Digital innovation in government services: Harmonizing theories, contemporary technology and practical experiences

András Nemeslaki (nemeslaki@finance.bme.hu)
Budapest University of Technology and Economics

Abstract

We present a case study of Hungary´s electronic income tax declaration application – an application which was rolled out in 2017 and has received a surprisingly good response both from experts and from the public. Our research model was based on the concept of digital service innovation, a position arguing that digital innovation differs from classic innovation theories in that it is less bounded and more fluid in terms of: a) problems-solution paring, b) how innovation agency is distributed and c) outcomes and processes are connected. We gathered data from user through questionnaires and public administration decision makers through interviews.

Keywords: digital service innovation, government services, on-line tax declaration

Introduction

The need for the enrichment of service innovation theories - in general, and specifically in public services, - have been raised most recently (Nambisan, Lyytinen, Majchrzak, & Song, 2017), (Bertot, Estevez, & Janowski, 2016). In the present "digital age" (Barrett, Davidson, Prabhu, & Vargo, 2015) argue that there are two key drivers for this need, the first being the growth of, what has been called, the traditional service industries coupled with the "servitization" of traditionally non-service industries (manufacturing, logistics etc.) due to the advancements in automation; the second being the characteristics of contemporary ICT and the world of pervasive computing (Yoo, Boland, Lyytinen, & Majchrzak, 2012). In our paper, we focus on the second area, and define the ICT artefact using (Benbasat & Zmud, 2003), who conceptualized them as a specific applications (e.g., in the e-government context a web based service), designed to enable and/or support some tasks (executing a citizen´s administrative request) within a structure (in a local or national region) which is itself embedded in a context - for instance, saving time and costs in order to provide efficiency. The challenge for innovation which has been posed by (Yoo, Henfridsson, & Lyytinen, 2010) from this point of view is that contemporary ICT enabled the creation of complex ecosystems due to its layered architecture built up from devices, networks, services and content – each triggering myriads of innovations.

Furthermore, they also show that digital technologies have three characteristics impacting services in which they are built in: a) reprogrammability, that is the same hardware takes different forms according to its use, b) homogenization of data, which results in treating everything in its digitized transformation as bits (identities, objects, texts, pictures, videos

etc.), and, c) self-referential nature, that is ICTs are personalized and take different forms and shapes with use. In the public domain similar pressures are shown by (Fishenden & Thompson, 2013) who reported that open standards, architecture, effective identity management advancements in interoperability enable major process and service innovations related to public service delivery. Building on these characteristics organizations manage product and service innovations in an environment of open and flexible affordances which are used in creating new solutions enabled by digital platforms, distributed and combinatorial innovations (Yoo, Boland, Lyytinen, & Majchrzak, 2012).

Generally, service innovation in this environment does not viewed as a one directional initiative, nor as a deterministic institutional directive, but instead, a socially rich ecosystem building on the human-technology duality of the pervasive ICT environment (Barrett, Davidson, Prabhu, & Vargo, 2015). What makes then services "innovative" and where is the state-of-the-art regarding standard services, what we might call "business as usual, nothing special" service offering? (Bertot, Estevez, & Janowski, 2016) drew the line between standard and innovative public e-services where we can identify the entrepreneurship, novelty and value. However, the "Schumpeterian" creative destruction, disruption of existing structures or fundamental re-engineering is not preferred in administrative innovations; governments are dominated with Weberian bureaucracies, even when ICT implementations are considered (Cordella & Tempini, 2015). Public service innovation is more incremental, less autonomous and flexible and very often exposed to political influences. Citizens, on the other hand, often "need to purchase" government services regardless of their wishes and that is a determinant factor of their perceptions, regardless of how attractively they are delivered to them (Bertot, Estevez, & Janowski, 2016).

