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# DIGITAL INNOVATION IN PUBLIC SERVICE ECOSYSTEM: ENACTING THE GENERATIVE AFFORDANCE

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# DIGITAL INNOVATION IN PUBLIC SERVICE ECOSYSTEM: ENACTING THE GENERATIVE AFFORDANCE

*Research in Progress*

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## Abstract

*The Information systems (IS) literature explains how specific digital characteristics enable structural generativity, i.e. “a system’s capacity to produce unanticipated change through contributions from broad and varied audiences” (Zittrain, 2008: p.70). This resonates well with innovation literature, which emphasizes the combinatorial aspect of innovation and the value of open and distributed innovation. However, the connection between generative affordance and desired outcomes in the form digital innovation is largely unexplored. In response to this research gap, this study takes a human agency perspective for analysing how actors perceive and act upon the generative affordance, how the actions are constrained, and how the actions and constraints relate to the concepts of generativity and digital innovation. In order to examine those issues, a qualitative embedded case study in the context of Finnish public administration is being completed. Preliminary findings indicate that generative digital innovation depends on individuals, who need to have ability and motivation to explore and implement new approaches, and sufficient coordination and support at the ecosystem level, but is constrained by current governance practices.*

*Keywords: Digital Innovation, Generativity, Affordance, Human Agency, Public Administration.*

## 1 Introduction

Digitalization is the megatrend of today that changes structures both internally in organizations and more broadly in their environment. The definition of digitalization as “*encoding of analogue information into a digital format and the possible subsequent reconfigurations of the socio-technical context of production and consumption of the product and services*” (Yoo, 2012: p. 137), implies that organizational response should consider both the structural changes and the social aspect of reorganizing. This is in line with a broader view that socio-technical reconfiguration enabled by technology requires an understanding of affordances and constraints, but also acknowledging the role of agency and the interplay between these two (Boudreau & Robey, 2005; Leonardi, 2011; Robey et al., 2013).

Regarding structural affordances, prior research has shown that digital artifacts, and the broader recursive systems of digital platforms and infrastructure, possess an inherent capacity for generative change (Kallinikos et al. 2013, Yoo, 2012; Yoo et al., 2012; Tilson et al., 2010; Zittrain 2008; 2006). This kind of generativity, defined as “*a system’s capacity to produce unanticipated change through contri-*

butions from broad and varied audiences” (Zittrain, 2008: p. 70), is associated with combinatorial growth and innovation (Brynjolfsson & McAfee, 2014; Zittrain, 2008; Weitzman, 1998). It is even suggested that the limit to innovation in a digital era would not be related to technical capabilities, but to our ability to process fast enough all the potentially valuable combinations (Brynjolfsson & McAfee, 2014, p. 82-83).

Based on this literature one would expect much faster progress and growth than we are experiencing today. Instead, we have seen a slump in economic growth and productivity (Syverson, 2016; OECD, 2015) and major challenges in turning the digital opportunities into beneficial outcomes (Hess, 2016; Aron, 2015). The contrast between digital opportunity and lack of outcomes has motivated our explorative study into how actors perceive digitalization and act upon new opportunities as well as how these actions relate to system level constraints and generativity. Accordingly, this research-in-progress article examines the *enactment* of the generative affordance which is claimed to be at the core of digital innovation. Our research questions are, therefore:

*Question 1: How is digitalization perceived by actors in a public service ecosystem and how do they act upon new digital opportunities?*

*Question 2: How are actions constrained and how do the actions and constraints link to the concept of generativity?*

The structure of the paper is as follows: The next section presents the theoretical basis of the study, including research on digital structures and their generativity, the context of digitalization and innovation in public administration, followed by the conceptual framing through relational affordances and human agency theory. The fourth section presents the research design and the methods used to answer the research questions, the fifth section presents expected contributions, and the last section concludes with the discussion of the results and limitations of the study.

## 2 Literature review

The study builds on literature showing generative capacity of digital structures and existing research on digitalization and innovation in public administration.

