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A Guiding Framework for Developing Theories Investigating the Design Drivers of IT Use and Value

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Understanding the benefits individuals derive from information systems (IS) is a long-standing theoretical and practical issue. To address it, a recommended approach is to investigate how individuals use these systems to better achieve their goals. Such an approach can be implemented via focusing on the distinctive object of study of our field, i.e., the information technology (IT) artifact. Hence, this paper is motivated by the lack of existing guidance on how to theorize about IS use when the research intent is to better specify the role of IT artifact design criteria. We provide assistance to scholars in identifying and relating key constructs based on which design-focused system use theories can be developed. To do so, we build on key assumptions and ideas from the Philosophy of Technology about the nature, the use, and the design of technical artifacts. These suggest that a better understanding of the design-related factors involved in the study of IT use and effects can be gained by studying (i) whether designers create IT artifacts that have the potential to support users' goal-oriented actions, and (ii) whether users can exploit these IT artifacts in a way that enables them to reach their goals. Following on these ideas, the paper specifies the key building blocks that could be used by scholars when developing theories explaining the effects derived from using a given class of information systems. It also identifies the key gaps preventing the achievement of users' goals that arise from both (i) the design of IT artifacts for goal-oriented tasks and (ii) the enactment of these artifacts by individuals. Finally, it proposes a series of steps to help researchers theorize about the influence of design-related aspects involved in IT use and IT value.

Keywords: IT value, IT use, IT design, Users' goals, Philosophy of Technology

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A Guiding Framework for Developing Theories Investigating the Design Drivers of IT Use and Value

Abstract

Understanding the benefits individuals derive from information systems (IS) is a long-standing theoretical and practical issue. To address it, a recommended approach is to investigate how individuals use information systems to better achieve their goals, which can be done by focusing on the distinctive object of study of our field, i.e., the information technology (IT) artifact.

This paper is motivated by the lack of existing guidance on how to theorize about IS use when the research intent is to better specify the role of IT artifact design criteria. Hence, we assist scholars in identifying constructs based on which design-focused system use theories can be developed. To do so, we build on key assumptions and ideas from the Philosophy of Technology about the nature, the use, and the design of technical artifacts. These suggest that a better understanding of the design-related factors involved in the study of IT use and effects can be gained by studying (i) whether designers create IT artifacts that have the potential to support users' goal-oriented actions, and (ii) whether users can exploit these IT artifacts in a way that enables them to reach their goals.

In sum, the present paper specifies constructs which could be useful for scholars developing theories that aim at explaining the outcomes derived from using a given class of information systems. It also identifies the key gaps that prevent the achievement of users' goals and that arise from both (i) the design of IT artifacts for goal-oriented tasks and (i) the enactment of these artifacts by individuals. Finally, it proposes a series of steps to help researchers theorize about the influence of the design-related aspects involved in IT use and IT value.

1. Introduction

1.1 Studying IT Use to Better Understand IT Impacts

An important question for both Information Systems (IS) researchers and practitioners is to understand how individuals derive benefits from IS (Markus and Silver, 2008). IS scholars generally agree that IT use constitutes an essential mediator of the relationship between technologies investments or capabilities and the value these technologies may provide to people (Al-Natour and Benbasat, 2009; Boudreau and Seligman, 2005; Orlikowski, 2000), groups (DeSanctis and Poole, 1994; Pavlou et al., 2008) and organizations (Devaraj and Kohli, 2003; Subramani, 2004). This supports Orlikowski (2000, p. 425) who states that "technology per se can't increase or decrease the productivity of workers' performance, only use of it can". This connection between IT use and value or performance has been documented for IT contexts as diverse as mobile (Wiredu, 2007), enterprise (Kane and Alavi, 2008), group (Pavlou and El Sawy, 2006), office (Burton-Jones and Straub, 2006), e-procurement (Mishra et al., 2007), and e-Commerce systems (Xiao and Benbasat 2007). As a result, scholars have highlighted the need to focus on the IT use phenomenon in order to better understand IT impacts (Agarwal, 2000; Karahanna et al., 1999).

1.2 Focusing on the "IT" When Studying IT Use

When studying IT use, researchers can choose to concentrate on different aspects. For example, researchers can focus on *individuals* and investigate constructs such as self efficacy (Compeau and Higgins, 1995) or computer playfulness (Webster and Martocchio, 1992); alternatively, researchers can focus on *context* and account for the role of variable such as facilitating conditions and normative influences (Ajzen, 1991).These perspectives are useful in providing managerial guidance such as foe devising training programs to assist individuals improve the

skills needed for using technologies effectively or for identifying flows of normative influence that may hamper individuals' willingness to fully engage in using a system. Scholars and practitioners in the IS field are likely to be even more interested in the role of factors pertaining to *system design*. However, such a focus has been lacking in research, thereby preventing contributions that are able to provide specific and actionable design guidance (Benbasat and Barki, 2007; Evermann and Tate, 2009). The present paper is motivated by the importance of better understanding how individuals derive benefits from using IS and the need to focus on the distinctive object of study of our field (i.e., IT artifacts). Given the lack of existing guidance on how to theorize about IT use in a way that accounts for the role of IT design-related criteria, the paper aims at assisting scholars in identifying and relating constructs based on which design-focused system use theories can be constructed.