The pragmatic question arises how to innovate e-services in public administration, and how to orchestrate all those dynamic relationships between users, ICT developers, public policy objectives and legislative constraints? The concept of design thinking (Kimbell, 2011), (March & Storey, 2008), (Barzelay & Thompson, 2010), practice orientation (Orlikowski & Scott, 2015) and social construction (Bijker, 1995) has been raised by several authors as a path forward in this direction. Building on these findings and their experiences in editing the Special Issue of MIS Quarterly in "IT and Innovation" (Nambisan, Lyytinen, Majchrzak, & Song, 2017) concluded that digital innovation differs from classic innovation theories, in that, it is less bounded and more fluid in terms of: a) problems-solution paring, b) how innovation agency is distributed and c) outcomes and processes are connected.

We build our research design on these three theoretical concepts and methodologically test them with a case study

Research Model and Methodology

Theorizing initiatives about digital innovation are summarized in the first two columns of Table 1. *Table*This table also shows our final conclusions, how these initiatives can be modified/extended to public services.

1. Table. Case summary – Extension of (Nambisan, Lyytinen, Majchrzak, & Song, 2017) *to digital innovation in public services*

Digital Innovation Construct	General Description (Nambisan at. al., 2017)	Case illustration	Public Administration
Problem – Solution matching	Distributed agency Trial-and-error Refinement and redefinition	Building on legacy systems It was mainly a design problem: most back-office systems were up and running. Analysis of user feedback – what do they "like"? "I could not ask for anything which I did not get."	Constraints of legacy systems and bureaucracy
Socio-cognitive sense making	Shared sense making Framing and re-framing Creation of narratives	Philosophical change: from control to service "Let your imagination work!" Discussion about the frustrations of taxation. "Two experts were working in the same room."	Problems could be political or policy related.
Technology affordance	Features and user potential Human-Machine interaction Concept of use and intent Fluid outcomes and processes	Multichannel – multiplatform (SMS, App, Mail) Most users´ intent is to check and verify not to calculate. Enforcing and re-enforcing known interfaces. Awareness of users´ behavior with ICT	Inverse IKEA model – no empowerment
Orchestration	Loosely connected contributors Managing the flow of problems-solutions-stakeholders Organizational stimuli	I could not ask for what I have not received. Checking with "big four" – workshops. Multidisciplinary expertise and teamwork – championed from the top. IT subcontractor and its designers – development ecosystem.	Powerful institutions create alignment

Research Model

Firstly, propositions for theorizing digital innovation, is the different dynamics of the problem and solution matching dynamism. With the ease of presenting beta versions, the addition of patches and updates, process of development and outcomes have become fluid. Outcomes influence solutions by affordances, and trial-and-error iterations become seamless. Refinement and redefinition of problems are also triggered by the complexity of ecosystems, ideas and solutions come from many sources, distribution of innovation agency is rather common in service design. Secondly, in digital innovation sensemaking and cognition are also fluid and distributed, can be shared with ease. Technology frames can be rapidly reframed, partly with the help of the seamless problem-solution dynamics, but partly with the easily exchangeable narratives. The classic "Relevant Social Groups" are not shaping each other in long cycles and in isolation; heterogeneous actors quickly populate the design and innovation space. The third logic of digital innovation is described with the concept of technology affordances and constraints. This entails the feature set offered by the particular ICT innovation and its human interpretation through its use. Human-technology interaction is the mechanism of how actors´ goals and intentions match the opportunities offered by the service solution. Affordances come in pairs with constraints which can reside both in human but in machine agency as well. Finally, the fourth theorizing logic of digital innovation is, how orchestration is performed during the development and design. Orchestration is more fluid than coordination, since it involves loosely coupled constituencies in the ecosystems, again, ideas pop up anywhere and signals can be week at the beginning. Also the flow of concepts – problems and solutions – need to flow between stakeholders enhancing the sensemaking and shared cognition. This is the source of organization stimuli on cooperation and provide venues for the different agencies to come together and provide platforms to exchange narratives and structure the solution.

