# The Residual effect of Imbrication – How user's past socio-technical entanglement affects IS adoption

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**Abstract**: The topic of digital age has been extensively covered in different settings. This paper explores the effect of users' digital lives on IS adoption process. Using imbrication metaphor, first the study discusses the implication of user's residual socio-technical entanglements for new IT implementation. The residual pattern developed using different digital media creates two seemingly opposite effect for IT implementation and design activities: Iron-cage effect and end-users broader participation. After presenting a case study of new IT system deployment, it further explores the effect of user's past imbrication experience in adopting new technologies. Based on the empirical data, the study also demonstrates IT based technologies adopted for personal use can affect the process of socio-technical imbrication and future users' intention IS adoption.

**Keywords:** Iron-cage effect, Imbrication, IS adoption, Cognitive artifacts, IS design

## 1. Introduction

The IS research field has conducted a wide study to identify factors that can affect end user's technology acceptance [1, 2]. In addition, considerable attention has been given to information system development approaches and methods [3]. Despite such efforts, there are still evidences of unfaithful engagement (maneuvering technologies) of end-users during the adoption of new IT systems [4-7]. In addition to unforeseen changes following the implementation of IT system, end-user's existing IT competency is cited as one of the reason for unsuccessful adoption of technology [8, 9]. In this regard, end-user's daily interaction with computer based technologies, accounts for user's proficiency and perception of new technologies adopted in the work place [10]. Consequently, end-user's 'digital lives' increasingly affect the way users perceive affordances during the implementation of IT artifacts. This paper explores the effect of digital technologies that are adopted and practiced for personal use, but not sanctioned or directly related to procedures and organization IT systems. Based on a case study of newly implemented Learning management system, the paper present the implication of user's computing background for adopting technologies. The paper then discuss how these phenomena affect the core IS activities of implementation and design.

In appropriating technology, users look for the material property that an IT artifact enables them to afford to achieve their goals. In the absence of such affordances, users tend to change their routines to efficiently continue their daily activities. Thus, during IT appropriation, it is inevitable that human and technology ensemble in a way that either technology changes to fit in to user's routine or users change their routine accordingly with technological properties. [5]. The paper uses the notion of imbrication [5] to underline this socio-technical entanglement of human and technology. The model of imbrication enables us to explore the effect of background computing skills and how such a background affects the way users perceive a real IT affordance or create perceptual affordances in the absent of real ones.

There is an increasing evidence (including the presented case study) that many organizations are adopting in-house IS methods that enable them to modify deployed IT systems [11]. Such an alternative method of IS design heavily depend on user's active participation. As we are living in digital world, user's IT related skills are improved and diversified. The study explore if end-user's digital lives affect how we design IT systems.

The paper draws on an empirical case study of the implementation of new Learning Management System (LMS) called Moodle that is deployed on three campuses of Mid Sweden University, Sweden. The system has been fully operational since January 2013 on all campuses, though it was partially adopted by different departments from early 2012. The Moodle technology is an open source course management system (moodle.org) that was built on the philosophical approach of "social constructionism" in Curtin University of technology in Australia by Martin Dougiamas [12]. The author were able to follow the implementation of LMS and have conducted an in depth interview with end-users and follow their appropriation practice for 6 months.

This paper proceeds as follows. First it starts discussing the theoretical framework by outlining users' technology acceptance and long term use based on existing literature. Second, it provides how end-user's 'digital lives' affect these two core IS activities based on imbrication metaphor. Finally, after presenting the case study, it further discuss the implication of digital age on IS implementation and design.

## 2. Theoretical Background

Digital technologies are increasingly permeates to our daily life in different forms. From simple equipment we use daily in our household such as TVs, refrigerators, DVDs and other digital stand-alone equipment to networked service available over the Internet, our lives can simply termed as 'digital lives' [13]. To avoid interoperability issues between digital equipment, efforts has been made to create digital profile patterns that concern with standardizing digital materials [14]. As a result, end-users are not only become savvy on how to use digitally developed equipment, but also are framed to expect standardized way of interacting with technology. In other words, we are taught to expect familiar affordances in technologies we adopt, even though technologies are developed for different purposes.