1.3 Implications of Adopting an "IT" Focus when Studying IT Use

The paper's objective touches upon the long standing discussion about the trade-offs between *specificity* and *generalizability* in organizational research (Langley, 1999) as well as in IS research where the rapidly changing nature and applications of technologies constitute a challenge for theorizing (Markus and Saunders, 2007). These two characteristics of scientific theories are not easily reconcilable. While it is generally assumed that theories and their constructs need to be at a level general enough to be applied to various contexts, this usually comes at the expense of specificity and actionable guidance. In fact, several theories in IS, such as TAM (Davis et al., 1989) have been criticized for providing little practical insight (Benbasat and Barki, 2007; Evermann and Tate, 2009; Lee et al., 2003) and Orlikowski (2001, p. 132) noted the need to focus more on the IT artifact and to "begin develop some useful theories". Because different technologies offer sometimes very different functional potential so that how

they are used and how they benefit people will vary accordingly, a possible approach for balancing specificity and generalizability is to develop IS theories that explicitly take into account the *key enabling capabilities of the given class of technology being studied* (Tate and Evermann, 2009). Adopting this middle-level perspective (Weick, 1989) concurs with the view that studying system use deserves a contextualized approach, which in turn implies that researchers should identify which element(s) of use to focus on according to their theoretical and substantive context (Burton-Jones and Straub, 2006). Hence, while the present paper accounts for all three aspects relevant to system use, i.e., the *users*, their *tasks*, and the *system* they use to conduct their tasks, it concentrates mostly on the *system* aspect because it aims to help theorizing about IT use and effects in a way that provides granular design insights. This differentiates our work from the ones of other scholars that have studied the relationship between IT and user performance in more general terms such as the task-technology fit theory (Goodhue, 1995).

In summary, the present paper provides guidance for developing theories informing practitioners about the design-related aspects of a particular class of IT artifacts that are decisive in shaping use and hence driving outcomes. It achieves this aim by leveraging some key assumptions and ideas developed in the Philosophy of Technology about the nature, the use, and the design of technical artifacts. This conceptual basis suggests that a better understanding of the design-related factors involved in the study of IT use and effects can be reached by studying (i) whether designers create IT artifacts that have the *potential* to support users' goal-oriented actions, and (ii) whether users *can exploit* these IT artifacts in a way that enables them to reach their goals, and it enables us to identify three levels of design-related factors involved in the use of IT artifacts. In the rest of the paper, we first present our key assumptions and then discuss a framework built upon the idea that design and use activities are intrinsically related and both

important in explaining the extent to which users reach their goals. We provide directions for applying the framework via the illustrative study of online social shopping networks, a class of IT artifacts situated at the intersection of e-Commerce and social networks.

2. Assumptions about the Nature, Design, and Use of IT Artifacts

2.1 Viewing IT Artifacts as Material Structures Realizing Functions

Conceptualizing IT artifacts for studying their use and effects on people is recognized as a thorny challenge (Markus, 2005). Our approach for dealing with that issue is to characterize IT artifacts in terms of their materiality and intentionality, that is, to consider them in terms of designed physical structures realizing functions (Kroes and Meijers, 2006), as illustrated in Figure 1. Intentionality implies that IT artifacts are involved in purposeful human actions through their functions, and materiality implies that these IT artifacts rely on their designed structures to fulfill their supporting functions. These ideas come from the Philosophy of Technology, a field emerging from diverse domains such as metaphysics, ontology, epistemology, philosophy of mind, aesthetics, and ethics (De Vries, 2005). Scholars in this field have discussed in much detail the status and characteristics of *technical artifacts* and the implications of these on key human actions related to them (i.e., design and use). By examining the nature of artifacts, philosophers have been able to differentiate technical artifacts from other artifacts of interest. For example, technical artifacts such as IT artifacts can be distinguished from *social artifacts* (e.g., laws, IT policies) because they depend strongly on their designed material structures to achieve their function. They are also different from *artwork* and *natural artifacts* in that they are intentionally produced and used to achieve certain goals: physical objects "acquire a teleological element and become technical objects only in relation to human intentionality" (Kroes and Meijers, 2006, p. 1). This perspective provides a clear anchor to distinguish IT artifacts from other objects or

artifacts. Note that while the material structures of technical artifacts may be mostly made of physical components, the material structures of IT artifacts refer to representational and processing capabilities created within software and hardware bundles.

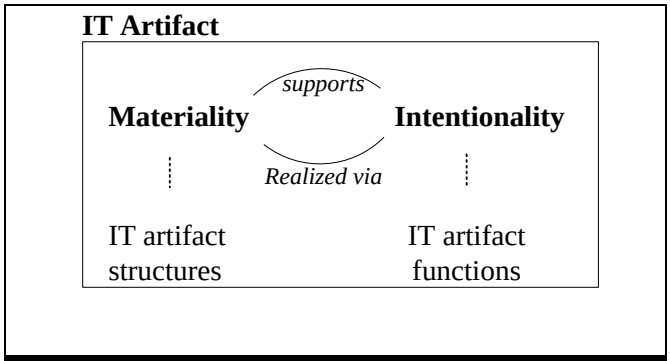


Figure 1 – The Dual Nature of IT Artifacts

2.2 An Action Theory of IT artifacts

Conceptualizing IT artifacts in terms of materiality (i.e., form) and intentionality (i.e., function) has implications for explaining how individuals can effectively use IT artifacts in their tasks. The relationship between materiality and intentionality can be synthesized via the general statements that IT artifacts are "purposefully made and made for a purpose" (Dancy, 2006, p. 61). An action theory lens, i.e., a view studying the formal structure and explanation of human actions, has depicted the more specific mechanisms reflecting the connection between materiality and intentionality (Houkes and Vermaas, 2004; Houkes et al., 2002; Vermaas and Houkes, 2006)), that is, the mechanisms involved in explaining how materiality can support intentionality and how intentionality can be embodied in and realized through materiality. This action theory lens considers IT artifacts as the central objects of both use and design actions and elaborates the central notion of user plan. *User plans* refer to 'cycles of intentional actions' (Houkes et al., 2002) in which the artifact is planned to be created (i.e., through design) and manipulated (i.e., through use) in order to contribute to the achievement of some intended goals. In this view, the

design and use actions involving IT artifacts are conceptualized broadly as constructing and executing a user plan, respectively.