Research methodology

For getting new insights on how successful digital service innovation works in public administration, we present a case study of the electronic personal income tax declaration (e-PIT) system introduced by the Hungarian National Taxation and Customs Office (NTCO) in 2017. In the center of the case we present an application, which both in its scale and in its impact might play a significant role to show new directions how to develop user centered e-services in the Hungarian public sector. The application enables users – tax payer citizens – to declare personal income tax via even their mobile phone and also settle payments if that is necessary. Methodologically, we present the artefact and briefly the pathway how it was created.

In order to investigate how the logic of digital service innovation was working in the case we selected two different group of informants and gathered data with two different methodologies.

The first group was what we named public administration innovators (PA group) represented by two key individuals who were interviewed by the authors. Both of them are key innovation agents, one is the deputy state secretary of NTCO holding the political umbrella above the project, and the other is the head of the tax collection department responsible for the e-PIT project. The second group was consisting of users, who were asked to fill out a questionnaire put together to test (Nambisan, Lyytinen, Majchrzak, & Song, 2017) digital innovation framework. Due to the exploratory nature of our research

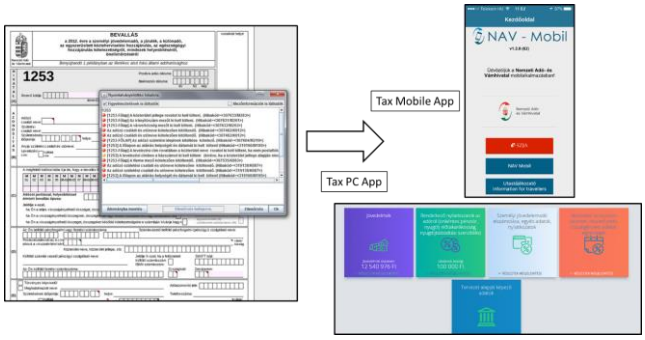
respondents were random, sending out the inventory to master students (who also work) and to interested colleagues. We have received 61 responses, out of which 52 indicated that they have used the e-PIT system, and 13 of them reported experience with the older on-line tax declaration system as well. Due to the small and not representative sample size, we have not analyzed differences between these groups but treated the 52 respondents as a whole an only assessed results related to the e-PIT innovation.

Average age is 39 years with 10 years standard deviation and 52%-48% male female ratio; quite young and gender neutral sample. ICT skills and experience was very high; more than 80% of them assessed their own skills as experienced users and 58% even rated themselves high on e-public services experience. More than 50% also indicated that they are knowledgeable about the issues of public administration – this is obviously due to the fact that most of them have degrees or work in this field. They intensively use e-commerce services, mobile apps so the testing user group can be considered knowledgeable both in terms of ICT but also with regard to general issues of public administration in Hungary.

For testing our research model we simply systematically organized the interview inputs according to (Nambisan, Lyytinen, Majchrzak, & Song, 2017) four "theoretical logic" presented in 1. Table. We than juxtapose these comments with the summary of our user group´s input, which previously have been analyzed with some basic exploratory data analysis testing in SPSS (factor loadings, correlations, descriptive statistics). In the following section we summarize these results and at each element of the research model propose extensions to digital service innovation in public services.

Description of the the Hungarian electronic tax declaration service

In 2017 the National Taxation and Customs Office (NTCO) has launched a new approach to on-line tax declaration called the electronic personal income tax declaration (e-PIT) and caused a major surprise in the Hungarian e-government landscape. The difference of the "look-and-feel" or GUI is shown in Figure 1. *Figure* In the right sides we can see the new e-PIT solution both on mobile and desk top versions, while the left illustrates the traditional look of the old "spreadsheet" style application.



