutk.*, vol. 34, no. 1, pp. 27–42, 2015.

[9] M. Saarijärvi, I. Alanko, and P. Nurminen, "SADe-ohjelma, loppuraportti," 2016.

[10] E. Eriksson, "Situated Reflexive Change: User-Centred Design in (to) Practice," PhD Thesis, KTH Royal Institute of Technology, 2013.

[11] J. Gulliksen, \AAsa Cajander, B. Sandblad, E. Eriksson, and I. Kavathatzopoulos, "User-Centred Systems Design as Organizational Change: A Longitudinal Action Research Project to," *Sociol. Philos. Asp. Hum. Interact. Technol. Adv. Concepts Adv. Concepts*, p. 80, 2011.

[12] M. Rajanen, "Applying usability cost-benefit analysis-explorations in commercial and open source software development contexts.," PhD Thesis, University of Oulu, Finland, 2011.

[13] I. Lindgren and G. Jansson, "Electronic services in the public sector: A conceptual framework," *Gov. Inf. Q.*, vol. 30, no. 2, pp. 163–172, 2013.

[14] M. Ylinen and S. Pekkola, "A process model for public sector IT management to answer the needs of digital transformation," in *Proceedings of the 52nd Hawaii International Conference on System Sciences*, 2019.

[15] S. Petter, W. DeLone, and E. R. McLean, "Information systems success: The quest for the independent variables," *J. Manag. Inf. Syst.*, vol. 29, no. 4, pp. 7–62, 2013.

[16] N. Urbach and B. Müller, "The updated DeLone and McLean model of information systems success," in *Information systems theory*, Springer, 2012, pp. 1–18.

[17] W. H. DeLone and E. R. McLean, "Information systems success measurement," *Found. Trends® Inf. Syst.*, vol. 2, no. 1, pp. 1–116, 2016.