### 2.1. How user's appropriate technology

With regard to technology adoption, there is a rich knowledge in the IS literature that proposes different ideas, methods, frameworks and theories as to why users' accept new technology.

Turner et al., for example, [15] conducts a systematic literature review based on "six digital libraries' to see if the idealized Technology Acceptance Model (TAM) holds water in different circumstances. They found that the 'intention to use' (BI) measure is directly correlated to the actual use of technology in working environment. The authors suggested that the other two measures included in the TAM, perceived ease of use (PEU) and perceived usefulness (PU) are "less likely to be correlated with the actual" use[15]. They warned against the 'random' use of TAM for different context and expect the model to provide the same result.

Waarts et al., [16] suggested that acceptance and successful diffusion factors change as the diffusion of the technology progresses. Citing a large-scale empirical study of ERP system acceptance among users, they demonstrate that strategic drives and attitudes toward new technology are important factors in the beginning stage of technology adoption. Later on, they found out that, the intention of accepting shifts to implementation issues "such as the scalability of the system and the yearly available budget"[16]. Their works indicate that it is difficult to find a 'one size fits all' indicative factors for technology appropriation method.

Another prominent work on this regard is that of Rogers's[17] diffusion of innovation theory. According to diffusion theory, a technology perceived as having a greater advantage, less complexity and more compatibility with existing system will be adopted more rapidly. Moreover, the diffusion theory provided a step-by-step decision process to accept new technology. It starts with gaining knowledge about new technology, to forming opinion, to deciding to reject or adopt the technology, then to implement the new technology and finally confirming the decision [18].

Others focus on technology-in-use processes to understand technology acceptance and successful adoption by users[6, 19]. Such studies show that technology-in-use brings change in work practice and users' skill. Such changes can affect how users perceive the technology and affect their long term use of appropriated technologies. In addition, these studies show how users' tend to change or alter technology, other than its intended use.

The above exemplars of literature show that there is a general consensus when it comes to the relationship between factors that affect the process of adopting technology and users' experience and expectations. In addition, such experiences and expectations are continuously adjusted accordingly with external environment.

### 2.2. Conceptualize foundation

Appropriating new IT artifact (ITA) usually starts with the introduction of technology properties that can be afforded to achieve goals. Affordances are "properties of the world that are compatible with and relevant for people's interactions" [20]. In the absence of affordances, users tend to change their routines. It is possible to have a wrong perception of affordance, hidden affordance or a clear constraint in new ITA [21]. In the absent or deemed

absent of affordances, users tend to create their own workaround (perceptual/cognitive artifacts) to fulfill their needs. Cognitive artifacts are human's act of trial to create 'real' affordance where technology does not provide one or, even worse, constrain affordances. The entanglement between human and material agency creates a 'residual pattern of interaction' that can affect the adoption of new material agency. To explain the concept of residual pattern of adoption', I will use Leonardi's concept of 'imbrication'[5].

Different theoretical perspectives were suggested in IS research to understand the interaction between human and technology, where Giddens's work of structuration theory has been the most acknowledged. Jones and Karsten [22] have identified 331 IS articles 'published between 1983-2004 that have drawn on Giddens's work' to examine the socio-materiality nature of human and technology. Despite its popular adaptation, structuration theory has also been criticized for giving a privileged position to human agency. Leonardi [5] reports that even though structuration theory "provides a useful framework for exploring" human actor's role in the process of 'structuring their environment', it lacks understanding how artifacts play the same kind of role but in their own way. Rose et al. (2005) conclude that "structuration theory sees agency as a uniquely human property", thus, toning down the actual effect that technology might have in determining the existing work systems. Other scholars including Orlikowski (2005), Markus (2005), Poole and DeSanctis (2004) have also shown their concern how structuration theory has been adopted widely in IS research, but failed to properly develop the determining role of technology in a given work process. The common critics among the scholars, , is that "it lacks a specific capacity for theorizing the role of technological artifacts" [5]. That is, structuration theory fails to specifically distinguish and theorize the enactment power of material agency[1] when it interacts with human agency. Some researches try to augment structuration and actor-network-theory to solve the deficiency of material theorizing power of structuration [23].