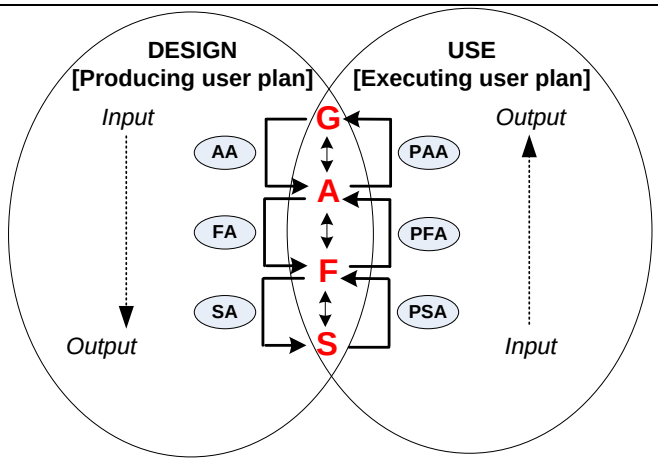
Constructing a user plan refers to conceptualizing a set of actions within which some artifacts will fit in to help support some identified goals. Hence, it is *more than just artifact design*. Houkes et al. (2002) identified the following iterative activities involved when producing a use plan. Designers specify users' goal (note that this can be achieved by having users elicit goals, or by negotiating or imposing views on goals), identify a set of actions that will be conducive to goal achievement, and incorporate artifacts as supporting objects to these actions. They design these artifacts by translating identified functions into a material form, and evaluate the effectiveness of the produced artifact in supporting the goal-oriented actions specified for the user plan. In turn, executing a user plan refers to users engaging in a set of actions facilitated by some artifacts. Hence, it is *more than just user-artifact interaction*. The steps involved in using artifacts are the following: users want to achieve some goals (e.g., make a strategic business decision, make a purchase on an e-commerce website), and based on these goals, they engage in a series of actions facilitated by technical artifacts. These actions involve the support and use of IT artifacts as well as the interpretation and assessment of how and the extent to which the IT artifact structures and associated functions are able to support goal-oriented actions. Users may form different kinds of beliefs leading to assessing whether an IT artifact provides the adequate potential to reach their goals, for example, (i) beliefs about the artifact's structure and functions, or (ii) automatic beliefs that the artifact can in general help achieve a certain goal, or (iii) beliefs gained from fellow users. The first set of beliefs is the one of particular interest for this paper's perspective given our focus on the system factors involved in system use.

The present paper studies system usage and its outcomes and adopts a special focus on the system aspect (Burton-Jones and Straub, 2006). Conceptualizing IT artifacts in terms of materiality and intentionality and using an action theory lens to explain their relationships has implications for studying how individuals can effectively use IT artifacts in their tasks. This view notably involves an IT artifact that is *designed* before being *interpreted and put into actions* by individuals in the context of their goal-oriented activities. Therefore, we consider that *both design and use related constructs need to be taken into account when developing design-focused theories of system use and value*. In summary, eliciting fundamental assumptions about the nature of IT artifacts and the way they are involved in the creation and execution of 'user plans' provides a common ground to develop a framework guiding theoretical accounts of IT effects that are design-focused. We now describe and illustrate this framework.

3. A Framework for Guiding Theoretical Accounts of IT Effects

3.1 Key Elements of User Plans: Goals, Actions, Functions, and Structures

The proposed framework, illustrated in Figure 2, shows that the two domains of IT artifact design and use share a common conceptual structure constituted by the four core elements of a 'user plan' derived from the discussion above: (i) goals, (ii) actions, (iii) functions, and (iv) structures. *Goals* represent the final outcomes that designers and users (or their representative agents) aim to satisfy. *Actions* refer to users' engagement in purposeful actions with and via the IT artifact. In turn, *functions*, i.e., the basic purposes enabled by IT artifacts, and *structures*, i.e., the material arrangements enabling these functions, constitute the two building blocks of IT artifacts, as explained earlier.



Key components of user plans relevant to IT artifact design/use:

- **-G** – Goals: the ultimate individual outcomes expected and/or derived from using IT
- **-A** – Actions: the purposeful user actions conducted with or via the IT artifact
- **-F** – Functions: the basic purposes enabled by IT artifacts
- **-S** – Structures: the material constituents enabling the artifact's functions

Key constructs of interest

AA ***Action affordances***
The identification of the key enabling actions users need to engage in to fulfill their goals

FA ***Functional affordances***
The identification of the key enabling functions the artifact needs to provide to facilitate actions.

SA ***Structural affordances***
The identification and creation of the enabling material structures needed to support the functions.

PAA ***Perceived action affordances***
Based on their actions with or via the artifact, users assess how and whether they can reach their goals.

PFA ***Perceived functional affordances***
Based on the functions provided by the artifact, users make inference about what they can do with and via the IT artifact

PSA ***Perceived structural affordances***
Based on the IT artifact's material structures, users 'ascribe' functions, i.e., they interpret how the artifact enables certain functions

Figure 2 - The Proposed Framework for Studying IT Use

3.2 Constructing User Plans: the Role of Affordances

Within the framework illustrated in Figure 2, design is broadly referred to as the 'production of a user plan' and is a top-down driven process. In order to highlight the idea that each key component in this Design part of the framework is an enabling constituent in a process leading to the creation of a user plan that supports users' goals and that each component is, therefore, involved in shaping the benefits individuals derive from using a system, we apply and expand the

notion of *affordances*. Affordance refers to the idea of supporting or being conducive to something. In Human-Computer Interactions, affordances have mostly been defined at a rather high level, such as in terms of "the range of possible desired and relevant activities which designers render visible to users" (Norman, 1999) and "the potential utility designed into an object" (McGrenere and Ho, 2000). A notable exception has been the definition of Hartson (2003) who defines affordances as "the set of sensory, physical, cognitive, and functional features designed into an object". Given their high-level, these definitions do not match the specific steps of the iterative design process through which designers create user plans from the identification of users' goals up to the creation of IT material structures in support of these goals. As such, they provide a limited potential for helping theorizing in detail about the IT design-related aspects involved in system use. To address this issue, we conceptualize new kinds of affordances associated with the levels of focus adopted at each of the design steps identified in the Framework. Starting from the bottom, *structural affordances* represent conceptual bridges between an IT artifact's form and its function(s). In other words, they stand for the enabling material capabilities for achieving key functions for the IT artifact. Next, *functional affordances* are situated at a level where affordances is usually most studied in IS and HCI, i.e., at a level where users are given the possibility to do something useful in the domain via the use of the IT artifact. Hence, we adopt the view of functional affordances as standing for the functional relation between IT artifacts and users, and thus we define them in terms of possibilities for goal-oriented action (Markus and Silver, 2008). Finally, at the highest-level, *action affordances* represent the enabling actions users conduct with and via IT artifacts for achieving users' goals, i.e., the desired outcomes realized via the use of the IT artifact in particular tasks. Specific illustrations of these three types of affordances are provided in section 5.2.