[18] P. Hallikainen and L. Chen, “A holistic framework on information systems evaluation with a case analysis,” *Lead Issues ICT Eval*, vol. 9, pp. 57–64, 2006.
[19] R. P. Bagozzi, F. D. Davis, and P. R. Warshaw, “Development and test of a theory of technological learning and usage,” *Hum. Relat.*, vol. 45, no. 7, pp. 659–686, 1992.
[20] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, “User acceptance of information technology: Toward a unified view,” *MIS Q.*, pp. 425–478, 2003.
[21] V. Venkatesh, J. Y. Thong, and X. Xu, “Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology,” *MIS Q.*, vol. 36, no. 1, pp. 157–178, 2012.
[22] G. S. Pan, “Information systems project abandonment: a stakeholder analysis,” *Int. J. Inf. Manag.*, vol. 25, no. 2, pp. 173–184, 2005.
[23] Y. K. Dwivedi *et al.*, “Research on information systems failures and successes: Status update and future directions,” *Inf. Syst. Front.*, vol. 17, no. 1, pp. 143–157, 2015.
[24] B. Van Der Raadt, S. Schouten, and H. Van Vliet, “Stakeholder perception of enterprise architecture,” in *European Conference on Software Architecture*, 2008, pp. 19–34.
[25] N. Agarwal and U. Rathod, “Defining ‘success’ for software projects: An exploratory revelation,” *Int. J. Proj. Manag.*, vol. 24, no. 4, pp. 358–370, 2006.
[26] O. Pankratz and D. Basten, “Opening the black box: Managers’ perceptions of IS project success mechanisms,” *Inf. Manage.*, vol. 55, no. 3, pp. 381–395, 2018.
[27] A. Klaus-Rosinska, “Concept of measuring the performance of IT projects,” in *2017 25th International Conference on Systems Engineering (ICSEng)*, 2017, pp. 412–417.
[28] F. Naschold, *New Frontiers in the Public Sector Management: Trends and Issues in State and Local Government in Europe*, vol. 69. Walter de Gruyter GmbH & Co KG, 2017.
[29] M. Warner and R. Sullivan, *Putting partnerships to work: Strategic alliances for development between government, the private sector and civil society*. Routledge, 2017.
[30] A. Jäntti, “Kunta, muutos ja kuntamuutos,” p. 245, 2016.
[31] G. Aichholzer and R. Schmutzer, “Organizational challenges to the development of electronic government,” in *Proceedings 11th International Workshop on Database and Expert Systems Applications*, 2000, pp. 379–383.
[32] “Arrangement and provision of municipal services,” *Localfinland.fi*. [Online]. Available: https://www.localfinland.fi/expert-services/finnish-municipalities-and-regions/functions-municipalities-and-joint-municipal-authorities/arrangement-and-provision-municipal-services. [Accessed: 09-Jun-2019].
[33] C. Agutter, R. England, S. van Hove, and R. Steinberg, *VeriSM - A Service Management Approach for the Digital Age*. van Haren Publishing, 2017.
[34] B. W. Wirtz, *Business model management*, 2nd ed. Speyr: German University of Administrative Sciences Speyer, 2016.
[35] C. Agutter, S. van Hove, R. Steinberg, and R. England, *VeriSM-A service management approach for the digital age*. Van Haren, 2017.
[36] Z. Van der Wal, G. De Graaf, and K. Lasthuizen, “What’s valued most? Similarities and differences between the organizational values of the public and private sector,” *Public Adm.*, vol. 86, no. 2, pp. 465–482, 2008.
[37] F. Ding, D. Li, and J. F. George, “Investigating the effects of IS strategic leadership on organizational benefits from the perspective of CIO strategic roles,” *Inf. Manage.*, vol. 51, no. 7, pp. 865–879, 2014.
[38] E. M. Rogers, *Diffusion of innovations*. Simon and Schuster, 2010.
[39] M. Arnaboldi, I. Lapsley, and I. Steccolini, “Performance management in the public sector: The ultimate challenge,” *Financ. Account. Manag.*, vol. 31, no. 1, pp. 1–22, 2015.
[40] M. Bourne, A. Neely, K. Platts, and J. Mills, “The success and failure of performance measurement initiatives: Perceptions of participating managers,” *Int. J. Oper. Prod. Manag.*, vol. 22, no. 11, pp. 1288–1310, 2002.
[41] A. Heberle, W. Löwe, A. Gustafsson, and Ö. Vorrei, “Digitalization Canvas-Towards Identifying Digitalization Use Cases and Projects.,” *J UCS*, vol. 23, no. 11, pp. 1070–1097, 2017.
[42] C. E. Moe, A. C. Risvand, and M. K. Sein, “Limits of public procurement: information systems acquisition,” in *Electronic Government*, Springer, 2006, pp. 281–292.
[43] K. J. Fox, *Efficiency in the Public Sector - Google-kirjat*. New York: Springer Science+Business Medi, LLC, 2002.
[44] D. E. Beck and C. Cowan, *Spiral dynamics: Mastering values, leadership and change*. John Wiley & Sons, 2014.
[45] M. P. Hekkert and S. O. Negro, “Functions of innovation systems as a framework to understand sustainable technological change: Empirical evidence for earlier claims,” *Technol. Forecast. Soc. Change*, vol. 76, no. 4, pp. 584–594, 2009.
[46] S. Fernandez and H. G. Rainey, “Managing successful organizational change in the public sector,” *Public Adm. Rev.*, vol. 66, no. 2, pp. 168–176, 2006.
[47] W. Huitt, “A systems model of human behavior,” *Educ. Psychol. Interact.*, 2003.
[48] M. H. Zack, “Managing codified knowledge,” *MIT Sloan Manag. Rev.*, vol. 40, no. 4, p. 45, 1999.
[49] J. Zhou and J. M. George, “When job dissatisfaction leads to creativity: Encouraging the expression of voice,” *Acad. Manage. J.*, vol. 44, no. 4, pp. 682–696, 2001.
[50] G. Bongiorno, D. Rizzo, and G. Vaia, “Cios and the Digital Transformation: A New Leadership Role,” in *CIOs and the Digital Transformation*, Springer, 2018, pp. 1–9.