The imbrication metaphor has started to take root replacing the structuration theory to describe the interaction between human and material agencies without giving 'unnecessary' privilege position to either of the two [5, 24]. I used the word unnecessary to describe the caution we should heed as we use the imbrication metaphor since humans will always hold the authority and the will power to decide as to whether imbrication should occur or not in the first place. In brief, the concept of the imbrication metaphor is [24]:

> The concept of … the reciprocal, self-reinforcing, often non-linear, impacts of one representation upon the other.

The imbrication metaphor gives equal power of shaping organizational routines to both material agency and human agency if a decision is made to imbricate between human and material agency. The metaphor helps to bridge the gap between 'extreme poles of voluntarism and determinism' while maintaining the free-will of human agency in deciding to appropriate a technology [5]. Both human and technological artifacts interweave (negotiate) together to produce an outcome.

The main contribution of imbrication metaphor for this study is its capacity to explain the 'production of durable patterns' that is produced from past interaction between human and material [5]. The imbrication process is a continual process that bases past experience 'between the two forms of representation as a dynamic unfolding process'[24]. Such durable ways of routines persist and affect new technology adoption. Thus, when facing new technologies, users not only look for technical properties, but also contextual patterns that they have created in their past interaction with other digital equipment. A constant exposure and interweaving with different IT based technologies can result in residual pattern of interacting with artifacts that share a resembling method of development.

The argument goes that not only the availability of affordances in technology but also the residual pattern of interaction affects the new technology appropriation process. This, by no means, implies the importance of availability of affordance in technology. In fact, the imbrication of human and material agency starts with and is realized through the mechanism of affordances. Introduced by perception psychologist J.J. Gibson [21], the concept of affordance has been used in different artifact designs to describe the interaction between designed artifacts and human actors [25]. The way we decide to design artifacts determines the kind of perception they create for the user.

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[1] Material agency is defined as "the capacity for nonhuman entities to act on their own, apart from human intervention" (Leonardi, 2011)

For instance, “thin vertical door handles *afford* pulling while flat horizontal plates *afford* pushing” [20]. According to Gibson, we decide to pull a door handle instead of pushing because "the attribute relevant for grasping is available" [20]. The existence of affordance in artifacts is independent of perception, which means artifacts and their property exist whether they are perceived or not. It is possible to have a wrong perception in the interaction process, where inference of usage is needed for hidden affordance.

Gibson informs his concept of affordance with strong connotation of the effect that past knowledge has for present or future interaction. Faced with new technologies, users tend to look for what the tool affords them to do. Gibson wrote: “What we perceive when we look at objects are their affordance…what the object affords us is what we normally pay attention to”[21]. This implies that even though users encounter the same objects and properties, the affordances they perceive can be different. Affordances exist in the space between artifacts and end-users. Users can interpret them based on ‘their goals for action’[5]. User’s past interactions and affordances made with technologies to accomplish their goals are used as bases for interacting with the new technology at hand. In the absence of such affordances, users will tend to change their routine (e.g. workarounds) to continue accomplishing their goals.

An example how users base their past knowledge of affordance to create cognitive artifacts illustrates this point. Cognitive (perceptual) artifacts are “components users designed as work-arounds to system shortcomings or extensions to systems that add functionalities to meet evolving needs” [26]. They are intended capabilities. The cognition strategy used to introduce oneself with a new ITA’s affordance is also used in creating a ‘cognitive affordance’ in the face of constraint. Let us say a user is accustomed to tabular system for arranging numbers to write a report from the previous experience of using an IT system. When a new technology is introduced, the end user will continue to look for properties and objects that afford the tabular reporting system. In the absent of such feature, the cognitive artifact that a user will develop is expected to resemble the old tabular system, whether the workaround involves other technologies or not. That is, we tend to copy previously accustomed technology’s affordance as a reference when we construct a perceptual affordance. It is as if we were copying how technology enabled us to afford in achieving our goals. In the same manner, self-design organizations, for example, use “their own identity as a primary point of reference when they reconstruct” their next form [27]. Perceptual affordances are inevitable as self-design organizations go through different changes and users apply technology’s affordance notion as a reference when they construct a perceptual affordance.