### 2.1 Generative affordance of digital structures

Existing information systems research explains how the characteristics of digital artifacts provide opportunities for generative change (Kallinikos et al., 2013; Yoo, 2012; Faulkner and Runde, 2011; Zittrain, 2008; 2006; Ciborra, 2000). The artifacts combine to broader recursive and overlapping digital structures of platforms and infrastructure, which further enhances the generativity (Hanseth & Lyytinen, 2010; Yoo et al., 2010; Tilson et al., 2010; Henfridson & Bygstad, 2013). This literature lays the theoretical foundation for exploring how goal-oriented actors enact the structural affordance to achieve desired outcomes.

The number and variation of digital artifacts, that keep growing as an outcome of pervasive digitization, is the backdrop of this opportunity. Digitization produces an ever-increasing amount of digital artifacts with specific characteristics, such as homogenization of data, re-programmability of technology, instant and cheap reproducibility, and the self-referential nature of digital technology (Yoo, 2012; Faulkner and Runde, 2011; Kallinikos et al, 2013). These characteristics loosen the traditional coupling between information and its storage, transmission, and processing technologies (Yoo, 2012; Kallinikos et al., 2013), thereby opening up a combinatorial and generative evolution path for new innovations (Yoo, 2012; Brynjolfsson & McAfee 2014; Zittrain, 2008). As the digital artifacts become con-

nected, and recursively form broader systems such as digital infrastructures and platforms, the generativity is further increased.

Generativity refers in this context to a system's ability to further build on what has been done before and is defined by Zittrain (2008: p. 70) as *"a system's capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences"*. This unanticipated system change can occur in different ways. It can be through the modification of an existing artifact, e.g. extending an open register with new data content, it can be by adding new artifacts to the system, e.g. implementing a shared Enterprise Service Bus (ESB) available for all agencies, or it can be by system reconfiguration, e.g. accessing the new data content over the ESB and including the new data content in an interactive citizen service form. All these changes would make use of the system generativity and by doing so allow for further evolution by others, i.e. achieving distributed, combinatorial digital innovation.

These contributions, summarized in Table 1 below, form a solid basis for further exploration of the generative affordance of digital structures.

	Concept	Description	Key literature
Digital structures	Digital artifact	Manmade objects and tools that have a digital representation of information or are used to create, store, transmit or consume such digital information.	Kallinikos et al. 2013; Yoo, 2013; Faulkner and Runde, 2011
	Digital Platforms	Extensible framework that addresses a family of generic functionalities meeting the needs of heterogeneous user communities, platform-controlling actor and third-party actors	Hanseth & Lyytinen, 2010; Yoo et al., 2010, Baudreau, 2012; Eaton et al., 2015
	Digital infrastructure	The shared, unbounded, heterogeneous, open, and evolving sociotechnical systems comprising an installed base of diverse information technology capabilities and their user, operations, and design communities.	Hanseth and Lyytinen, 2010; Tilson et al., 2010; Ciborra, 2000; Henfridson & Bygstad, 2013.
	Generativity	A system with the capacity to produce unanticipated change through unfiltered contributions from broad and varied audiences.	Zittrain, 2008; 2006; Eck et al. 2015

Table 1. Key literature on generativity of recursive and overlapping digital structures

Affordance theory explains how technical objects provides possibilities for goal-oriented action to specific user groups (Markus and Silver, 2008; Majchrzak and Markus 2012; Leonardi, 2011). The theory was originally developed in studies of ecology (Gibson, 1979), but has since been broadly used in IS research to explain the outcome of using IT in organizations (Majchrzak and Markus 2012; Markus and Silver 2008) as well as organizational changes (Zammuto et al. 2007; Leonardi 2013; Volkoff and Strong 2013).

