Barriers and Facilitators of Digitalization in Organizations

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Digitalization has transformed industries and societies in profound manner. Some changes have been documented as increased productivity and reduced costs of communications and information processing, to name a few. However, new technologies are not always fully embraced by organizations. This paper delves into barriers and facilitators surrounding adoption of digital technologies. The study was done as a systematic literature review. The paper introduces the most common technology acceptance models. Even while not being directly facilitators or inhibitors of use of new digital assets in organization, these models help to explain how the technology is accepted in organizations. The paper also introduces main inhibitors of digitalization and use of novel digital solutions in organizations. Moreover, the most significant facilitating factors are presented in the paper.

General Terms: Digitalization, Organizations

Additional Key Words and Phrases: Technology Acceptance

1   INTRODUCTION

Digitalization is a hype word of the decade. Not by accident, when thinking about how much digital technologies have altered the way we live and function. The profits and alterations caused by digitalization have been studied and shown convincingly. Even if the effects are clear, the ways to adapt to digitalization and the organizational prequisites for adaptation are not thoroughly studied. It is thus an interesting topic. In this article, a literature review of the barriers and facilitators of digitalization in organizations is presented. In this article digitalization is defined as the automation of tasks accomplished by digital technologies like business information systems and as the change in the way of working.

There are a few studies regarding the inhibiting effects of organizational inertia and incumbent systems [Haag 2004, Polites and Karahanna 2012], and large body of research on how innovations diffuse and are adopted in companies [Jeyarajaj et al. 2006, Jones et al. 2010, Yao et al. 2009, Scupola 2012). Main theoretical models featured in these studies are technological acceptance model (TAM), the unified theory of acceptance and usage of technology (UTAUT) and technology-organization-environment framework (TOE).

Each one is further explained in their own sections. In addition, there is small stream of extant literature on drivers and barriers of IT adoption in organizations. Beyond these points, however, no literature was found with the applied methodology. Managerial perspective on how to facilitate digitalization seems to be almost white area in the map – even though many studies suggest top management support is a key issue in IT adoption and diffusion.

This literature review was inductively created beginning with keywords "digitalization" "barrier" and "facilitator" mixed in different combinations in scopus, andor and google scholar. After selecting articles back- and forward reference searches were conducted on each article to attain fuller picture of the phenomenon. Articles were selected on same basis as the ones in first round from the search engines. This reference search was iteratively repeated for every new article selected this way until no new articles surfaced. Only articles from peer-reviewed journals or conferences were selected to provide rigor for the research.

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The article proceeds as follows: Organizational Inertia is discussed in section two. Section three is about TAM. UTAUT is presented in section four. Fifth section brings forth TOE-model. Facilitators of Digitalization are discussed in section six and finally Information Systems strategic alignment is addressed in section seven. Section eight concludes the article.

2   ORGANIZATIONAL INERTIA

The Organizational inertia is seen as a barrier for adopting digitalization in organizations. Polites and Karahanna [2012] define inertia as: "inertia in an IS context as user attachment to, and persistence in, using an incumbent system (i.e., the status quo), even if there are better alternatives or incentives to change." Haag [2004] further conceptualizes organizational inertia to have five sub-dimensions. These are cognitive, behavioral, socio-cognitive, economic and political aspects. Cognitive dimension refers to managerial tendency of using incumbent systems even while knowing there are better alternatives available. Key manager having much resistance to new systems can easily hold back the whole organization.

Behavioral inertia is the tendency to keep doing things in certain way, just because they have always been done that way. Socio-cognitive dimension consists of change-inhibiting culture in company making changes hard to implement. Economic inertia entails both sunk costs in legacy systems as well as costs of adopting the new system. Political inertia refers to environmental reasons – partners and customers holding back the adoption of new innovation as it would affect them as well [Haag 2004]. Polites and Karahanna [2012] find support for their claim that individual working habits lead to organizational inertia. Habits can be considered to be a good thing since carrying out habitual tasks requires less concentration and leaves the employee's mind available to think other tasks while shortening decision times. However, in the context of adopting new systems or advancing digitalization, habitual working methods need to be broken in order to advance with the new way of working.

3   TECHNOLOGY ACCEPTANCE MODEL

The Technology acceptance model (TAM) has been widely used in organizational studies. Gangwar et al. [2013] consider it being the dominant model for explaining technology adoption at all organization levels and at individual level. It was adapted from the theory of reasoned action. Since it has been used extensively, it has developed some advantages such as well-researched and validated inventory of psychometric measurements [Gangwar et al 2013].