Consequently, the way users come to understand a new system's enabling or constraining characteristics originates from their imbrications norms they developed in the past. In addition, when a new technology is deployed in organization, the new system is expected to interweave with “an entire history of imbrication that came before it” [5]. That is, accustomed way of appropriating technology affects the choices and patterns users follow to imbricate other technologies, the way they develop cognitive artifacts in the face of constraints and the way they identify affordances in new technologies. Humans continue to learn as they interact with technologies and that ‘lesson’ leaves a print for the next imbrication process.

The interaction with technologies teaches us how to identify and perceive affordances in similar technologies. Such residual effect can have two possible results. On the one hand, it can create what we will call the ‘iron cage’ effect. The iron cage effect implies that users continue to look for the same affordance and the same method of presentation of affordances. In this regard, familiarity of user-interface can play a critical role. As users get accustomed to old way of interacting with technology, they will expect the same affordances from new IT system properties and objects. If affordances cannot be perceived as they used to be in the old system, users tend to create perceptual workarounds that resemble features of previously adopted technology. On the other hand, as users become digitally savvy as a result of frequent use of different technologies, they might develop a skill that can help them to increase their participation in the IS design process. As outlined above, new systems are expected to imbricate with the existing context, which also include user’s way of identifying affordances in a given technology. If a user is exposed to other digital system that bases same IT technology, which may not be related to IT systems at work, the iron cage pattern can be durable and strong.

### 2.2.1. The effect of 'Digital lives' on IS implementation

As users increasingly imbricate with digital equipment in different parts of their daily routines, they tend to develop a specific type of entanglement pattern for each type of services. For example, the introduction of touch screen by iPhone creates a durable pattern of how we interact with touch screen based phones. Other phone industries follow the same suit by creating similar function based on the past imbrication history. Users have already created a socio-technical entanglement pattern and way of perceiving affordances. Such residual imbrication creates an 'iron cage' of thinking, where familiarly of IT system is expected by users in the work place.

In addition to the iron cage effect, past imbrication history informs how users develop cognitive artifacts and its durability in the work environment. Past residual entanglement with technology can come in handy when developing our own perceptual artifacts based on the affordances needed for daily work. The argument is that the cognition strategy used to introduce oneself with a new ITA's affordance is also used in creating a 'perceptual affordance' in the face of constraint. We are using technology's presentation of affordance method as a reference when we construct a perceptual affordance. New affordances are adapted to improve work systems, whether they are 'real' (originated from material artifact) or 'perceptual' affordance revealed as workarounds. If such perceptual affordances are shared and adopted by many, its durability as imbrication residual can increase overtime. Many organizations pick such perceptual affordances as a new user requirement to create real affordances using IT artifacts, thus affecting the IS design.

### 2.2.2. The effect of 'Digital lives' on IS design

One can assume that user's frequent imbrication with different types of digital equipment can contribute to the emergence of digitally savvy end-users. That is, users can develop a critical eye on what and how affordances should exist as an end product based on their socio-technical entanglement history. Some end-users can go even further and participate in the IT development process, in which the End-User Computing (EUC) method can be cited as an example [28]. As a target audience for any IT systems, end-users' participation in the development stage is expected. But as a result of frequent engagement with different systems, users can now participate not only as a source of user requirement documents, but also in the capacity of defining and perceiving affordances. Thus, frequent imbrication with digital equipment not only enables end-users to increase participation in IS design but also alters their locus from passive participation to active one.

In addition, as the digital world continues to construct new artifacts, users embrace new imbrications and socio-technical entanglements. These phenomena continue to put pressure on organizations to adapt user's high expectations they have already experienced on personal levels. For example, an increased end-user's imbrication with social networks may force organizations to integrate their IT system to such services. Such integration may in turn call for adopting IS methodologies that can accommodate system modifications. An example of such system can be a combination of in-house developed ISD methods with open-code IT system. The following table summarizes the analytical framework.