3.3 Executing a User Plan: the Role of Perceived Affordances

User plan execution reflects a bottom-up process, i.e., it starts with goal-oriented individual users interacting with the IT artifact's material structures. This first 'step' in user plan execution refers to users ascribing functions to the material structures they encounter. This means that users interpret how the material structures embodied into the IT artifact enable certain functions to be performed by the IT artifact. Parallel to design, the associated relevant key concept at this stage is therefore *perceived structural affordances*. Next, users make additional inferences about how the IT artifact's functions can support their specific goal-oriented actions, which is reflected via the construct of *perceived functional affordances*. Finally, users interpret how these actions are conducive to their expected outcomes, i.e., their goals. This highest level of 'enablement' is referred to as *perceived action affordances*, and is defined as users' perceptions about how using the artifact is able to satisfy their goals.

4. Key Insights Gained from and Developed based on the Framework

The proposed framework builds on assumptions about the nature of objects specific to the information systems field (i.e., IT artifacts) and the key human actions involving these artifacts (i.e., design and use). It achieves three main purposes: (i) it specifies and relates *key building blocks* that can be used in developing theories explaining the effects derived from using a given class of information systems, (ii) it identifies *key gaps* (arising from both the design of IT artifacts for goal-oriented tasks and the enactment of these artifacts by individuals) that might prevent users from reaping the expected benefits from using systems, and (iii) it forms the basis for specifying *key steps to help researchers theorize* about the influence of design-related aspects involved in IT use and IT value.

4.1 Key Building Blocks of Design and Design Evaluation Theory

The proposed framework specified key constructs for building design-oriented theories of IS use. The key building blocks of such theories are of two types: we identify the four elements constituting user plans, and from them, derive the set of three affordances and three perceived affordances. These three levels (i.e., structural, functional, and action) represent a finer grained perspective for studying use and understanding how it fulfills positive outcomes. The two types of constructs (affordances and perceived affordances) highlight the fact that studies of IT use and effects should take into account both the designed potential embedded into artifacts as well as users' access to this potential (Figure 3). In sum, affordances are necessary but not sufficient for understanding the outcomes of IT use.

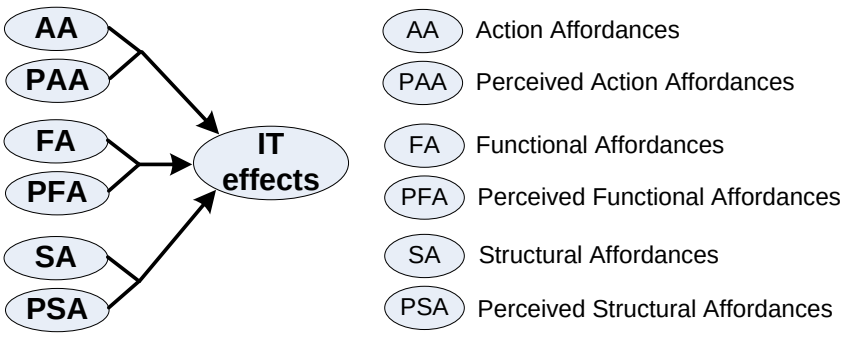


Figure 3 – Key Affordances and Perceived Affordances for Studying IT Use and Effects

4.2 Identifying the Origins of Gaps Observed in IT Outcomes

This framework conveys the key idea that for individuals to use a system in a way whereby their goals can be attained, and for researchers to theorize about this phenomenon, both the role of the *designed* artifact and of the *interpreted* artifact need to be accounted for (Grange, 2011). That is, if researchers want to theorize about the factors that may support or impede users in reaching their goals, they should look for the causes to such factors on the design as well as on the use

side. In sum, a better understanding of the design-related factors involved in the study of IT effects can be reached by studying (i) whether designers create material structures that are able to support users' goal-oriented actions, and (ii) whether users enact material structures in a way that enables them to reach their goals. This is in accordance with the view of IT artifacts as being boundary objects (Fleischmann, 2006), that is, objects common to and linking both design and use domains. By leveraging the framework and its constitutive classes of key affordances created by designers and perceived by users, we now describe some key domains of theorizing for IS researchers studying the design factors affecting the effective use of a system by individuals.

4.3 The Role of Designed affordances in Shaping Effective IT use

As the framework shows, designers start from the identification of users' goals (both extrinsic and intrinsic ones, such as gaining knowledge and having fun, respectively) which drive the whole user plan execution process from the specification of a set of actions supporting the goals, the specification of a set of functions supporting the actions, and the development of material structures enabling the functions. By following the assumption that goals and desired outcomes are well-known and understood, we identify three areas, illustrated in Figure 4, constituting potential design gaps at the origin of variance in expected IT outcomes. First, designers can fail to specify the appropriate set of actions that will lead to the achievement of goals. This is represented by area (i) in Figure 4: designer have failed to identify an action (A1) that could contribute to the fulfillment of goal G1. A cascade effect is likely to follow with as consequences at the end, the production of material structures that are not capable of satisfying fully certain functions and indirectly actions and goals. For example, in Figure 4, the designed structures S2 cannot support functions F3 and F4 that would enable A2, an action contributing to achieving G1 and G2. In sum, gaps can occur at the three levels of structural, functional, and action

affordances, with various effects such as the incomplete or inefficient achievement of goals (e.g., G1) or the total inability of the created design to fulfill some goals (e.g., G2), and therefore the analysis of these three levels of affordances would be useful for designers engaging in the evaluation of their design.