1. Figure. Illustration of the user perspetive of on-line tax declaration before and after 2017.

A key impact of e-PIT and the new service design is shown in Table. 2. *Table*and demonstrate that apart from users´ perception expressed in social media, press or other forums, there are some quantitative evidence to justify the benefits. GFS „2D" shows those submissions, who downloaded the forms to calculate their income tax, but because of either lacking a client gate account or because of other reasons chose to print their form and to send it in by regular mail.

2. Table. Change in paper based tax-return submission between 2016 and 2017

Paper based submission by mail	2016 units	2017 units	Reduction %
GFS „2D" (downloaded and print)	2 073 084	1 351 695	35 %
Manually filled print form	470 674	180 077	62 %
Print mailed total	2 543 758	1 531 772	40 %

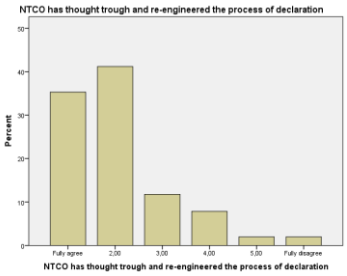
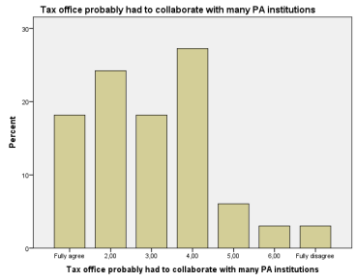
As a result of the new e-PIT on-line system a 40% decrease in the paper based submission was achieved – in total numbers it is more than 1 million people – this is about 23% of the 4.2 million individuals who received pre-designed task declarations.

Discussion of digital service innovation logic based on the e-PIT case

PA Designers narratives and socio-cognitive sense making

We took two representative variable from user responses – simple underlined – and triangulated with the corresponding narratives of or interviewees. Results are presented in 3. Table. Interviewees have emphasized the philosophical change of NTCO to taxation - shifting to „service orientation" from the "control orientation" – that is using the existing data for preparing the declaration forms instead of controlling user input..

3. Table. PA Designers and User responses for the narrative of socio-cognitive sense making

PA Designers	Users	
Importance of political agenda Philosophical change in taxation attitude. Using what we have differently	 Changing processes and outcomes	 Exchanging framing concepts

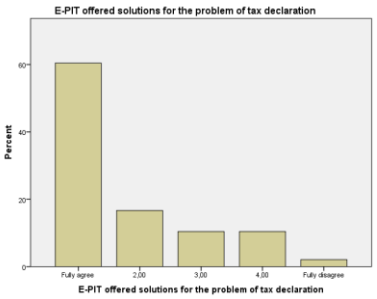
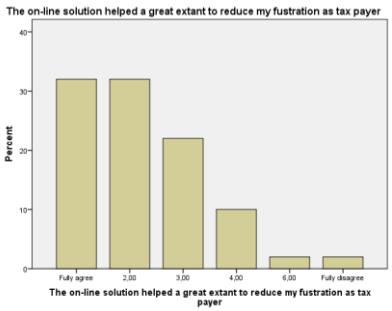
Ambitions of higher management of NTCO (president, state-secretary) and the professional management at the department level – being fed up with the one of the most criticized and often ridiculed public service in Hungary – played a great role in openness of genuine exchange about technology frames and the entire taxation process. NTCO as an organization managed to create an alignment in the desire to break out of the negative service perception, and importantly to mobilize its tremendous resources for this objective. The slogan of the "tax declaration should fit on beer-tag" communication has become a burning promise, where the interpretation of political agenda to pragmatic policy solution and implementation has been painfully missing.

As we can see in 3. Table. our user group perception harmonizes with the narratives of our PA interviewees, although the opinions of the "collaborative" nature are more spread, than regarding the NTCO internal process redesign efforts.

PA Designers narratives on problem-solution pairing

As far as the solutions of tax declaration is concerned users responses were in agreement both technically and emotionally (functions and perceptions), with the PA interviewees.