**Table 2. Summary of analytical framework**

| IS activities | Digital living | |
|---|---|---|
| | **Iron-cage effect** | **End-users participation effect** |
| **IS implementation** | Residual dependency.<br>Durable pattern of perceiving affordances.<br>Constructing cognitive artifacts in reference of real IT artifacts. | Easier new technology appropriation.<br><br>Familiar with technology affordances |
| **IS design** | Expectation of familiar affordance.<br><br>Too many entanglements to consider in the design phase | Adaptive technology methods and approaches.<br>Increased and active participation of users on designing affordances. |

## 3. The case study

The objective is to study the effect of 'digital living' on the two cores IS activities: IS design and implementation. Thus, a follow-up case study of new IT system design and implementation is appropriate. The technology in question is Moodle, a learning management system implemented on three campuses of Mid Sweden University, Sweden. Moodle is an open-source system implemented on a phase by phase roll-out since the beginning of January 2012. The system has been fully adopted since January 2013, officially replacing the old learning management system, WebCT. Currently Moodle serves more than 17,000 students and the university's 1500 staff under the supervision of Learning Management Center (LRC).

### 3.1. Research Method

We have applied a 'content analysis' [29] method to examine end-user's technology appropriation behavior and identify their motives to resist or easily embrace new technology properties and objects. The university has nominated 16 so-called moodle champions who have been supporting the implementation process of Moodle. Moodle champions work under their perspective departments, and at least one champion is selected for each department of the university. I have conducted 30-60 minute long in-depth interview with 8 Moodle champions. In addition, 3 more LRC representatives (2 Moodle developers and 1 Moodle administrator) have participated in the interviews to share their experience. In total, 13 interviewees (4 female and 9 male) agreed to participate during the last 6 month.

#### 3.1.1. Data Analysis

Analyzing the interviews, the study were particularly interested in locally implemented IS methods, resisted IS features, user's computing background, existing cognitive artifacts, and overall intention of IT based system use. In particular, we have followed these steps:

1) All the interviews are transcribed and uploaded to Atlas.ti software

2) After re-reading all the interviews, about 20% of coding have been done manual. In doing so, I looked for patterns at conversation level. For example, repeated responses like " the new system interface is different and took me some time to find what I want" is coded as "*conversant*" to denote the residual effect of Old system.

3) After coding each response, the author looked for patterns (similarities) in each code. Three main themes (families as Atlas.ti calls it) have emerged (See table 3). Each family was then compared with the interviewees response based on the original code.

4) Based on these families, the paper develops logical relationship with the analytical framework.

**Table 3: Three Main themes of context based coding**

| Categories | Descriptions | Examples |
|---|---|---|
| Conversant | User follow their familiar imbrication to adopt new technology | *"I would like to have something similar to WebCT, since it felt home"* |
| Cognitive artifacts | Perceptual artifacts created by users to fulfill IT system limitation | *"I have workaround as well, which I created before long time ago, from WebCT limitation, but I continue using it, in fact I adapted my old solution (to) the new system"* |
| Peripheral knowledge | End-user's external knowledge that is applied in fulfilled their intended goals | *"I know some teachers set up their own websites, either internal or external. They tell students to login to those software's"* |

### 3.2. Presentation of findings

Based on the empirical data, this section discusses three main categories that emerged as main findings.