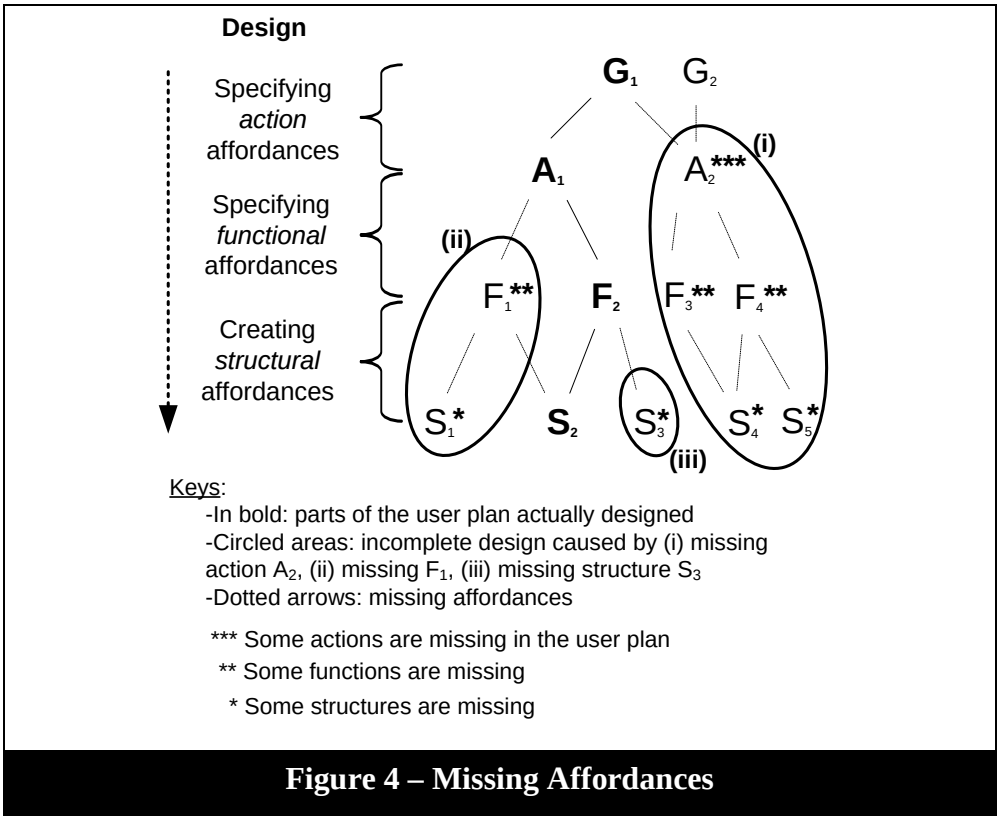


Figure 4 – Missing Affordances

4.4 The Role of Perceived Affordances in Shaping Effective IT use

On the use side, even with a designed artifact embedding all the required affordances, it is possible that other gaps occur and hamper users' achievement of their goals. This phenomenon has been called gulf of evaluation in Human-Computer Interaction to refer to the psychological gap of interpretation between users and the interface they interact with (Norman, 1986). As can be seen in Figures 4 and 5, a function can be realized in multiple structures and a structure may realize multiple functions. This two-way under-determination property (Houkes and Meijers, 2006) is applicable to both artifact design and use situations. For design, most of the times, it is

argued that there is not a one-to-one mapping between the artifact's functional and physical structures, meaning that there may be many possible paths in the assignment of functions into their materialization. This implies the possibility for creativity in design, a topic of interest but not within the scope of the present paper. For use, this suggests that different ways of using IT artifacts can be distinguished. Using an IT artifact in accordance to the designer's intent has been called *proper use*, i.e., use that is faithful to the designer's intended artifact. *Accidental use* and *innovative use* are two variants of using an artifact in a way that would not be intended by designers. Use is accidental when it consists in leveraging a function that is enabled by the artifact despite not being intended by designers and that may be based on misconceptions about the artifact, sometimes with dramatic consequences (e.g., when a person used her microwave to dry her pet). Under that account, designers should try to anticipate accidental use and to prevent unwanted abuses. Alternatively, innovative use refers to agents using an artifact in a way and for a purpose that was not intended in the designed user plan but that does not entail harmful implications such as the one mentioned above. On the contrary, innovative use can be conducive to the fulfillment and discovery of additional goals. Figure 5 illustrates these phenomena. It shows that given that design is a top-down process (from the identification of outcomes/users' goals to the design of material structures), if designers do not adopt a complementary bottom-up perspective for evaluating their design, they might fail to identify unexpected and/or undesired affordances created by their structures (e.g., $A_{(u)3}$) and subsequently enable undesired/accidental outcomes ($G_{(u)3}$); they may also miss the opportunity of identifying innovative use patterns ($A_{(i)2}$) and goals ($G_{(i)2}$) for which they might want to think of new and improved ways of supporting. For example, when Twitter[1] users started using special codes in their messages to facilitate the

[1] Twitter is a micro-blogging tool. In a presentation accessible at address mentioned next, Evan Williams, the CEO of Twitter emphasized how users had discovered new ways of using Twitter to achieve many unexpected goals and

communication with other users (e.g., the '@username' code to specify the intended recipient of the message, or the '#topic' code to specify the topical content of their message), designers used that trigger to adapt the design in both ways: (1) *adapting the user plan*, by accounting for the new goals that users had imagined for Twitter (e.g., communicating in a one-to-one fashion, searching for topics of interest), and consequently, (2) *adapting the artifact design*, by adding the functions and structures facilitating and formalizing users' manipulation of Twitter for one-to-one communication and topic search.