4. Table. PA Designers and User responses for the narrative of problem-solution pairing

PA Designers	Users	
Reaching out to taxpayers differently using platforms Design thinking in PA Back-office and infrastructure	 Functional Problem	 Perception of the Problem

In order to get a working design, according to the narratives, a key dilemma has been the pivotal client relations – posing random questions by experts at all levels to check the workflow of how declaration reaches taxpayers. For instance, how an ordinary citizen receives his/her pre-filled tax-form? How do they ask questions and modify? How can they make decisions on allowances and exemptions? *5. Table* summarizes the distribution of the most significant platforms of communication.

5. Table. Channels used for requesting tax declaration forms (number of request)

	SMS	**WEB**	**Mail**	**Personal (branch offices)**	**Total**
Request received until 2017.06.12	358 279	121 242	109 969	126 229	**715 719**
Distribution percent	50,06%	16,94%	15,36%	17,64%	**100%**

Narratives elaborated on the details of how design thinking was operating to seek out effective solutions. First of all in order to prepare draft declaration forms to all eligible 4,8 million individuals collection of 60 million different data-lines is ensured from 30 different sources (e.g. stock dividends, income reports, National Social Insurance Office, employers, etc.). These data and these sources have served as the foundations of levying taxes.

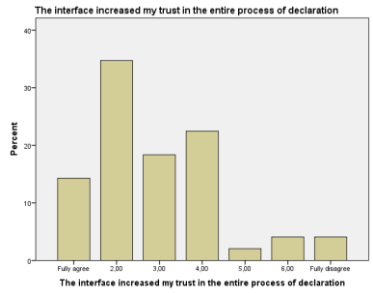
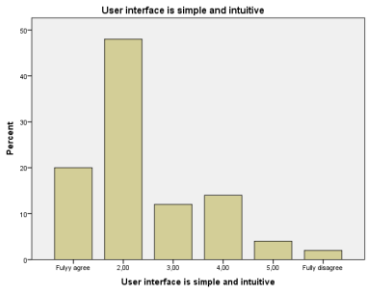
PA was closely working with the IT software and solution designer and solutions were brainstormed together. Team work has been essential in the tax declaration department, a notably unusual form of organizing in Hungarian public administration. For instance, it has become apparent that the forms are complicated; in the case of the e-PIT solution there are 1100 potential error codes generated by 400 functions and formulas ensuring that the final declarations are error free. Some of the reasons for this are real life situations such as individuals change employees, work at more institutions, combine several exemption possibilities etc. Some others come from the combination of different data sources, often resulting in the so called "anomalies" rooted in interoperability malfunctions between PA registries. The teams considered it pivotal, that error messages are displayed with highly visual presentations, and they are easly interpreted.

Narratives on technology affordances and constraints

In 6. Table. we used the user interfaces in order to analyze how users and PA designers assessed the technology constraints and affordances in the e-PIT case. As our state-

secretary interviewee phrased: “The most essential point of our innovation in 2017 was, that one could declare one´s personal income tax on the move, by phone – and even settle payments if he/she desired”. This narrative is the manifestation of the importance of how the ICT feature set should match the actors capabilities (users to transact, institutions to enable and technologists to provide functions), or even suggests new forms of behavior (use phone apps to declaration).

6. Table. PA Designers and User responses for the narrative of technology affordances and constraints

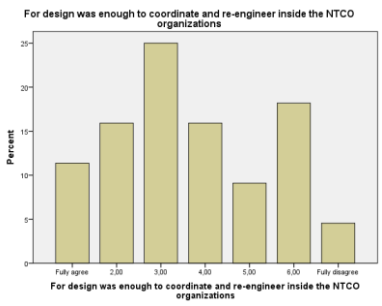
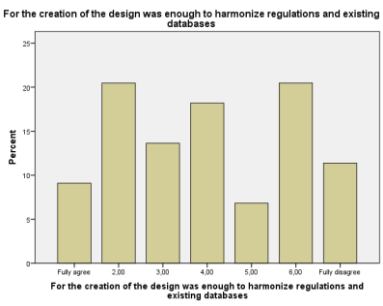
PA Designers	Users	
Trendy use patterns of ICT Intuitiveness in tax declaration Satisfying different needs	 Connection to the problem framing	 Connection to the problem handling