TAM assumes that the more accepting users are to use a new system, the more likely they are to use time and effort on learning and adopting the new system over the old one [Jones et al. 2010]. TAM conceptualizes two key antecedents for adoption of new system. First one is perceived ease of usage. Perceived ease of usage is defined as "the degree to which the prospective user expects the target system to be free of effort". This is rather intuitional – the easier a new system is to use, the happier persons are to adopt it. Another antecedent is perceived usefulness. Its definition is as follows: "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organizational context" [Gangwar et al 2013]. Perceived ease of use affects the perceived usefulness as well as the attitude of user.

These perceived notions of the technology to be adapted form individuals attitude toward using the new technology. This attitude then motivates a behaviour intention which in turn initiates the actual behavior [Williams et al 2015]. Conceptual model of TAM is shown in Figure 1.

Some forms of TAM take out attitude, arguing that the antecedents affect the behavior intention directly. These are called parsimonious models of TAM. Key thing in TAM is that it does not make any assumptions about the actual quality of the new technology or innovation but focuses on what the user perceives of it. In their study of forced technology situations Jones et al. [2010] found that managerial support has major influence over perceived ease of use. In all cases it should be possible to influence the perceived ease of use with proper education during implementation of the technology.
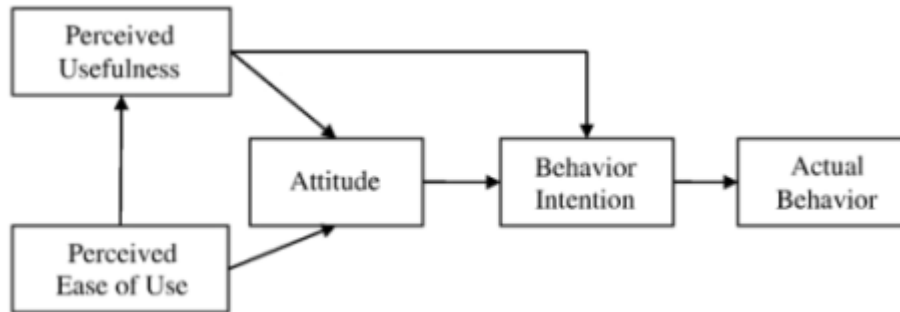
Fig. 1: Conceptual model of TAM [Venkatesh et al 2003]

4 THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

Past research on user acceptance of technology has been rich in volume and also in theories generated [Williams et al 2015]. The unified theory of acceptance and use of technology (UTAUT) was combined from several theories in 2003 by Venkatesh et al [2003]. They reviewed and integrated eight dominant models of the time to create one with more explanation power. Theories included in forming UTAUT are: Theory of Reasoned Action, the Technology Acceptance Model, the Motivational Model, the Theory of Planned Behavior, a combined TBP/TAM, the Model of PC Utilization, Innovation Diffusion Theory, and Social Cognitive Theory [Tornatzky and Fleischer 1990]. In their study, Venkatesh et al. [2003] show that UTAUT outperforms the theories it has been based on. Since its creation, UTAUT has been widely used in variety of fields [Williams et al 2015].
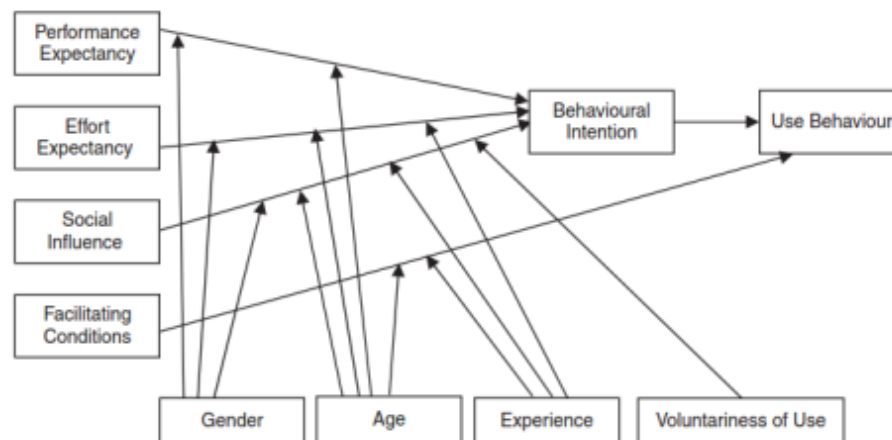

Fig. 2. Conceptual model of UTAUT [Venkatesh et al 2003]

As can be seen from Figure 2, UTAUT has some degree of similarity with TAM. This is not surprising as TAM is one of the theories UTAUT has been based on. UTAUT adds six new constructs in addition to those found from TAM – and discards attitude. The new construct in direct determinants of behavioral intention added is social influence. Another new construct is facilitating conditions, which is seen as direct determinant of use behavior [Williams et al 2015].