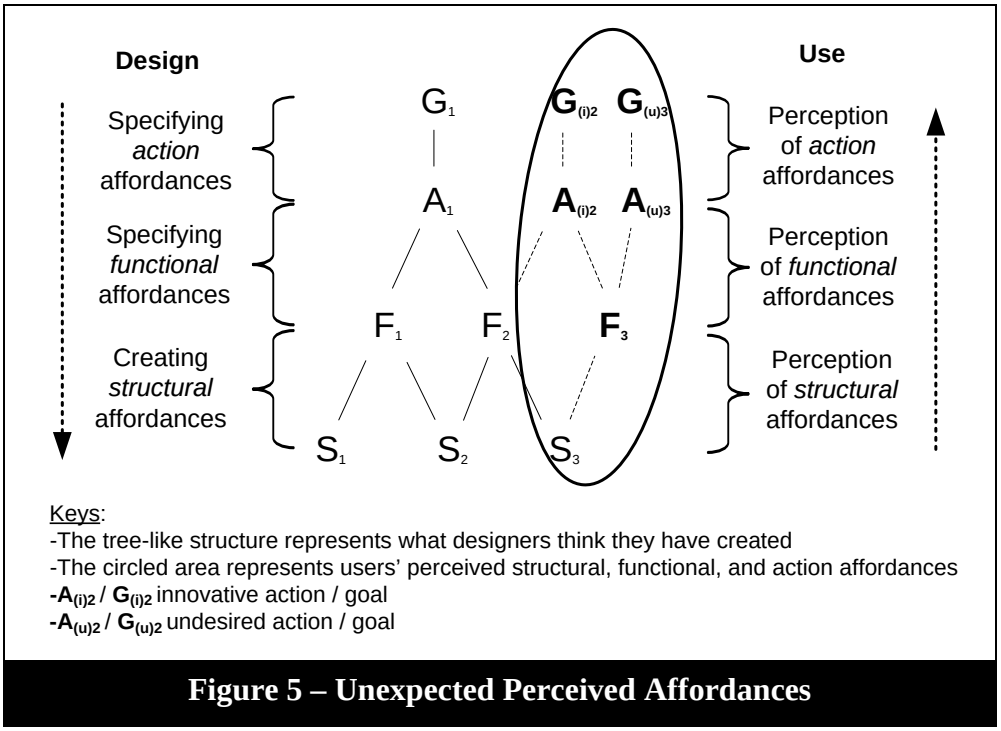


Figure 5 – Unexpected Perceived Affordances

As illustrated in Figure 6, users can also build an incomplete perception of the structural, functional, or action capabilities created by designers. In other words, they might be blind to part of the IT artifact's potential. In the example provided in Figure 4, a user could have achieved the same outcome (G_1) more efficiently, or maybe could have reached other goals (G_2). This

how this had driven redesign: http://www.ted.com/talks/evan_williams_on_listening_to_twitter_users.html

situation is not uncommon and has been noted in prior research, for example, DeSanctis and Poole (1994, p. 126) stated that generally users' interpretations "are likely to capture only limited aspects" of the system (e.g., think of all the available but unused functions in Word or Excel).

In sum, use 'errors' highlight the importance of individuals' intentionality (twitter example) and interpretations (work/excel example) in the IT artifact-Value relationship while design errors are a reminder that IT artifact's structures represent physical properties and hence potential boundaries conditions put on use and hence on value.

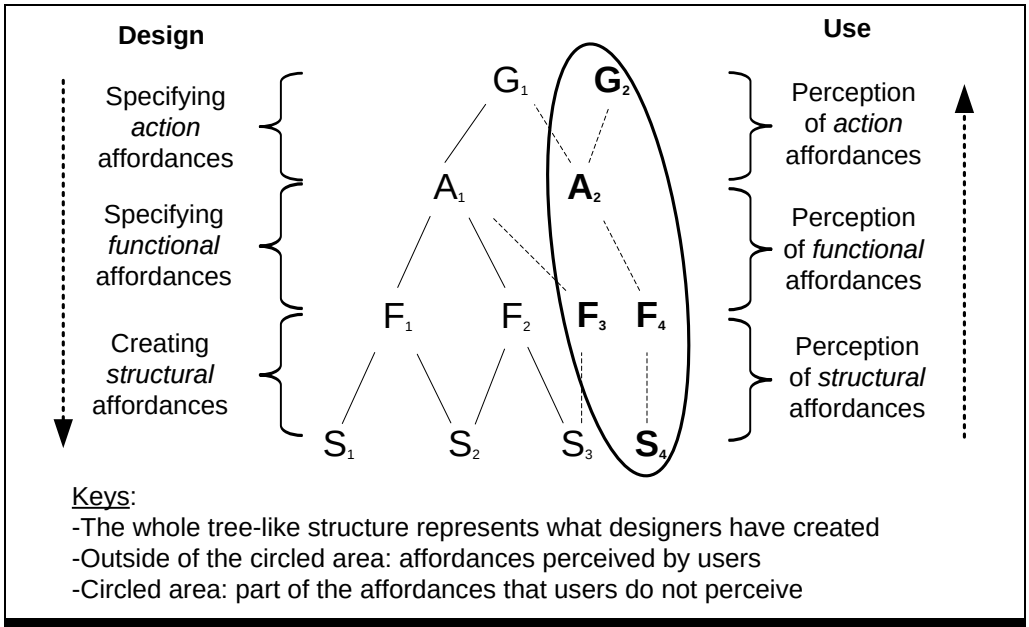


Figure 6 – Invisible Affordances

5. Leveraging the Framework for Theorizing–Guidance and Illustration

We now present some guidance for helping researchers theorize about the design factors that are involved in the use and value of specific classes of systems. We first describe the proposed approach and then illustrate it via a fictive study on the value of a class of online shopping platforms.

