Affordance Perceptions under Malleable Information Technology: A Social Cognitive Theory Perspective

Completed Research Paper

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Abstract

Organizations benefit from malleable IT only if users perceive the affordances that malleable IT provides for their work. However, theoretical explanations and empirical evidence related to affordance perception are scarce. In this paper, we develop a theoretical framework based on Social Cognitive Theory to explain two different types of affordance perceptions: vicarious and autonomous. Data from a survey of 154 users supports the framework. We find that vicarious affordance perceptions depend on social information and on basic knowledge about the malleable IT. In contrast, autonomous affordance perceptions, which rely on uncertain and cognitively complex search activities, depend on self-efficacy gained through prolonged use and on the knowledge acquired through a learning process that starts with system use and observation of other people's use, followed by vicarious affordance perceptions. The key contribution of our paper lies in developing and testing explanations for affordance perceptions under malleable IT.

Keywords: Malleable IT, Affordance Perception, Vicarious Affordance Perception, Autonomous Affordance Perception, Social Cognitive Theory, Self-efficacy, Adaptive Feature Use, Learning

Introduction

Contemporary work settings increasingly allow, and require, users to shape the information technology (IT) that they use in their work (Schmitz et al. 2016; Sun 2012). The role accorded to users is a particularly active one in the realm of *malleable IT*, i.e., IT that provides generic, configurable features that users can flexibly use to support a potentially unlimited variety of actions (Kallinikos et al. 2013; Richter and Riemer 2013;

Schmitz et al. 2016). For instance, the filtered list feature in the malleable IT Microsoft Sharepoint may allow (1) production planners to show production orders due today, (2) quality managers to inform employees about applicable procedures, and (3) top managers to maintain awareness of projects in status red (Lehrig et al. 2017). These *affordances* (i.e., action potentials) are not pre-determined or inherent to the generic filtered list feature; they become salient only after users have perceived that they can perform particular actions with the feature. If users do not perceive affordances, the potential offered by malleable IT will lie idle (Richter and Riemer 2013). A pivotal question for organizations aiming to leverage the potential of malleable IT is thus: How and when do users perceive the affordances offered by malleable IT?

Although the literatures on affordances and on feature use offer valuable perspectives on this question, they are limited in three important regards. First, while a few studies have examined affordance actualization (Anderson and Robey 2017; Leonardi 2011; Strong et al. 2014) or changes in feature use (Schmitz et al. 2016; Sun 2012), these studies pay relatively little attention to affordance perception. However, since affordance perception is a key prerequisite for affordance actualization or change of feature use, it is difficult to explain these events without accounting for affordance perception. Conceptual work has looked more closely at affordance perception, arguing that affordance perception depends on the information available to users (Bernhard et al. 2013; Pozzi et al. 2014). However, this work is silent about the processes through which users gain access to that information and on the reasons for why users do or do not engage in these processes. Second, with few recent exceptions (Lehrig et al. 2017; Schmitz et al. 2016), these literatures do not tackle malleable IT. Since malleable IT differs from purpose-specific IT in that affordances are not predetermined, affordance perception processes may also differ, requiring users to establish the link between generic features (e.g. a filtered list) and the user's particular work (e.g. production planning). Establishing this link is likely a cognitively demanding and uncertain activity. Third, while a few studies have taken a process perspective (Lehrig et al. 2017; Leonardi 2011; Strong et al. 2014), insights into the amount of affordance perceptions (i.e., the number of action potentials perceived by users) is lacking. Explaining the amount of affordance perceptions (henceforth in brief: affordance perceptions) is particularly relevant in the realm of malleable IT, where generic, configurable features offer a multitude of affordances to particular users. If users perceive few of these affordances, they will actualize at best few of them, and they will forego much of the potential offered by the malleable IT. Hence, knowledge about the antecedent conditions of affordance perceptions is critical for organizations striving to leverage the full potential of malleable IT.