### 3.2.1. Conversant category

During the implementation of Moodle, user's first reaction was to look for affordances that are similar to WebCT, which used to facilitate their daily activities *("I would like to have something similar to WebCT, since it felt home. As it is now if I want to use the same file in different course, then I have to uploaded twice or create a link which can create a mess in the end. I know there is a solution for these things in moodle, but it is not coming here yet." Tagge08)*. Even though, features they were looking for existed in the new system, those affordances seemed invisible as they were not presented as it was perceived in the old system. (*"I used to get question like 'would it be good if I can do this' then I would say, but yes you can do that" Tagged 04 (…) "The question is more about the equivalent options they can get in Moodle." Tagged06).*

Some features of the system were completely resisted or ignored. For instance, the users resisted the Moodle email system. *("it's hard to find your emails, which mails I sent, when and to whom. WebCT was easier in this way. It was more like an ordinary mailbox. I don't know if technology is limited or our knowledge about it" Tagged 07 (…) "The message system is the biggest weakness I would say. It is not natural the way it works" Tagged06*). After examining the severity of this problem, LRC decided to implement a Gmail emailing system that reflected more familiar emailing environment. End-users started to use the Moodle email system and responded favorably. *("Yes. I use the new Gmail system rather than the old "message" available in Moodle. I think Gmail very similar to other e-mail systems that Gmail and outlook and that it is relatively easy to get started with"Tagged11).*

### 3.2.2. Cognitive artifacts category

The case study reveals end-users persistent practice of perceptual artifacts and their effect on appropriating new technology. All interviewees complemented IT artifact limitations with workarounds created within or outside of the existing system. End-users continued to practice old system workarounds in the new system. *("I have workaround as well, which I created before long time ago, from WebCT limitation, but I continue using it, in fact I adapted my old solution (to) the new system. Workaround stick longtime may be even though you don't need them anymore" Tagged08).*

It is also observed that cognitive artifacts resembled other commonly used IT based system that end-users were familiar in their daily activities. (*"Yes, of course, grading in excel file or importing to excel file. This is because I feel like more at home. I used to do that before in WebCT as well, so it is continued process. May be it is also feels good that you have the grades in your file inside your computer, so that you can manipulate the work as you want" Tagged01 (…) "In my department, the architects want to upload files but then I have to send those from outlook, so it is hard. We find some way around it, we instead start to use a forum to upload the files, but I don't think that is efficient way to do it."Tagged05).*

### 3.2.3. Peripheral knowledge category

Apart from providing user requirement information, the study also shows that computer savvy end-users can provide valuable input for system improvements. This is especially true, when it comes to how affordances should be presented. *("Users on the other hand have no ability to improve system on their own, as the plug-ins is approved by LRC, but there are cases where users ask for different plug-ins directly. They went to other university and see how other do things and come and suggest those solutions."Tagged01).* Once users understand the existing system has a material resource to accommodate modification, it can promote them to provide ideas on how to improve IT systems. *("People will have to find out their own way on how to adapt themselves with the system after some time use and if that happens they will come up with some suggestion and plugins, especially if they know that the system can be adaptable. I think all users will find their way of being comfortable with a system." Tagged01*)

The study also observed that such users tended to use external IT based knowledge to improve real artifact affordances. *("I know some teachers set up their own websites, either internal or external. They tell students to login to those software's. They see problems in Moodle and set it up on their own. I think LRC should approach such teachers and see the missing components. Uppsala for instance they actively approach teachers that they use their own system and this should be applied here also"Tagged02).*

## 4. Analytical Discussion

This section discusses how user's imbrication history results from daily interaction with digital equipment affects IS design (approach and method) and implementation (technology appropriation and on-going practice). In doing so, the study relates the empirical findings with the analytical framework outlined in Table 4.

### 4.1. IS implementation

The case study shows that user's imbrication history (Residual dependency) with older systems affects the implementation of new technology in the work place. Such dependency does not solely originate from workplace previous IT based system. As the Gmail account case shows (See Conversant category), personal use of IT systems can create imbrication patterns. That is, properties and objects of an IT system will only be visible as an affordance if it creates the feeling of easy imbrication already constructed with other systems. At times, such residual dependency can be durable if a user gets entangled with different system in a similar manner. Again in the Gmail example, many email systems are designed in a way that they create a standard kind of imbrication with end-users, even though the systems are provided by different companies. Many users are frequently exposed with email icons on the left side with different labels (inbox, sent, delete and as such). One can expect a durable pattern on how to identify the affordance of finding these labels and their function. A different pattern can result in resisting the new way, even though the functionality is available. Such cases illustrate the iron cage effect discussed in the theory section. Users are accustomed to specific *way* of perceiving affordances in technology. As we are living in a digital world, the likelihood of users to experience different IT system functions applied in the workplace beforehand is reasonably copious.