5.1 Proposed Approach

Scholars investigating the design factors influencing how individuals derive value from a specific class of systems should focus on affordances that are *salient* to these systems. Hence, substantive context represents the starting point in an approach which is aimed at systematically specifying the chain of action, functional, and structural affordances involved in satisfying users' goals. The proposed approach is composed of the following activities: (1) specifying the key properties of the substantive context of investigation, i.e., describing the class of systems being studied, (2) defining the spectrum of users' goals relevant to this class of systems, (3) defining system use in the specific context being studied and specifying the different ways of engaging in use, (4) theorizing on action affordances, i.e., specifying the actions conducted with or via the system and explaining how they support users' goals, (5) theorizing on functional affordances, i.e., identifying the functions facilitating the actions identified in (4), and (6) theorizing on structural affordances, i.e., identifying and specifying the structures (i.e., material properties) that need to be designed into the IT artifact in order to support the key functions identified in (5). Note that depending on their theory's scope (i.e., objectives and targeted level of accuracy and generalisability), researchers may focus on certain levels of affordances, for example stop at the functional level, and within one level choose to focus on certain affordances only. We now provide an illustration of the approach in the context of online social shopping networks value.

5.2 Illustration with the Case of Online Social Shopping Networks

(1) Substantive context - Online Social Shopping Networks (OSSNs) stand for a special type of IT-based applications that enable shoppers to connect and interact with products and with other shoppers within their social network. On the one hand, they are online shopping environments where actors, as shoppers, interact with products (interacting in the sense of learning about,

evaluating, buying, praising, etc.). On the other hand, they differ from typical transactional online shopping environments in that they are social spaces: individuals do not access and interact with products in isolation from their peers (such as when an online shopper searches for a camera on a retailer's website) but rather within their relevant social network (i.e., with access to the input of the social network's members and while being visible to them). OSSNs are particularly interesting for the present study's purpose because they rely on unique material structures with specific network logic (i.e., digital representations of nodes - shoppers and products – and of the links - connections and interactions – between them).

(2) Users' goals for using OSSNs – OSSNs are hybrid e-Commerce systems, i.e., they are capable of satisfying a wide variety of expectations that involve *social* facets in addition to the more traditional *utilitarian* ones (Theotokis and Doukidis, 2009).

(3) OSSN use - OSSN use is defined as users' employment of social shopping network IT tools to perform expressive and instrumental shopping-related tasks. This definition is based on Social Capital theory (SCT, Lin, 2001) which suggests that OSSN use can be conceptualized in terms of (i) the *use of OSSN as a knowledge resource*, i.e., users' instrumental actions whereby they exploit their shopping network to gain resources, and (ii) the *use of OSSNs as a social utility*, i.e., users' expressive actions through which they sustain their shopping network.

(4) Action affordances – Shoppers can exploit their network for knowledge gain purposes (i.e., *instrumental actions*), and because they are embedded in a social network they will do so via social navigation (Dieberger, 1997) by either (i) directly soliciting other shoppers (e.g., by using of a voting feature to ask others' opinion about products) or (ii) navigating through the network's resources unobtrusively, i.e., without the need for others' actions (e.g., browsing a friend's product list to find a gift for someone). Shoppers can also engage in *expressive actions* by

maintaining their network via self-presentation (Goffman, 1959) and supporting other shoppers. In general, it can be expected that utilitarian value will be gained via actions enabling shoppers to use their network to gain knowledge about products, and that social value will be gained via actions enabling shoppers to develop their status within the network and engage in supportive relationships with other shoppers.

(5) Functional affordances – The social network literature conceptualizes networks in terms of nodes (the actors of the network) and the ties between them (Wasserman and Faust, 1994). Ties between nodes have been considered as being of two types: backcloth and traffic (Borgatti and Kidwell, 2010). Backcloth ties represent basic connectivity (e.g., shoppers being 'friends') and form an infrastructure of 'latent ties' (Haythornthwaite, 2000) while traffic ties represent the active channels through which resources flow in the network (e.g., two shoppers 'chatting' about products). In order to make our proposed illustration as succinct as possible, we now assume that the OSSN theory's scope is limited to expressive actions consisting in 'supporting other shoppers', and we subsequently propose that 'supporting other shoppers' can be facilitated via the provision of features enabling users to *connect with others* (i.e., shopper connectivity functions) and to *communicate with them* (i.e., shopper interactivity functions).

(6) Structural affordances – Assuming further that the scope of the theory implies focusing on connectivity aspects, we propose that designers will need to design connectivity structures (i.e., digital representations of backcloth links) between shoppers so that *a symmetric connection* is required, that is, so that a two-way agreement between shoppers is required to establish a connection (e.g., being friend and not just following). This is because a common agreement on establishing a connection will favor trust and reciprocity between shoppers thereby influencing community involvement and knowledge sharing.

Table 1 synthesizes the application of the proposed theorizing approach to the OSSN case.

Table 1. Guidance for Theorizing: Synthesis	
Recommended steps	Illustrative Application to the Online Social Shopping context
1. Specify substantive context	A special type of IT-based platforms that enable shoppers to *connect* and *interact* with *products* and other *shoppers.*
2. Identify user goals	*Utilitarian* and *social* expectations.
3. Define Use	There are two main ways of using an OSSN: use as a *knowledge resource* and as a *social utility.*
4. Theorize on action affordances	'Use as a social utility' includes the following actions: *self-presentation* and *supporting others*. These actions *enable users to satisfy social expectations*.
5. Theorize on functional affordances	'Supporting other shoppers' is facilitated via the provision of features enabling users to *connect with others* and to *communicate* with them
6. Theorize on structural affordances	'Connecting with others' so that shoppers can support each other is best enabled by designing '*connectivity' structures* (i.e., digital representations of backcloth links) *between shoppers* that enforce *a symmetric two-way connection*.

