Digitalization: A Concept Easier to Talk about than to Understand

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Abstract: Many organizations have come to rely on digitalization to solve many issues. Today knowledge is an equal production factor besides the traditional ones; capital, natural resources, and work. Thus, there is an ever-growing need for getting the information in, sorted, and used. Digitalization is widely used phrase with many definitions, quite often case-specifically. We show that the existing definitions are not very precise and through two studies investigating executed digitalization initiatives we point out that the reality does not always respect earlier findings. Through the comparison we present questions to be answered in later research. However, business environments and technologies are often unique and thus not all recent issues are taken into consideration. We take business intelligence (BI) as a framework to draw a picture of organizational processes and to give context for the features to be taken into account when discussing digitalization, ie. technological side and the human oriented aspects.

1 INTRODUCTION

There is little news in stating that organizations are facing data and information overflow (Schwarzkopf, 2019; Virkus et al., 2017). Information and communications technology (ICT), while helping the organizations in their tasks, is also creating vast amounts of data all the time (Hellsten and Myllärniemi, 2019). The amount of data generated is growing at a staggering rate[1]. The question is not whether one has the access to the data and information needed for the decision-making, for example, but to distinguish what is relevant and how it is to be dealt with.

In public discussion and in public statements digitalization is sometimes seen as a silver bullet that can solve a multitude of problems and answer a plethora of challenges, each unique in its context. Similar to one another perhaps, but not the same. One is able to read news about digitalization being a solution to match a growing need of improved service offering; services that are easier to use for the end user but also cheaper to produce for the offering side (Hellsten & Pekkola 2018). But what exactly is meant by it, the digitalization? What are the prerequisites for it? The phenomenon and the discussion surrounding it, reminds us, and indeed it is somewhat similar to the massive hype of the Big Data some years ago (eg. Gandomi and Haider, 2015; Scott, 2019). The Big Data was supposed to solve many problems in organizational context, but still there seems to be only few practical solutions that really work in utilizing the vast masses of data or the complex technologies that have emerged. In order for us to make better use of these newer ways and possibilities of working, a closer scrutiny around the big picture is needed.

There is a wide variety of tools and solutions to aid in decision making and operations. Some of these are overlapping, some just labeled differently depending on the viewpoint and angle to the phenomenon under scrutiny. To view briefly back in time, some decades ago CRM (customer relationship management) required the personnel to become more active towards the customers and to collect data of them to be later used in making better business. (Buttle, 2001) As years went by, the concept of business intelligence (BI) emerged to enable the broader considerations of the business environment in order to ensure the rightfulness of decision-making (Shollo and Galliers, 2016). After that the 'Big data' became the buzzword widening the observations and possible data sources to really make the best of the vast data sources and newer technologies (De Mauro et al., 2015). After

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[1] IBM states that 2.5 quintillion bytes of data are created daily. http://www-01.ibm.com/software/data/bigdata/what-is-big-data.html

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that the developments gave us 'data science' with its tall order of qualifications and requirements, stretching broadly over various areas in organizations operation (Davenport, 2020). Notable is, that the surroundings for these developments as well as the aides and toolkits which were used during all these developments were digital. Obviously. Of course, also the users are there too to learn newer ways of working, and indeed thinking, to use the tools and implement the development schemes. Digitalization has so far proved to be one possible, even if a broad term to cover these areas.

Even though the BI, for example, as a discipline, and various models in that area, are not very old[2], already during their lifespan the business environment has undergone changes and developments as have the tools being used to accomplish the tasks. This may cause the need for updated thinking in this area, considering both the technology-oriented and human-oriented approach. The ever-evolving environment, developed during recent years, has features that affect our thinking. Phenomena like newer and continuously changing technologies, even further networked businesses, Internet of Things, big and open data, and just the information overflow in general are constantly transforming the operations. For example, social media as part of BI can provide improvements but also bring up new challenges; regarding both technologies and personnel, ie. how to accomplish the tasks with the existing technologies and should this not be optimal then how to develop better ones (Ketonen-Oksi et al., 2016; Xue et al., 2018).

Organizations are faced in an unprecedented way with streams of data flooding in from various media and channels at an accelerating rate. It has become increasingly apparent that companies that learn to harness the power of data sources, most often digital information systems, benefit significantly (Grant and Preston 2018), yet many organizations, smaller businesses in particular, find it difficult to define how data can be used to drive business growth or improve management of operations and manage risks. Organizations of various sizes struggle to see the practical relevance and possibilities of using all the data sources available to them. Simultaneously they may be missing out on real possibilities to improve their decision-making, overall performance and enhance their sustainability (Grant and Preston, 2019; Oxford Economics 2018). This has also to do with the adoption of digital tools, which are there in abundance and the versatility of their use.