The other four constructs that the model adds are conceptualized as moderators for the direct determinants. These are user's gender, age, experience and voluntariness of use. These moderating

constructs are not applicable for organizational research as such. However, it can be argued that these constructs can be applied to organization as well by calculating mean values of all the employees of the organization. Indeed, few studies have been made on organizational context with UTAUT [Gangwar et al 2013]

5 TECHNOLOGY-ORGANIZATION-ENVIRONMENT FRAMEWORK

In their meta-analysis of research conducted between 2010 and 2012 Gangwar et al. [2013] identify Technology-Organization-Environment (TOE) framework as one of the more widespread frameworks when researching IT adoption. TOE framework was originally developed by Tornatzky and Fleischer [1990]. Main benefit of TOE is that it is free from industry and company size restrictions. Critics of TOE state that the framework is just taxonomy and does not really offer any conceptual depth. It contains three contexts, which are explained in the next paragraphs and elaborated in Figure 3.

Technological context holds all the variables influencing adoption of innovation. Gangwar et al. [2013] found that: "The studies found that system assimilation, trailability, complexity, perceived direct benefits, perceived indirect benefits and standardization are significant variables while observability is found insignificant" Organizational context is the most interesting one considering the scope of this thesis. It refers to organizational characteristics and resources of company. The studies identify several significant aspects of organization: degree of formalization, managerial structure, trust, human resources, organizational slack, innovation capacity, knowledge capability, linkages among employees, financial resources, firm structure, operational capability, strategic use of technology, technological resources, top management support, quality of human capital, organizational knowledge accumulation, expertise and infra-structure and organizational readiness [Gangwar et al 2013, Bradford et al. 2014].

Many of these organizational topics identified in TOE are tied to findings on the effects of the digitalization in this research. Environmental context focuses on the environment in which the company operates. In this case it means mostly factors influencing whole industry, such as government regulations or incentives. "Significant variables in environmental context include customer mandate, competitive pressure, external pressure, internal pressure, trading partner pressure, vendor support, commercial dependence, environmental uncertainty, information intensity and network intensity while government regulation is not identified as significant variable" [Gangwar et al 2013].
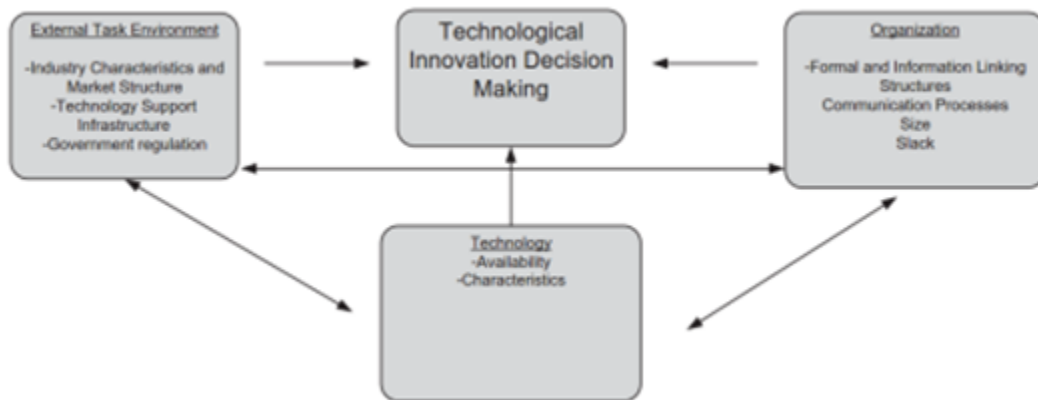

Fig. 3. The context of technological innovation [Tornatzky and Fleischer 1990]

6   FACILITATORS OF DIGITALIZATION

Some studies have set to find out what drives digitalization. Some of the answers are intuitive and others maybe not so. Yao et al. [2009] find support for the very intuitive assumption that bigger IT spending helps in adopting new technologies. Human resources management practices have also been linked as factors facilitating digitalization [Carroll and Wagar 2010]. Jeyaraj et al. [2006] published a meta-analysis of the research made in the subject of diffusion of IT-based innovations between 1992 and 2003. In their study of 99 research articles, they find four best predictors for IT application, here presented in Figure 4. The scores in the figure are calculated as percentage of the times the factor was found significant from all the studies it was used. External pressure was found being significant facilitator of IT adoption in all six of the studies it was tested on. External pressure stems from suppliers, customers or industry standards. Professionalism of IS unit was found significant in 7 studies of the total 8 times it was studied.