In order to theorize about the three levels of affordances, note that a combination of different approaches can be used by researchers. For example, literature reviews, focus groups, surveys can be useful to validate the scope and content of each set of affordances and assess how they are related to IT outcomes (i.e., the extent of goal achievement). Also, in order to assess more tightly the causal link between affordances and IT outcomes, a more controlled experimental setting would be required. Finally, researchers engaging in such theorizing and theory testing should account for the 'delivery' of affordances, i.e., the perceived affordances side. As discussed along this paper, fully understanding IT effects requires that researchers also take into account the extent to which the affordances are visible to users and how these users may enact the affordances (e.g., for innovative purpose).

6. Discussion

The action theory lens adopted in the present paper is built on teleological and human agency principles. In fact, the core assumptions of user plan construction and execution are (i) goal-orientation, i.e., the agents – designers and users – act according to the goals they intend to fulfill, and (ii) practical reasoning, i.e., the agents form their plans based on beliefs and desires (Houkes et al., 2002). These assumptions are related to the long-standing discussion in the literature regarding the roles of materiality and human agency in shaping the use and value of technologies. For example, DeSanctis and Poole (1994) propose that the structural features offered by a technology encourage different forms of IT-user interactions. Studies on communication media have also theorized on the roles of media capabilities in constraining and enabling behaviours (Dennis et al., 2008; Yoo and Alavi, 2001). On the other hand, other scholars view "technology as text" (Grint and Woolgar, 1997), a metaphor implying that technologies are open to interpretation (Boudreau and Robey, 2005; Orlikowski, 1992, 2000; Pinch and Bijker, 1984). In line with this agency perspective, a large part of IS positivist research studied the effects of users' beliefs about and evaluations of a technology (e.g., Al-Natour and Benbasat, 2009; Davis, 1989; Goodhue, 1995). Another stream of IS research driven by interpretive assumptions also observed that users' cognitions about the purpose, context, and role of technologies were essential in understanding individual's interactions with systems (e.g., Orlikowski and Gash, 1994; Vaast and Walsham, 2005). Despite their apparent opposite stances, and as we have discussed in this paper, the materiality and human agency views can cohabit (Leonardi, 2011; Leonardi and Barley, 2008). The notion of affordances captures the idea that IT materiality influences how a technology can be used: "an affordance perspective recognizes how the materiality of an object favours, shapes, or invites, and at the same time constraints, a set of

specific user" (Zammuto et al., 2007, p. 752). This highlights that IT artifacts' properties and resources make a difference in providing people with the ability to do things, and do things in new or more effective way (Leonardi and Barley, 2008). In parallel, the notion of perceived affordances (McGrenere and Ho, 2000; Norman, 1999; Tate and Evermann, 2009) supports the view that individuals' beliefs about a particular IT shapes its use as "affordances have to be perceived (…) before they can be acted on" (Markus and Silver, 2008, p. 619-620). In line with this existing line of research, this paper views the use of a technology as being driven by individuals' understanding of that technology as well as by the enablers and constraints materially embodied into the IT (Mutch, 2010), and accordingly, that affordances and perceived affordances constitute constructs to investigate together.

Whetten (1989) defines four key elements of a theory: (i) the what – the constructs, (ii) the how – how the constructs are related, (iii) the why – why the constructs are related as proposed, and (iv) the who/when/where – the boundaries within which the theory is applicable. The two first elements correspond to the *domain of the theory*, i.e., the identification of the theory's building blocks and the causal relationships between them. In that view, the present paper has made a contribution by specifying the scope and constituting elements of the domain to be covered when studying IT use and effects with a focus on how the system design performs in enabling the achievement of users' goals. We have identified, specified, and related key constructs for building theories of IS use that are system-design driven. The key building blocks of such theories are the structural, functional, and action affordances created by designers and interpreted by users.

At the beginning of this paper, we stated that an approach to develop theories that are more amenable to providing specific design guidance was to account for the key enabling

capabilities of the given class of technology being studied (Tate and Evermann, 2009). We have followed this guiding principle and have expanded it by incorporating different levels of such capabilities. In fact, we have identified different levels of affordances, from the most specific (structural affordances) to the most general (action affordances) and with functional affordances in the middle as the level most traditionally studied in IS and HCI. This multi-level view of IT affordances provides a finer–grained view of the potential or enabling capabilities of IT artifacts while staying relatively parsimonious in the meantime.

The framework and guidance provided in the present paper can be elaborated in future research. For example, another interesting domain to study in much more detail is the possibilities of conflicting affordances between levels. This is visible in the proposed framework but we have not elaborated this aspect. In the OSSN context, this issue of conflicting affordances happens for example when users are provided with full transparency and accessibility within the network and can therefore access much information in an online network, but are in the meantime suffering from this transparency because other users can in the meantime access their private space. In addition, in certain contexts, end-user and managerial or organizational goals may conflict (purposefully or not). This opens an interesting line of research inquiry into how designed artifacts created based on organizational goals may differ from end-users' interpreted and enacted potential and how the two perspectives could be reconciled.

7. Conclusion

The present paper was motivated by the importance of better understanding how individuals derive benefits from using IS and the need to focus on the distinctive object of study of our field (i.e., IT artifacts). Given the lack of existing guidance on how to theorize about IT use for the specific purpose of understanding the role of IT design-related criteria, the paper has provided

some assistance to scholars in identifying and relating key constructs based on which design-focused system use theories can be constructed. To do so, it has built on some key assumptions and ideas from the Philosophy of Technology about the nature, the use, and the design of technical artifacts. These have suggested that a better understanding of the design-related factors involved in the study of IT use and effects can be reached by studying (i) whether designers create IT artifacts that have the potential to support users' goal-oriented actions, and (ii) whether users can exploit these IT artifacts in a way that enables them to reach their goals. Following on these ideas, the paper has specified the *key building blocks* to be used in developing theories explaining the effects derived from using a given class of information systems. It has also identified the *key gaps arising from both the design of IT artifacts for goal-oriented tasks and the enactment of these artifacts by individuals that* might prevent the achievement of users' goals. Finally, it has recommended a series of *steps to help researchers theorize* about the influence of design-related aspects involved in IT use and IT value.

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