In this paper we study how digitalization is defined in the literature and how it is built and developed over time, ie. what did it mean in the early days and how has the concept evolved. Furthermore, the more theoretical viewpoint is good as it offers a framework, but how does it meet the challenges of reality? In order to answer this, we compare the findings of two separate studies in regard how digitalization is perceived with the findings from the literature.

Intuitively we may feel certain that there is more than one way to understand digitalization, ie. we need to find out how do actual stakeholders understand and perceive the digitalization and how these issues are addressed in real life cases. Are these concepts taken from the literature and executed in practice the same or even converging? Our objective is to show that closer definition of the features and procedures and analysis of the effects and requirements are needed in addition to further research, before the full scale of benefits of this newer way of working can be achieved.

Digitalization, ie. according to one of the simpler definitions to create and execute "changes associated with the application of digital technology in all aspects of human society" (Stolterman and Fors, 2004, p. 23) covers quite a few of the organizational endeavours, if not all. Changes and trends described above affect the whole organization. Digitalization must be connected to all business processes of an organization, because only by this connection it is able to draw high quality information from everyday operations and information products formed from this empirical material to bring value to decision-making.

Thus, it becomes a question of angle and viewpoint to define more closely what exactly is under scrutiny. In this paper we strive to remain on a higher abstractive level to bring out interesting issues to be looked into in more detail in the future.

Digitalization has most often to do with organizations operational data and information. Having said that, one literary definition for business intelligence is; a systematic process for knowingly collecting and analyzing data and information from all possible sources to produce insights of the competitive environment, business trends and daily operations (Murphy, 2016). These insights aim to support decisions that promote organization's operational objectives. We feel that this definition serves quite nicely not only when the contemporary businesses are considered but also the operations in the public sector if understood correctly and a bit more broadly. In addition

[2] As to the origins of the phrase, there are more than one version. According to one, the phrase BI was introduced in late nineties by IBM as they connected it with their database and data warehouse solutions.

to the previous features, BI includes the assessment of both the quality of the information sources and the significance of the insights (Brody, 2008; Fleisher and Bensoussan, 2015). This brings the solutions and tools of the trade into the picture as there are a variety of things more or less related to processing data and information into knowledge and insights.

As for digitalization, literature presents definitions for it. They all are based on certain interpretations and presumptions of their makers. The models mirror findings of cases of the time the studies were conducted in including the aspects felt relevant at the time.

Based on both the literature and empirical findings our objective is to present definitions for the concept of digitalization and a variety of areas to be taken into account when thinking of studying, or indeed implementing a business-related solution under the flag of digitalization. We bring forward challenges in these areas and execution of the actions in these areas in organizations. We also introduce some possible ways in responding to the challenges and their outcomes in the studied cases.

Even if already a number of these introduced areas and the challenges thereof are being studied in various institutions, we still want to pinpoint some avenues for further research.

The paper is organized as follows: after introduction, definitions for the concept of digitalization are presented in section two. In the section three, findings of two studies are explained and their meanings are further analyzed in section four in which the theme is also discussed. The fifth section summarizes the conclusions of the paper with a number of avenues to further the research in a few possible areas regarding the digitalization.

2 DIGITALIZATION; NOTIONS AND RELATED RESEARCH

Digitalization is dealing with the organizations data and information resources with dedicated tools and techniques. However, before we go any further, it is crucial to introduce another phrase; digitization. Digitization is shortly put the process in which 'older', analog data gets transformed into digital for further use (eg. Bloomberg, 2018; Brennen and Kreiss, 2016; Clivaz, n.d.). To show the organizational context of data and information handling to be digitalized a generic model is introduced below in Figure 1. The model of five stages is based on multiple sources (Choo, 2002; Fleisher and Bensoussan, 2015; Pirttimäki, 2007). The framework takes into account the two views: refining information to knowledge and refining data masses to information products. Pirttimäki (2007) in particular shows that both the order and the actual being of stages are dependent on the organization and the operation under scrutiny. The goal of the process is to produce organization-specific target-oriented intelligence solutions instead of producing general business information or knowledge (ibid.).