In this paper, we address these gaps by advancing and testing a theoretical framework that explains affordance perceptions under malleable IT. We build on Social Cognitive Theory (SCT) (Bandura 1986), while integrating concepts from the literatures on affordances and adaptive feature use. We choose SCT because two key ideas from SCT are particularly relevant in our context. First, SCT emphasizes that learning occurs to a great extent vicariously (i.e., by observing others). Second, SCT holds that people choose activities and the amount of effort they put into activities based on their self-efficacy beliefs, i.e., the beliefs that they can successfully perform the activities. Building on these ideas, we argue that two different forms of affordance perceptions—vicarious and autonomous—have distinct antecedents. While vicarious affordance perceptions depend on information from social sources, autonomous affordance perceptions depend on self-efficacy and technology learning. Results from a survey of 154 users of Microsoft Sharepoint support these ideas and offer some unanticipated insights. The key contribution of our paper lies in developing and testing explanations for affordance perceptions under malleable IT.

Background Literature

The Affordance Literature

The affordance concept has recently attracted strong interest in information systems (IS) research (e.g. Burton-Jones and Volkoff 2017; Leidner et al. 2018; Strong et al. 2014; Treem and Leonardi 2012). The concept originates from the field of ecological psychology, where Gibson introduced it to explain the interactions of animals with their environment (Gibson 1979). When Norman subsequently applied the affordance concept to human machine interaction (Norman 1999), the concept also started to spread in IT-related research and later in IS research (Markus and Silver 2008). In this study, we use the relational affordance lens (Hutchby 2001), which defines affordances as a "relationship between a technical object and a specified user that identifies what the user might be able to do with the object, given the user's capabilities and goals" (Markus and Silver 2008, p. 622). For instance, the filtered list feature of Microsoft

Sharepoint (an object) allows production planners (users) to show due production orders (affordance) and top managers (users) to maintain awareness of projects in status red (affordance). The relational nature of affordances implies, thus, a need to link the technical object to particular actions, meaningful to particular users that have particular capabilities (e.g. knowledge about the filtered list feature) and goals (e.g. awareness of production orders or of problematic projects). The relational affordance lens is particularly well suited for studying malleable IT because it helps emphasize that one generic feature (such as the filtered list feature) provides a potentially endless number of context-specific affordances (such as showing due production orders or tracking problematic projects), affordances that the developers of the malleable IT typically cannot, and need not, anticipate. Instead, it is often up to the users to establish a link between generic features and particular actions meaningful to them. A key implication is that organizations will not derive any benefits from malleable IT unless people in the organization actualize at least some of the affordances that the malleable IT offers to them.

Affordances are actualized through a three-step process (Bernhard et al. 2013). The first step is *affordance existence*, i.e., the moment when the action potential emerges for the particular user. The action potential may emerge because a new artefact or a new user capability now allow the user to perform an action that was impossible or more difficult before. Although the affordance exists, it may or may not (yet) be perceived by the user. The second step is *affordance perception*, i.e., the event when the user becomes aware of the action potential (Bernhard et al. 2013). Although the user now knows about the potential to perform a particular action with the object, this does not imply that the user (or the collective of which the user is part of) will actually perform the action. The third step, *affordance actualization*, describes "the actions taken by actors as they take advantage of one or more affordances through their use of the technology to achieve immediate concrete outcomes in support of organizational goals" (Strong et al. 2014, p. 70). A key insight from this process is that for an affordance to be actualized, it needs to be perceived.

IS research has thus far largely focused on affordance existence and actualization. A key question in research on affordance existence is what affordances particular classes of IT provide in particular social settings. For instance, studies have examined the affordances offered by electronic health records systems to hospitals (Anderson and Robey 2017; Strong et al. 2014), by enterprise social media to new hires (Leidner et al. 2018), or by cloud-based software development environments to developers (Krancher, Luther, & Jost, 2018). Research on affordance actualization has explored how conditions and dependencies between affordances affect actualization and how affordance actualizations impact work practices (Anderson and Robey 2017; Krancher et al. 2018; Leonardi 2011; Seidel et al. 2013; Strong et al. 2014).