This finding is seconded by Scupola [2012], who identifies the lack of knowledge to specify system requirements and the lack of IT competence as organizational operative barriers. External information sources was also found to be significant in seven of the eight studies it was studied. Top management support was studied the most of the best predictors. It had been in 12 studies, of which 10 found it to be significant [Jeyaraj et al 2006].
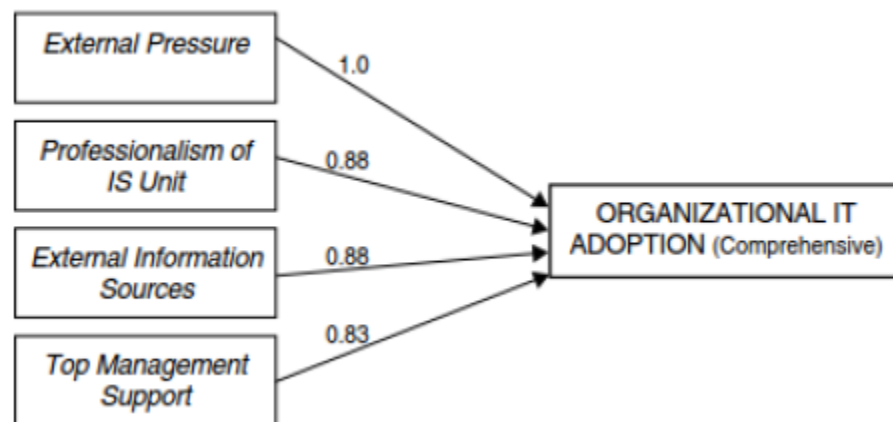

Fig 4. Facilitators of IT adoption [Jeyaraj et al 2006]

Scupola [2012] studied ITC adoption in facilities management supply chains of Denmark. She extracted both organizational and technology driven facilitators for the adoption process. These findings present support to the work of Jeyaraj et al. [2006], offering organizational drivers closely related to top management support. These drivers include company policy and better strategic and tactic facilities management decisions. She also identifies seven external drivers and barriers such as industry characteristics, supplier interdependence, lack of collaboration among software providers and government regulation.

7   INFORMATION SYSTEMS STRATEGIC ALIGNMENT

A topic that borders the effects of digitalization is information systems (IS) strategic alignment. There is a large body of research done in this topic ([Preston and Karahanna 2009, Reich and Benbasat 2000, Johnson and Lederer 2010, Alaceva and Rusu 2015), including the barriers and inhibitors of IS strategic alignment on companies. The results of these studies are included in this thesis, as they offer reason why information systems are not perceived as working well in companies - something that should act as a barrier for further digitalization as well.

There is no clear, agreed on definition or model for strategic alignment of IS. Preston and Karahanna [2009] find two views for the term in their literature review of the subject. First one, the intellectual dimension of strategic alignment, defines it as alignment between business and IS on various dimensions such as strategy, plans or infrastructure of processes. The second one, the social dimension of strategic alignment is defined as the mutual understanding and commitment to business, objectives and plans between business and IT departments.

Alaceva and Rusu [2015] argue that companies cannot reach intellectual dimension if the social dimension is not achieved before. They study the social dimension in their case study of a large Swedish company. They divide this dimension in four subgroups: Shared domain knowledge between business and IT executives, Successful IT history, Communication between business and IT executives and connections between business and IT planning. It seems that communication, connection and shared domain knowledge should be interlinked as concepts, as they are mainly asserting that the main barrier of IS alignment is lack of communication and understanding between business and IS departments.

A study by Johnson and Lederer [2010] support the finding of Alaceva and Rusu [2015], with the result that the prequisite for IT alignment is mutual understanding of CEO (Chief Executive Officer) and CIO (Chief Information Officer) of the company. Conceptually the results from these two studies are very close even though the terms used are a bit different.

8   DISCUSSION

Even while digitalization as a word and as a phenomenon has been hyped for the past decade, many aspects are still unclear. It has no standard definition – in many discussions it is used to convey different meanings. The main objective of this article is to summarize the state of research made on understanding how digitalization is advanced or how its progression is halted in organizations. It seems that the most important factors in software are the ones affecting how user perceives it. This might be changing a with the introduction of artificial intelligence models which would render most of the users obsolete and provide a substantial leap forward in productivity of an organization. This productivity leap should be more imminent in large private organizations where a lot automatizable office work is being done. Small and governmental organizations might be slower in adapting the new artificial intelligence based technologies. Management support was unsurprisingly found to have major effect in advancement of new technologies in organizations. However, majority of the current studies and of the current explanations are not very fine grained. A fruitful research topic would be "what are the organizational prequisites for IS adoption" – with the aim of more fine grained information about the phenomenon than simply "top management support".

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