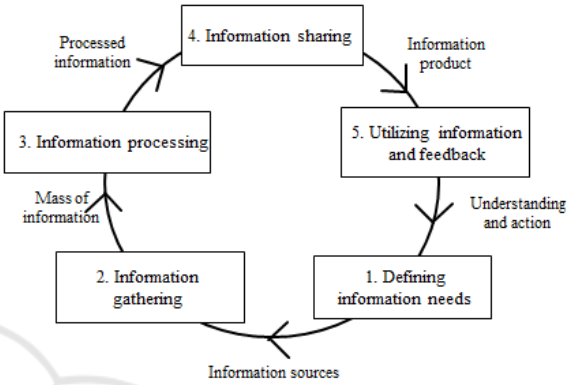

Figure 2: Information process of BI (Myllärniemi et al., 2016).

Basically, the process, any operation, starts with defining the information needs. It needs a clear statement of the key intelligence topics and more specifically the questions concerning the current issues, problems, or trends (Pirttimäki, 2007). The stated information needs dictate the information sources that act as a primary foundation for gathering data or information after having first been evaluated. This means managing multiple sources and finally collecting the information. The collected information is stored in organization's repositories.

Frameworks part 'processing' includes analysis and evaluation of the collected information, and reproducing it in a compact, readable form, i.e. information products. During the process, the collected information is evaluated and combined with the existing information, e.g. structured information of external environment is connected to the expertise of employees. This is where modern tools and techniques come in handy. However, the mere existence of information and the presence of information products is not enough. Dissemination is about sharing the knowledge and insights between the users. Equally a part in which digitalization may prove to be great asset. The results need to be communicated to the right recipient, at the right time and by using most suitable tools. In the final stage, using or utilizing, the information, it is used in operational problem solving and

organizational decision-making. Using information, and indeed knowledge, creates understanding as well as further information needs, and by subsequently adjusting of the operation accordingly, the cycle starts over. To promote digitalization efforts in organizations, it is crucial to acknowledge, design, implement, and use BI through an organized approach of conceptualizing, planning, executing, and auditing (Grandhi and Chugh, 2013).

Digitalization, by definition to create and execute "changes associated with the application of digital technology in all aspects of human society" (Stolterman and Fors, 2004, p. 23), may indeed change the way employees interact with one another, their places of employment, and their actual objectives and goals of working as well as to how they perform their tasks (Parviainen et al., 2017). A fundamental question is whether this may be made into an 'everyone wins' type of situation, giving employees larger personal freedom and enable creativity at work, while simultaneously increasing productivity in organizations, and providing citizens with improved (self-)services. If this is indeed the case, how can it be achieved, what kind of support does it take to make this happen?

There is a really wide range of features as possible targets for digitalization in all walks of life, not only in work life of people (Gray and Rumpe, 2015). Sometimes the border between the professional and private lives is blurred and the newer technologies are actually part of this, as the hobbies and domestic affairs converge towards one's working day, eg. when one uses one's work hours and computer to run domestic errands.

Gartner defines digitalization with a more business-oriented focus in '*Gartner's Information Technology Glossary*' as digitalization is seen to be "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business." (Gartner, n.d.; Gray and Rumpe, 2015). In this definition change is again an integral part, something is changing and this is not only considering the technological aspect, but the human side is included. This definition widens the relationships between different operations and businesses, in addition to business and administrations, and the essential relationship to customers. An objective is to execute digitalization in such a manner that there is a clear relationship between the services offered by businesses and the actual needs of users and essentially customers.

If a more detailed definition of the organizational proceedings concerning the tasks from the digitalization's point of view is needed, the business intelligence (BI) offers one worthy of looking at. BI has been studied and used by scholars and professionals to describe the process that produces information products for various levels of decision-making (Brijs, 2016; Intezari and Gressel, 2017). BI may be observed too as an umbrella-like concept under which one combines different tools, applications and methods (Turban et al., 2008). Terms differ due to the different sourcing of information (external – internal), scope of information collecting (narrow – broad), the information viewpoint (technological – conceptual), or even because of its geographical location (cf. Fleisher and Bensoussan, 2015; Pirttimäki, 2007). Common for all approaches is to data processing and information refining to form and to use them in more meaningful way. Therefore, BI may be described as a framework for refining data to information products, information products to knowledge to be used in operations and decision-making.

One main objective, or process or even tool, is to systematically derive knowledge and insights from organizational data and information to support decision-making (Brody, 2008; Fleisher and Bensoussan, 2015). Knowledge, both tacit and explicit, in this context refers to the outcome of human actions that take place e.g. in decision-making situations (Smith, 2001). Knowledge is based on information combined with experiences. It is acquired from information, which in turn is processed from data (Choo, 2002). Decision makers strive at these meaningful insights in order to better make sense of proceedings and ultimately to add value to the organization.