In the context of examining the generative affordance of digital structures, it is important to remember that affordances are not considered to be properties of the technology per se, but relational between the technology and the actor (Markus and Silver 2008; Robey et al., 2013; Leonardi, 2011). They reflect possibilities enabled by the digital structures, but any positive outcome would be dependent on the actor's ability and motivation to understand the opportunity and make use of the affordance (Volkoff and Strong 2013; Zammuto et al. 2007). This view that affordances turn to specific outcomes through enactment by an actor, perceiving the affordance in relation to his or her objectives (Volkoff and Strong 2013; Strong et al., 2014), resonates well with the claim that *"participation is the input to generativity and innovation is the outcome"* (Zittrain, 2008: p. 90).

This argument that generativity leads to innovation (Zittrain, 2008; Yoo et al., 2012; Brynjolfsson & McAfee, 2014) is a key aspect of linking the structural opportunity discussed above to desired organi-

zational outcomes. The claim is supported by two aspects of innovation, which the literature supports. Creating something new by recombining existing assets has always been important in innovation literature (Romer, 1994; Weitzman, 1998; Nelson and Winter, 2009) and goes back all the way to the way Schumpeter, throughout his various works, defined the essence of enterprise and entrepreneurship as "the carrying out of new combinations", and argued that "development consists primarily in employing existing resources in a different way, in doing new things with them" (Schumpeter, 1934). The other supporting aspect is a more recent stream of innovation management research, which emphasizes the value of a distributed audience that introduces new assets and competences, but also variation into a system (Chesbrough, 2003; von Hippel, 2005).

As we study the generativity of digital structures, we are especially interested in digital innovation outcome, which is defined "*the creation of (and consequent change in) market offerings, business processes or models that result from the use of digital technology*" (Nambisan et al., 2017: p. 5).

## 2.2 Digitalization and innovation in Public Administration

Exploring how ICT can be used to better support public administration has been on the agenda of researchers for decades (Fountain, 2001; Yildiz, 2007; Garson, 2006; Heeks & Bailur, 2007) and this stream of research has become a distinct field of IS research, which takes into account the specifics of government context (Heeks & Bailur, 2007; Meijer & Bekkers, 2015).

After decades of focusing mainly on process efficiency, service delivery and individual solutions, there seems to be a shift of focus towards a more holistic and integrative view on digital opportunities in government context (Dunleavy et al., 2006; Margetts & Dunleavy, 2013; Fishenden & Thompson, 2013; Janowski, 2015; Zhang et al., 2014). In the proclamation that New Public Management (NPM) is dead, a new approach is called for that would hold digitalization in public administration as something more profound than just a support tool for NPM. Three tenets of governance for a digital era are introduced; re-integration of government, needs based holism, and pervasive digitization of processes (Dunleavy et al., 2006; Margetts & Dunleavy, 2013). A similar call for integrative and holistic approach is presented in the OECD recommendation on Digital Government to member states. The recommendation states that we are entering "a new stage of maturity in the use of digital technologies by governments, and a shift from e-government to digital government with a view to opening, innovating and modernising public sectors" (OECD, 2014: p. 5). Fishenden & Thompson (2013) take a more targeted information systems approach in their analysis of how the dominant models of sourcing, introducing and operating technical solutions is incompatible with both needs and new opportunities. Monolithic projects automate processes and transactions, but they also "cement" the processes and creates severe lock-in situations, which makes future adoption and distributed innovation much more difficult (Fishenden & Thompson, 2013; Orlikowski, 2000).

A more holistic view on IT in government has been proposed before (Fountain, 2001; O'Reilly, 2011), but we have seen little results in this direction so far (Zhang et al., 2014). There are some developments and trends worth noting, though. The increased interest in Open Data and Open Government is a fundamental step towards a layered modular architecture that enables more holistic approach and generative evolution (Zuiderwijk et al., 2014; Mellouli et al., 2014; Yoo, 2012). With Open Data initiatives expanding towards Open API, machine-readable interface and a system of open services, we can expect a renewed interest in the concept of Government as a Service (GaaS), originally proposed by O'Reilly (2011). The platform dynamics, which has become so central in generic information system discourse, is reappearing in research on digital government (Janssen & Estevez, 2013; Klievink et al., 2016).