[51] A. Horlacher and T. Hess, “What does a Chief Digital Officer do? Managerial tasks and roles of a new C-level position in the context of digital transformation,” in *2016 49th Hawaii International Conference on System Sciences (HICSS)*, 2016, pp. 5126–5135.
[52] F. Verbeeten and R. Speklé, “Management Control, Results-Oriented Culture and Public Sector Performance: Empirical Evidence on New Public Management - Frank H. M. Verbeeten, Roland F. Speklé, 2015,” vol. 36, no. 7, pp. 953–978, 2015.
[53] F. Ahlemann, “How digital transformation shapes corporate IT: Ten theses about the IT organization of the future,” in *Computer Science and Information Systems (FedCSIS), 2016 Federated Conference on*, 2016, pp. 3–4.
[54] M. De Tuya, M. Cook, M. Sutherland, and L. Lunareyes, “The leading role of the government CIO at the local level: Strategic opportunities and challenges - ScienceDirect,” *Gov. Inf. Q.*, 2017.
[55] J. Magnusson, E. Högberg, and H. Sjöman, “How the West was Lost: Chief Information Officers and the Battle of Jurisdictional Control,” in *Proceedings of the 52nd Hawaii International Conference on System Sciences*, 2019.
[56] C. Bason, *Leading public sector innovation: Co-creating for a better society*. Policy Press, 2018.
[57] S. Donetto, P. Pierri, V. Tsianakas, and G. Robert, “Experience-based co-design and healthcare improvement: realizing participatory design in the public sector,” *Des. J.*, vol. 18, no. 2, pp. 227–248, 2015.
[58] H. Torvinen and P. Ulkuniemi, “End-user engagement within innovative public procurement practices: A case study on public–private partnership procurement,” *Ind. Mark. Manag.*, vol. 58, pp. 58–68, 2016.
[59] S. Goldfinch, “Pessimism, computer failure, and information systems development in the public sector,” *Public Adm. Rev.*, vol. 67, no. 5, pp. 917–929, 2007.
[60] C. Legner *et al.*, “Digitalization: opportunity and challenge for the business and information systems engineering community,” *Bus. Inf. Syst. Eng.*, vol. 59, no. 4, pp. 301–308, 2017.
[61] C. Loebbecke and A. Picot, “Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda,” *J. Strateg. Inf. Syst.*, vol. 24, no. 3, pp. 149–157, 2015.
[62] P. Baily, D. Farmer, and D. Jessop, *Purchasing principles and management*. Pearson Education, 2005.
[63] R. K. Yin, *Case study research: Design and methods*, vol. 5. Sage Publications, Incorporated, 2008.
[64] “Smart Tampere,” 19-Oct-2017. [Online]. Available: https://www.tampere.fi/smart-tampere.html. [Accessed: 06-Jun-2018].
[65] D. Morgan, “Snowball sampling,” *SAGE Encycl. Qual. Res. Methods*, vol. 2455, pp. 816–817, 2008.
[66] G. Walsham, “Doing interpretive research,” *Eur. J. Inf. Syst.*, vol. 15, no. 3, pp. 320–330, 2006.
[67] L. S. Flak and H. Solli-Saether, “Benefits Realization in eGovernment: Institutional Entrepreneurship or Just Hype?,” in *2013 46th Hawaii International Conference on System Sciences*, 2013, pp. 2062–2071.
[68] T. Paivarinta, W. Dertz, and L. S. Flak, “Issues of adopting benefits management practices of IT investments in municipalities: a Delphi Study in Norway,” in *2007 40th Annual Hawaii International Conference on System Sciences (HICSS’07)*, 2007, pp. 103–103.
[69] A. Bharadwaj, O. A. El Sawy, P. A. Pavlou, and N. Venkatraman, “Digital business strategy: toward a next generation of insights,” *MIS Q.*, pp. 471–482, 2013.
[70] O. A. El Sawy, P. Kr\a emmergaard, H. Amsinck, and A. L. Vinther, “How LEGO Built the Foundations and Enterprise Capabilities for Digital Leadership.,” *MIS Q. Exec.*, vol. 15, no. 2, 2016.
[71] H. Kagermann, “Change through digitization—Value creation in the age of Industry 4.0,” in *Management of permanent change*, Springer, 2015, pp. 23–45.
[72] C. Fischer and A. Pöhler, “Supporting the change to digitalized production environments through learning organization development,” in *The impact of digitalization in the workplace*, Springer, 2018, pp. 141–160.
[73] Z. Patel, S. Greyling, S. Parnell, and G. Pirie, “Co-producing urban knowledge: experimenting with alternatives to ‘best practice’for Cape Town, South Africa,” *Int. Dev. Plan. Rev.*, vol. 37, no. 2, pp. 187–203, 2015.
[74] F. Fagerholm, A. S. Guinea, H. Mäenpää, and J. Münch, “The RIGHT model for continuous experimentation,” *J. Syst. Softw.*, vol. 123, pp. 292–305, 2017.
[75] E. Lindgren and J. Münch, “Raising the odds of success: the current state of experimentation in product development,” *Inf. Softw. Technol.*, vol. 77, pp. 80–91, 2016.
[76] K. Becker, “Organizational unlearning: time to expand our horizons?,” *Learn. Organ.*, vol. 25, no. 3, pp. 180–189, 2018.
[77] M. Fiol and E. O’Connor, “Unlearning established organizational routines–part I,” *Learn. Organ.*, vol. 24, no. 1, pp. 13–29, 2017.
[78] E. Karanges, K. Johnston, A. Beatson, and I. Lings, “The influence of internal communication on employee engagement: A pilot study,” *Public Relat. Rev.*, vol. 41, no. 1, pp. 129–131, 2015.
[79] R. A. Noe, J. R. Hollenbeck, B. Gerhart, and P. M. Wright, *Human resource management: Gaining a competitive advantage*. McGraw-Hill Education New York, NY, 2017.
[80] E. M. Mone and M. London, *Employee engagement through effective performance management: A practical guide for managers*. Routledge, 2018.