In contrast to affordance existence and affordance actualization, affordance perception has received relatively little attention in IS research. In their review of the affordance literature, Bernhard et al. (2013) find that "even though psychology researchers have highlighted the role of a user's affordance perception before being able to act on it, this conceptual separation has largely been ignored in existing studies in IS" (p. 3). The scant attention to affordance perceptions is unfortunate because in order to create impact an affordance needs to be actualized and in order to be actualized an affordance needs to be perceived. Accounts of impact or of affordance actualization therefore remain incomplete if they do not incorporate the factors that lead to affordance perception in the first place. Two papers have made first steps towards better understanding affordance perception. Bernhard et al. (2013) propose that affordance perception depends on the information available to the user. Lehrig et al.'s (2017) inductive study shows that, in the context of malleable IT, users perceive affordances through three alternative processes: imitating, exploring, and transferring. In *imitating*, users observe other people using the artefact in a particular way and thereby recognize that they could use the artefact to perform a particular action meaningful to them. In *exploring*, users try out features while interpreting the symbolic expressions of the artefact (i.e., the messages communicated by the artefact to the user) (Markus and Silver 2008). In *transferring*, users recognize that they can apply their existing ways of using the artefact for a new purpose. Thus, the information based on which users perceive the affordance resides in the social environment in the case of imitating, in the artefact in the case of exploring, and in the user's memory in the case of transferring. Lehrig et al. (2017) also found that affordance perception by imitating typically precedes affordance perception by exploring and by transferring.

Although the inductive case study by Lehrig et al. (2017) is a first step towards theory of affordance perceptions in the context of malleable IT, their study does not aim to explain the amount of affordances perceived by individual users (in brief: affordance perception*s*). Moreover, while Lehrig et al. develop propositions for potential antecedents to particular affordance perception processes from the data, these propositions

remain untested thus far. In this paper, we build on and extend the insights provided by Lehrig et al. (2017) in two major ways. First, we argue that SCT is a promising foundational theory for explaining affordance perceptions, echoing and substantiating the propositions suggested by Lehrig et al. (2017). Second, to help contextualize SCT, we draw on the literature on adaptive feature use. We next provide brief reviews of SCT and of the literature on feature use before we develop the theoretical framework of our paper.

Social Cognitive Theory

SCT emphasizes cognitive, vicarious, self-regulatory, and self-reflective processes as determinants of human behavior (Bandura 1986, p. xi). Cognitive implies that behavior can be explained by knowledge structures that enable people to perform a particular behavior but also by the belief that particular behavior will result in particular outcomes (Bandura 1986, p. 457). Vicarious implies that humans learn to a large extent by observing other people's behaviors and their consequences (Bandura 1986, p. 21). Self-regulatory implies that humans pursue goals, anticipate the likely consequences of behaviors, and, on this basis, make deliberate choices about what challenges to undertake, how much effort to expend, and how long to persevere (Bandura 2001). Self-reflective implies that humans update their beliefs and their goals based on the outcomes of past actions. Although SCT has its origins in attempts to explain the behavior of phobics (Bandura et al. 1969), it constitutes a comprehensive framework for explaining human behavior, and it has been found useful to explain IT use behaviors (Benlian 2015; Compeau et al. 1999; Schmitz et al. 2016), although not with a focus on affordance perceptions.

SCT offers two insights that are particularly important for theorizing affordance perceptions. First, users anticipate the likely outcomes of the behaviors that they need to engage in to perceive affordance. For instance, if a user believes that he is unlikely to perceive an affordance by exploring the symbolic expressions of an artefact, he is unlikely to expend substantial efforts on exploring. A key concepts in this regard is self-efficacy, generally defined as the belief of being able to successfully perform a particular action (Bandura 1986, p. 391). People form their self-efficacy beliefs based on information from at least three sources (Bandura 1977, pp. 195–198): (1) performance accomplishments (i.e., own past performances of an activity and their outcomes), (2) modelling (i.e., performances of the activity by others and their outcomes), and (3) persuasion (i.e., attempts to convince a person that the person can perform an activity). For instance, a snake phobic may gain self-efficacy by touching snakes (performance accomplishments), by observing how another person touches a snake (modelling), or by being persuaded that it is safe to touch particular snakes (Kazdin 1973). Transferred to the context of IT use, this implies that users may gain self-efficacy by using the IT, by observing how others use the IT, and by being persuaded about their ability to use the IT. A second important insight from SCT is that users may often perceive affordance vicariously, i.e., by observing how other people perform actions that are similar to the actions that the user may want to perform. This suggests that the ability to observe other people's use of technology can affect the amount of affordance a user will perceive.