Innovation in the public sector is often discussed in parallel with digitalization (OECD, 2015; Fishenden & Thompson, 2013; Meijer, 2015). The literature of innovation in public sector emphasizes topics such as Open Data or Data Driven Innovation (Zuiderwijk et al., 2014; Sucha et al., 2015; OECD, 2015b), citizen engagement and distributed innovation (Thapa et al, 2015), and collaborative

innovation (Sørensen & Torfing, 2012; Szkuta et al., 2014). Some scholars in this stream takes a specific eGovernment perspective on public sector innovation (Meijer, 2015; Misuraca and Viscusi, 2015), and Meijer provides a useful classification of constraints to eGovernment innovation according to innovation phase, customer vs. administration related constraints as well as between separating between structural and cultural barriers.

### 3 Theoretical lens: A human agency perspective

In exploring how affordances are enacted in goal-oriented actions, we turn to the theory of human agency. Human agency theory complements the affordance view by suggesting that humans enact technologies in ways that support their objectives. By doing so they determine the organizational impact of the technology (Bandura, 2000; Boudreau & Robey, 2005; Leonardi and Barley, 2010). Actors exposed to new technologies can use it to advance their goals individually or collectively, or they can choose to ignore it or minimize the use if they find it irrelevant or against their objectives. They can also improvise or reinvent usage beyond the original planned purpose of the technology (Boudreau & Robey, 2005; Nevo et al, 2016).

Emirbayer and Mische (1998) argue that human agency involves the capacity to sustain or transform structures (both digital and non-digital), which is interesting in the analysis of how generative affordance sometime turn to the sociotechnical reconfigurations that defines digitalization and sometimes not. They also claim that human agency is best understood when actors are situated not only in social structures but also in a temporal dimension (Emirbayer & Mische, 1998, Nevo et al., 2016). The temporal aspect means that the actors of the study draw on their past, their perception of the current and their view on the future in their response to digitalization. All of these temporal aspects influence agency, but there is normally one primary orientation (Emirbayer & Mische, 1998). In the case of projective orientation, the agency becomes essentially a process of making sense of the perceived affordance in relation to goals (Boudreau & Robey, 2005; Nevo et al., 2016). The human agency theory builds strongly on the assumption of self-efficacy, i.e. that sub-units in the system can drive change to advance their own objectives (Bandura, 2000). This assumption may not hold, however, if there are may be too many interdependencies in the system or other structural constraints (Orlikowski, 2000).

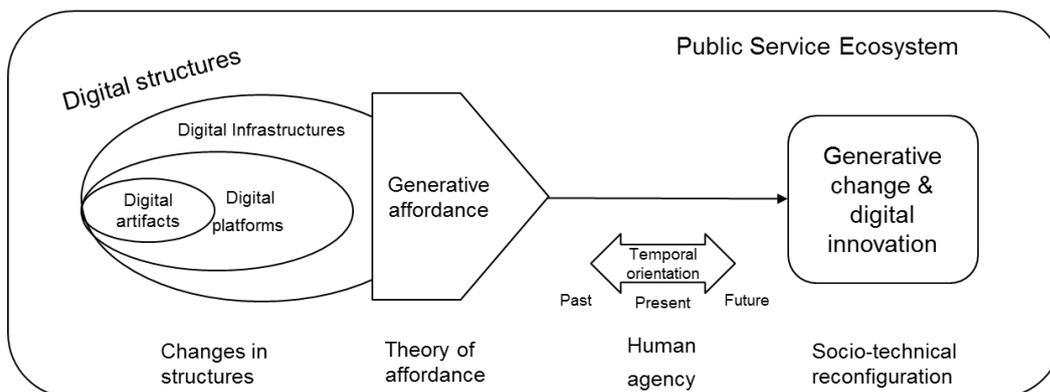


Figure 1. The lens of human agency is linking the structural affordance with desired outcomes

The theories of affordance and human agency are often used together to emphasize the relational aspect and the enactment or actualization of an affordance (Leonardi, 2011; Volkoff & Strong, 2013; Eisenhardt, 1989). Framing the study through these theories enables an analysis of digital generativity through the eyes of the actors. This offers opportunities to advance our understanding of how the generative affordance provides different potential for actors depending on their goals, historical trajectory,

position in the ecosystem and power to act independently, and it can reveal constraints that makes it difficult or impossible to act upon the affordance even when there would be intent and motivation.