In addition, the evidence shows that cognitive artifacts implemented as a result of old system stay longer, even after new system's implementation solves those limitations. In fact, one can assume that personally developed artifact's residual persist longer than imbrications with systems developed by IS designers. The iron cage effect is also visible when users stick to what they know best. *("Never mess with something that works well. That is a round rule of course, so when it comes to moodle opportunities, should we use that?" Tagged04).* The case study also reveals how users develop cognitive artifacts. Users were following their imbrication history as a reference to develop perceptual artifacts. Such imbrications may not occur only in the work place. Socio-technical entanglement residual can have a root from personal use digital equipment. Consequently, the iron-cage effect might develop from IT based systems that a user interact on a daily bases outside work practice.

Previous experience of digital imbrication enables to understand easily how new system works. In this regard, the case study shows that younger generation with more entanglement opportunities with digital equipment (e.g. digital natives [30]) easily learn how the new Moodle system works. *("Usually, older people are scared of computers and they don't like they want to change I don't have a lot of question from young ones. The young ones, they can do the same thing they used to do in WebCT, but they have to do it differently, it is not the same button or it is not the same page" Tagged06*). As it will be discussed in the next section, frequent imbrication with different digital equipment may also promote users to increase their participation in IS designing process.

### 4.2. IS Design

Designing IT system for digitally savvy users presents both challenges and opportunities. As the case study shows, users exposure to digital technologies affects what they can expect from technology (See peripheral knowledge category). Consumer based digital equipment tends to change rapidly mainly due to competition in the business environment. Even though, accommodating all changes that users experience in their daily lives is not warranted, the need for acquiring adaptive technologies in the work place becomes justifiable. Consequently, implemented IT solutions can be abandoned if they do not satisfy future organizational needs. One can also assume that technological awareness increases not only the frequency of user's participation but also the quality of input users bring to the table. Consequently, users are competitive enough to suggest technology affordances, how affordances can be designed, perceived, and materialized.

The IS design is also affected by the iron-cage phenomenon. The abundance of digital equipment results in numerous socio-technical entanglements. In addition, user's expectations from familiar affordances can halt

innovations. Consequently, digital living has brought a different challenge to the IS design field, where organizations are expected to craft a balance between the iron-cage effect and a broader end-user participation

## 5. Conclusion

This paper has explored the effect of 'digital living' on the success of IS adoption. In addition, the study briefly discusses the implication of digital living on IS design. In doing so, the research identifies two main accounts: the iron-cage and end-users participation effects. While imbricating with technology, end-users develop a durable and specific pattern of interacting with artifacts. Based on such patterns (residual imbrications), they tend to appropriate new technologies. If their experience of imbrication does not present itself in new technologies, they tend to resist adopting the new artifact. As a result, past imbrications create an iron-cage where practitioners expect the same way of perceiving affordances. Frequent exposure to digital media also results in technology savvy users. In this regard, end-users participation in the IS activities has increased, as they are well-aware of what to expect from IT system.

The study contributes to the IS field in different ways. Frist, it addresses the relationship between seemingly opposite roles of digital living effects. Even though, frequent exposure to digital equipment increases IT awareness, it also contributes to a 'boxing' effect where users expect familiar presentation of technology affordance. Second, based on empirical evidence, the study demonstrates the durability of cognitive artifacts and how user's past experience to construct them. The end-users apply familiar digital equipment as a reference to construct perceptual artifacts. Finally, the paper highlights the effect of digital living on IS design process.

This study has several limitations. First, the empirical evidence limits the study to make conclusive evidence for the analytical framework. A case study of long-term use of technology appropriation and thorough analysis of user's digital behavior may result in a conclusive perspective. Second, it is not guaranteed that digital living results only in two effects. Instead, I have presented them solely as an analytical framework. Finally, future studies are also warranted on the effect of locally adopted IS methods and approaches.

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