3 THE DIGITALIZATION IN CASE STUDIES

In order to respond to the ever growing demand for better and improved services and to meet the expectations of the customers both private and public sector organizations have launched various digitalization and smart city initiatives (Bakıcı et al., 2013; Denhardt and Denhardt, 2015; Taylor Buck and While, 2017). Our examples cover a bit of both. Our first case is a case in which a smart city program was initiated, introduced, and implemented to and for various service areas of public administration in form of numerous experiments in the city services. The goal of the experiments was to find out whether the emerging service innovations could be later applied and upscaled to permanent service offerings of the city administration to enhance the life of citizens. (Hellsten & Pekkola, 2019) An additional target for the experimenting was to develop the overall attitude to more

positive towards experimenting with digitality and later digitalization. The other case observes a web-based open source service enabling digital applications of construction and other permits related to infrastructure. The service was developed as a part of Action Program on eServices and eDemocracy (SADe program) set by the Ministry of Finance in Finland (Helander et al. 2019). The program's objective was to provide interoperable, high-quality public sector services via digital channels to create savings, improve cost-efficiency, and generate benefits not only to citizens, businesses, organizations but also to local and government authorities.

The *Digiprogram* was a part of a smart city initiative. The larger initiative was originated by the city's top management of which the CIO is a member of. The *Digiprogram* originated from the city's CIO's office where also the management of the program would be. A program manager was appointed along a few other staff members at the CIO's office to form the basic organization, but the main focus would be elsewhere, ie. in the service areas. As one may assume, some heads of service areas proved to be more eager, some at least willing, to take part in the initiative. The *Digiprogram* committed a number of city employees from the areas to act as experimenting project managers, another number of people to be their supportive development managers. There were also steering groups to oversee and guide the endeavors in each service area involved.

The program itself consisted of numerous experiments the various service areas of public administration in the city. The ideas for the experiments arose from the service areas as there was the best comprehension on in which tasks and how the digitalization could help the most. The objective of these experiments was to find out if there could be service innovations that may be later applied to permanent service offerings of the city administration (Hellsten and Pekkola, 2019).

In addition to the experimenting, the general attitude towards developing the city's administrative operation through digitalization was regarded as an additional target for development. The undertaken experiments varied by their nature. They came in various shapes and sizes; some were less ambitious (ie. how to do daily conferencing more effectively by using e-conferencing tools, such as Skype, more effectively), some did almost ground-breaking rethinking in formulating their whole operational process anew.

The city employees involved were ordinary civil servants of the service areas. Perhaps with an exception that they were possibly more eager to participate in such initiative (as at least some of them volunteered to this program) than average person in the city's payroll. Their technical capabilities were not necessarily always top-notch, but their attitude was the key.

The other case, *Lupapiste* is a web-based open source service that enables digital application of construction permits and other permits related to infrastructure. *Lupapiste* was a sub-project in the larger program coordinated by Ministry of Environment. Solita Inc. was chosen as a service provider for *Lupapiste* after a competitive bidding. The pioneering municipalities operated as co-developers for *Lupapiste* service, later during the evolution of the service the ownership was transferred to Evolta Inc. a spin-off company from Solita Inc (Helander et al., 2020).

Currently approximately 60 % of Finland's municipalities with about 100.000 users use *Lupapiste* service ("Lupapiste" 12.06.2020). We conducted 16 interviews with corporate representatives operating in construction, city planning, architecture and electric engineering whilst studying the case. The interviewees regularly use *Lupapiste* service in their work to apply for various permits in various fields (architecture, electric engineering etc.) and in different municipalities in Finland. The overall user experience was positive and the interviewees felt that the service has eased the application process of different permits.

4 THE COMPARISON OF THE THEORETICAL APPROACH AND PRACTISE

Organizations' ability to use digitalization in operation is based on users' personal characteristics and organizations' culture and way of working. Our studies, in addition to previously introduced literature, indicate that bases of digitalization should stem from business processes and information systems and connected to personnel.

Top management is one main source of origin for digitalization, but technologies are used at almost every level of organizations. Problem formulation, development initiation is not only top management's responsibility. Similarly, continuous feedback and active updating of information needs on all levels of operation improves the quality of information products and makes knowledge processing more fluent. Based on our studies, people in organizations use quite often their personal inference skills to define development needs and gather information independently from relevant sources. The information needs are based on subject-matter requirements and situation-determined contingencies (Choo, 2002)..

Developments both in business environment as well as in internal operations would need to be considered in advance. Methodicalness is required in addition to a sort of free thinking to enable the best outcome from these types of initiatives. We acknowledge the need to integrate these strains of thought, newer aspects and requirements, to the centric business models and thus recognize a need to construct a more innovative approach to the business processes and digitalization.