## 4 Research design and methods

The study is conducted as an embedded case study in a public administration context. An embedded case study is a design with more than one unit of analysis within a single case. This allows for in-case analysis of subunits as well as looking for similarities and variations across units (Yin, 2013). In this study, it allows us to focus both on how individual actors perceive and act upon new digital opportunities and the relation to constraints and generativity on the ecosystem level.

The case study is conducted in the ecosystem of public services in Finland and the subunits are selected individuals within the ecosystem. Relying on the Adner's (2017, p. 42) definition of ecosystem: *"The ecosystem is defined by the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialize."*, we extend the ecosystem to government and private actors who interact to produce value, but not to clients or consumers of services, which could be considered part of an ecosystem in other definitions (Autio & Thomas, 2014). The alignment of partners is an important aspect of this definition, meaning that there is an understanding of positions and flows in the ecosystem and environmental changes might trigger realignment (either designed or spontaneous). A third important aspect of the definition is the focal value proposition, which helps to keep independent actions aligned towards common goals and values. A public service ecosystem, which can be characterized as a system of independent or semi-independent actors acting within a variety of digital structures, would thereby be a suitable context for exploring the actor response to new opportunities caused by changing digital structures.

The case of Finland is selected based on its relevance and potential for new insights about taking a holistic, customer-centric view on digitalization across organizational and sectorial boundaries. Finland is already one of the leading countries in public electronic services (European Commission, 2016), and the new government program of 2015 has raised the bar to a new level with holistic customer focus and a culture of experimentation as priorities for future development (Valtiokonttori, 2015). The digital maturity in the Finnish public administration is ranked third among EU member states and the digital inclusion rate and skills related to digitalization among citizens is the highest in Europe (European Commission, 2016). These two macro-economic factors should provide a favourable condition for broad digitalization of public services, as some of the potential barriers that may rise from lack of infrastructure or lack of skills are less likely to influence progress.

Within the ecosystem individuals are selected for sub-unit analysis based on theoretical sampling (Eisenhardt and Graebner, 2007). Specifically, it means that the selected actors are in position to influence digitally enabled change, they can propose or decide about actions to take advantage of digitalization, and they have personally faced the constraints and challenges related to driving digital change.

Primary data is collected through semi-structured interviews, which are recorded and transcribed for further analysis. The interview data is complemented with selective observation and secondary data on the case environment, strategy and policy documentation as well as any other material and documentation that is being referred to by informants as relevant to the events and experiences they tell about.

Data analysis is done based on coded transcripts of interviews and supporting secondary data. In line with the "Straussian" version of grounded theory, data collection and data analysis is done iteratively, with theoretical fine-tuning along with emerging findings. This inductive approach allows for emerging theory, literature and professional experiences to guide further data collection and analysis (Strauss and Corbin, 1990).

## 5 Expected Contributions

Upon completion, we expect that the study will contribute to our understanding of how human agency may serve as the instrumental link between digital opportunity and desired outcomes. The generative affordance, which previously has been studied as a structural mechanism, can be enacted by goal-oriented actors, provided that actors have the motivation and ability to act upon it and it is not constrained by other structures in the system. By foregrounding actors and examining the temporal aspects of their reasoning around actions and lack of actions, we can gain access to the intentions and reflective choice of actors in relation to the enabling and constraining context (Emirbayer & Mische, 1998). These actor level findings will inform our understanding about system generativity and the related capacity for distributed digital innovation.