Looking at 6. Table. we can observe a very similar pattern of users´ response through the affordance lens both how they view the human-technology duality (intuitiveness of the interface) and how they assess the potentials of structuring a new form of declaration (human and process). Both of our PA Designers emphasized though, that Hungary applies the self-declaration principle holding the taxpayer responsible for her declaration and NTCO intends to maintain the empowerment of users to create their own forms and tables accordingly.

Orchestration – the major difference is narratives

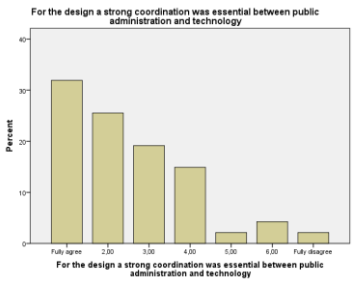
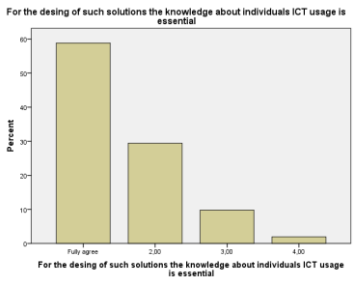
NTCO is one of the most dominant, visible and equipped with resources such as technology and human expertise. Its role in public administration, as a matter of fact in governance in general, is pivotal, not even mentioning its impact on economy through the business sector but also in the life of individuals. As illustrative data in 7. Table shows users´ responses are distributed on the coordination issue.

7. Table. Narrative on harmonization between organizations and technology solutions

PA Designers	Users	
Institutional power Orchestration with politics Harmonization with IT the ecosystem	 Organizational alignment	 Technology alignment

8. Table. provides a finer insight to how duality of technology was working in the e-PIT innovation.

8. Table. Narratives on the duality of technology – social and technological shaping

PA Designers	Users	
Genuine openness Learning from stakeholders Historical pathway	 Technology and Institutions	 Technology and Individuals

In 1. Table we summarize and present the case data with (Nambisan, Lyytinen, Majchrzak, & Song, 2017) digital innovation research initiatives and – as a theoretical contribution - conclude how the findings can be generalized for extending this initiative to public administration.

Conclusions

In order to contribute to the question of what leads to successful digital service innovation in the public sector, we presented the case study of Hungary´s electronic income tax declaration application – an application which was rolled out in 2017 and has received a surprisingly good response both from experts and from the public. Our research model was based on (Nambisan, Lyytinen, Majchrzak, & Song, 2017) proposition arguing that digital innovation differs from classic innovation theories in that it is less bounded and more fluid in terms of: a) problems-solution paring, b) how innovation agency is distributed and c) outcomes and processes are connected. Using their framework we gathered data from user through questionnaires and public administration decision makers through interviews.

In terms of problem-solution pairing digital innovation framework proposes that stabile solutions emerge with trial-and-error, continuous redefinition of the problem based on refined solutions which are the consequence of the distributed agency and initiation. Our case data, while recognizing that trial-and-error and problem refinement are present, revealed that path dependency - building on legacy systems and having concentrated on powerful agents are critical in public administration. These findings are in alignment with (Bertot, Estevez, & Janowski, 2016).