The studies showed that personnel are one of the most important factors. Organizations have faced difficulties in considering and collecting information from personnel. The multiplicity and variety of technologies, thus possible innovations make it necessary for an organization to build newer forms and ways of scrutinizing their operations. In addition, as the relevant information may as well come from people or from social media it is notable that information gathering is not solely a technical phase in the process. Obviously sometimes the 'client' is able to define his/her ideas better and some other times less well. The bottom line is that the organization committing the personnel to an initiative is able to do better and more successful projects to anticipate the needed developments to business needs set by the organizational strategy and the ever-changing business environment.

To sum up the *Digiprogram* case, the program aimed at clarifying whether it would be possible to create innovations providing interoperable, high-quality public sector services via digital channels to improve cost-efficiency, create savings, and generate benefits. As beneficiaries may regarded everyone, from citizens, to businesses, to organizations and to local and government authorities. All these stakeholders need new solutions that are easier to use for the end user but also cheaper to produce and use for the offering side (Helander et al., 2020; Hellsten and Pekkola, 2020).

The *Lupapiste* service was introduced to the users through small information seminars held usually by the service provider and the community after which the service was to be implemented. Even though the usage of *Lupapiste* service is in fact compulsory to various clients, companies and individuals, the user experience was favorable and adaption of the services was considered a positive development. The difficulties arose when taking a closer look to the instructions and regulations of each municipality. Every municipality has their own instructions and even the implementation of the services is in some municipalities limited to some parts of the services, although the service is used in the hole country. Thus, the parties operating in multiple parts of the country faced challenges as the procedures were different. More uniformity and clarity of the possibilities and advantages of the service should be made visible and transparent to the municipalities and comprehensive instructions for the whole field needed be made.

5 CONCLUSIONS

Digitalization is a part of any today's organization's actions. The working practices and processes in which data and information are refined into a more meaningful knowledge in order to support decision-making are all digital. The process itself has various variables and stages that make the process complicated and each time unique. This complexity is caused by the fact that the information needs of the people and processes change continuously, sources for information are not limited to organizations' internal sources but vary and used tools, ie. technologies, are more and more sophisticated and more demanding for their users.

It is obvious that investing in digitalization organizations may gain benefits, like better quality of information, faster decision-making and deeper understanding of business environment. However, not every organization has the same identical situation. Organizations' operational maturity and size do have an influence. Our studies targeted rather large organizational entities and operations and the results are notable at some level concerning organizations that digitalize their operation regardless their size.

However, this presents one of the limitations of this paper, it is a case study of two rather large-scale operations. The results are hardly generalizable, but they do give directions where to target further scrutiny. Similarly, the longitudinal approach would give more depth to the studies.

Organizations may take advantage of the digitalization in various ways, for example, they may use it just to get a better grip of their overall standing, to report what is their current state of affairs. Attention needs to be directed besides applications towards the human side too, to processes and the employees. The insights from the benchmarking in this work can assist in making better and more informed decisions, which is also the fundamental purpose of BI thinking (Fleisher and Bensoussan, 2015; Pirttimäki, 2007; Thierauf, 2001; Vuori and Okkonen, 2012).

Organizations' employees on all levels possess individual knowledge and expertise that needs to be included in the insights regarding the operation and its relationship to digitalization. This further highlights

the need to consider members of the organization as a relevant source of information. Seems that there are few studies delving into the formulation of these factors, ie. the people and their digital capabilities, but also the attitude. In Finland the organizations have PC's, laptops and tablets, yet the skillsets of their users differ. Not yet are all employees on the same level when their technological savviness is concerned. To broaden the thought, not all countries may boast with similar technological wellbeing, ie. connections, hardware, software. This certainly would merit more research.

Innovation creation is yet another such issues that is not equally distributed. There are people and organizations that are more innovative than others. There are university courses regarding the theme, but we feel that more research is needed to really fathom, whether this could ensure evenly distributed innovative possibilities.

For example, an expert is likely to form a comprehensive understanding of the problem at hand and issues related to it. Sharing this knowledge is essential in order to give the best possible description of reality for the planners, designers, and decision-makers. However, articulating tacit knowledge is not always an easy task as there are several challenges (eg. Haldin-Herrgard, 2000; Riege, 2005).

In this paper, we tackled this challenging issue by presenting some definitions of digitalization and comparing them to the findings of two cases in which digitalization was introduced and implemented. Our goal was to present notions of the definitions and to point out some focal issues needing to be covered in order to address these issues in organizational context to answer to modern environment's requirements. We also propose some avenues for further research to clarify emerging angles and viewpoints.

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