In the area of Digital Government, this detailed analysis of affordance, agency and constraints towards distributed change, contributes to the shift towards an integrative and holistic approach of using ICT in government. Human agency has the capacity to either change or sustain structures, and this is expected to be increasingly important in more holistic use of technology for administrative reform. Scoping the study at the level of service ecosystem, instead of focusing on individual units or technologies, allows us to explore the perceptions, actions and constraints beyond organizational boundaries. It makes the study more complex, but it is necessary in order to address the generative opportunities of digitalization, which by definition are distributed. Using the lens of human agency in addressing holistic ecosystem level opportunities might be counterintuitive, but it is a great opportunity for theoretical contributions, which is supported by IS as well as innovation literature.

From a practice standpoint, the study is expected to contribute to the understanding of response to digitalization. It explicates actions that have been possible to take and constraints that reduce the ability and motivation of individual actors to act upon opportunities that span beyond organizational boundaries. The study will also show the importance of making the ecosystem attractive to innovators. Further, the identification of system level constraints will help policy makers to adjust governance of the ecosystem to become more flexible for reconfiguration and realignment with changes in internal and external structures.

## 6 Discussion and conclusions

The study explores how the generative affordance of digital structures is perceived and enacted by actors in a public service ecosystem, and how this enactment relates to digital innovation through the concept of generative change. Using the lenses of relational affordance and human agency, the study analyses the way individual actors relate to the opportunities in a mix of temporal orientations and reason about actions taken or planned as well as the constraints they are facing.

After a first round of data collection and analysis, we can already see various temporal orientations of actors when discussing digitalization in public administration. An orientation towards the past is shown in comments of how change builds on existing building blocks and the evolutionary aspect of digitalization, such as:

*“ Digitalization is a continuation of previous ICT-development”, “They should not be separated”, “How would the byte know if it an IT-byte or a digital-byte “, or “We have the evolution that has been going along the evolution of the Internet.”*

A present orientation is expressed in comments about the slow progress and fragmentation of activities, such as:

*“ In practice, what we do is still more digitization”, “ still much talk and little action”, “to them it is more automation”, or “... but it is too fragmented. We need to take a broader approach”.*

But the present orientation also shows a change in attitudes and actors realizing that things can be done in another way, such as:

*“Maybe the biggest change is in competences and the realization what can be done and what is worth doing”, “we have found out that we can do so much more with existing technology”, or “attitude now is that the technology under construction is not the end-point, but a step towards an unknown future”.*

Finally, the comments with a prospective orientation show how actors are reasoning about future challenges with cross-organizational development and use of common assets, such as:

*“ It is a new situation and requires new approaches. We have to go back to the drawing board...”, “only when we get to a holistic approach, not a patch-work, will we see the productivity impact”, “we need a portfolio approach to national digital assets”, or “we need to rethink the role of the public administration.”*

In general, actors perceive digitalization as an evolutionary process building on what has been done before, but at the same time changing the logic of organizational development and calling for new approaches and models to secure future success.

The actions taken in this slowly changing situation, include cross-sectoral initiatives carried out much according to old development models, an increased focus on data management and service interfaces, and experimentation with both structural elements, such as boundary resources, and social arrangements, such as hackathons and new sourcing arrangements. Many comments relate to the need to do the basics right, such as:

*“Data and services are driving development”, “back to the fundamentals and innovation will follow”, and “data and content in the forefront, without that technology is useless”*

The constraints that actors find difficult to overcome are related to governance and leadership, funding arrangements, and legal framework, and show a considerable degree of counterevidence to the assumption of self-efficacy in human agency theory. Representative quotes include:

*“The old model is not working”, “the current governance model is not working”, “less formal and more customer driven model”, “smaller steps in the right direction”, “ability to experiment and try”.*

Together these preliminary findings suggest, that addressing the identified constraints on ability and motivation to drive distributed change in the system should help governments to unleash the potential for digital innovation. Going forward with analysis and a second iteration of data collection, we hope to extend and complement the human agency perspective analysis, but also to proceed with more detailed ecosystem level analysis of how actions and constraints relate to the theory of generativity.

A single case study provides limited external generalizability of the findings, even when implemented as an embedded study. The aim of the study is, however, to draw inductively on the detailed case data to develop our understanding of the phenomenon, and suggestions for further analysis to validate and generalize will be provided in the final report.

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