Data collected both form users and the PA experts confirmed that shared cognition and dynamic exchange of problem narratives leads to innovative solutions using digital technology satisfying both users and institutions. In the case “philosophical change” was used as a key term to describe the discourse between politics and administration and also between the tax authority understanding users´s behavior and attitude with regard to tax declaration. Framing and re-framing the problems, however, in the public setting remained mostly behind closed doors and constituencies were simulated by the designers and PA experts. Conceptually, this approach is logical, since tax declaration cannot be considered as participatory or co-creation based service – our case rather illustrates a personalized and potentially anticipatory public service innovation according to (Bertot, Estevez, & Janowski, 2016) classification.

According to the third area, namely technology affordances and constraints, our user data has confirmed the fluidity of digital innovation: problems and process of tax declaration are seen through the lens of technology. Intuitive use, availability of multi-channels, and simplicity of transactions create potentially high level of trust even in the back-offices of taxation. Interestingly, user empowerment and allowing the self-customization option in the case of taxation is less preferred – ordinary user´s practices prefer receiving a personalized solution prepared for them. Conceptually, we found that automated computations, user interfaces, combinations of platforms work together with user practices to configure a stabile service offering – which could be further explored for instance using the framework of sociomateriality or relational ontologies (Orlikowski & Scott, 2015).

Finally, we found controversial orchestrations in our case. Innovation agency was found at one of the most powerful and resource available public institutions with a very strong political and professional commitment for deploying the application. Data has revealed genuine openness and willingness to learn from constituencies in terms of ICT impacts and how the ecosystem works. Coupled with teamwork internally, and orchestrating with politics externally, we found a smart balance of alignment applied for public administration (Vander Elst & De Rynck, 2014).

References

Barrett, M., Davidson, E., Prabhu, J., & Vargo, S. L. (2015). SERVICE INNOVATION IN THE DIGITAL AGE: KEY CONTRIBUTIONS AND FUTURE DIRECTIONS. *MIS Quarterly, 39*(1), 135-154.

Barzelay, M., & Thompson, F. (2010). Back to the Future: Making Public Administration a Design Science. *Public Administration Review, 70*(Supplement to Volume 70: The Future of Public Administration in 2020), S295-S297.

Benbasat, I., & Zmud, R. (2003). The identity crisis within the IS discipline: Defining and communicating the discipline´s core properties. *MIS Quarterly*, Vol. 27., No. 2., pp.: 183-194.

Bertot, J., Estevez, E., & Janowski, T. (2016). Universal and contextualized public services: Digital public service innovation framework. *Government Information Quarterly, 33*(2), 211-222.

Bijker, W. E. (1995). *Of Bicycles, Bakelites and Bulbs: Toward a Theory of Sociotechnical Change.* Cambridge, MA: MIT Press.

Cordella, A., & Tempini, N. (2015). E-government and organizational change: Reappraising the role of ICT and bureaucracy in public service delivery. *Government Information Quarterly, 32*(3), 279–286.

Fishenden, J., & Thompson, M. (2013). Digital Government, Open Architecture, and Innovation: Why Public Sector IT Will Never be the Same Again. *Journal of Public Administration Research and Theory, 23*(4), 977-1004.

Kimbell, L. (2011). Designing for service as one way of designing services. *International Journal of Design, 5*(2), 41-52.

March, S. T., & Storey, V. C. (2008). Design Science in the Information Systems Discipline: An Introduction to the Special Issue on Design Science Research. *MIS Quarterly, 32*(4), 725-730.

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital Innovation Managemement: Reinventing Innovation Management in a Digital World. *MIS Quarterly, 41*(1), 223-238.

Orlikowski, W. J., & Scott, S. V. (2015). The Algorithm of the Crowd: Considering the Materiality of Service Innovation. *MIS Quarterly, 39*(1), 201-216.

Vander Elst, S., & De Rynck, F. (2014). Diving in the Dynamics of Alignment Process in Public Organizations: Lessons for a Reconceptualized Alignment Framework. *EGPA Conference*, (pp. 1-14). Speyer, Germany.

Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for Innovation in the Digitized World. *Organization Science, 23*(5), 1398–1408.

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research, 21*(4), 724-735.