The Literature on Adaptive Feature Use

The adaptive feature use literature explores how and when users revise their use of features over time (Maruping and Magni 2012; Schmitz et al. 2016; Sun 2012). In contrast to the affordance literature, the adaptive feature use literature does not focus on the distinction between features and actions, a distinction that we deem to be particularly useful in the realm of malleable IT, where the same feature can afford many different actions and where explaining this variety of actions is at least as important as explaining the breadth of features used or the frequency with which features are used. Although we therefore rely on an affordance framework in this paper, the adaptive feature use literature is also informative because constructs that influence change of feature use may also influence affordance perceptions. Table 1 provides a selective summary of this literature by summarizing definitions of and findings on key constructs.

Hypotheses

In this section we develop hypotheses by drawing on SCT while integrating insights from the literatures on affordances and adaptive feature use. We argue that two different kinds of affordance perceptions—vicarious and autonomous—differ fundamentally in the nature of the activities leading to perception, in information requirements, and in self-efficacy requirements (see Table 2).

Table 1. Selected Constructs from the Literature on Adaptive Feature Use			
Construct	Definition	Key finding	Source
Other people's use	The extent which a user observes other people's system use	Other people's use is positively related to adaptive system use.	(Sun 2012)
Self-efficacy	The extent to which a user believes to be able to use IT (or a particular IT)	Self-efficacy is positively related to technology usage, to exploitative technology adaptation, but not to exploratory technology adaptation.	(Benlian 2015; Compeau et al. 1999; Schmitz et al. 2016)
Experience	The amount of time a user has been using the particular software	Experience is positively related to initial feature use and negatively to growth in feature use over time.	(Benlian 2015; Jasperson et al. 2005)
Deliberate initiatives	The extent to which a user is asked to revise feature use	Deliberate initiatives are unrelated to adaptive system use.	(Sun 2012)
Personal innovativeness in IT	The extent to which a user is willing to try out new technology and to engage in innovative behaviors	Personal innovativeness in IT is positively related to cognitive absorption and technology adaptation; moreover, it moderates how users process information about the IT.	(Agarwal and Karahanna 2000; Agarwal and Prasad 1998; Sun 2012)

A *vicarious affordance perception*—an affordance perception based on imitating other people's use (Lehrig et al. 2017)—occurs through serendipitous discovery. People perceive affordances vicarious simply because they observe a particular use by others, without necessarily planning to make that observation in the first place. Since vicarious affordance perceptions occur through observation, they critically rely on information from social sources. Given the serendipitous rather than deliberate or planned nature of vicarious affordance perceptions, actors do not assess the expectations of success prior to perception. Therefore, actors do not require high amounts of self-efficacy to engage in the activities leading to affordance perception.

Table 2. Vicarious versus autonomous affordance perceptions		
	Vicarious affordance perception	*Autonomous affordance perception*
Nature of activities leading to perception	Serendipitous discovery	Deliberate, uncertain, cognitively demanding search
Information requirements	Relies on information from social sources	Relies on information in the IT or on the actor's knowledge
Self-efficacy requirements	Low due to serendipitous nature	High due to uncertain nature of deliberate search

In contrast, an *autonomous affordance perception* describes a situation in which a user independently perceives an affordance, either by exploring the symbolic expressions of the IT or by attempting to transfer her existing use patterns to a new purpose. Autonomous affordance perceptions are, hence, the result of deliberate, uncertain, and cognitively demanding search processes undertaken by the actor. These search processes do not rely on information from social sources but on information in the IT (i.e., symbolic expressions) and in the actor's memory (i.e., knowledge about existing patterns of use and about the IT). Given their deliberate, uncertain nature, the search processes leading to autonomous affordance perception are likely to be perceived as risky. Hence, actors require high amounts of self-efficacy in order to engage in the search activities. We next develop these ideas in more detail while we develop the hypotheses as depicted in Figure 1.

Vicarious Affordance Perceptions

A key tenet of SCT is that a great deal of human learning occurs vicariously (i.e., by observing others) rather than enactively (i.e., by interpreting the consequences of own performances). As Bandura put it, "one does not teach children to swim, adolescents to drive automobiles, and novice medical students to perform surgery by having them discover the requisite behavior from the consequences of their successes and failures" (Bandura 1986, p. 20). In line with these ideas, Lehrig et al. (2017) found that users often perceive affordances by observing how other people use particular features of malleable IT and then recognizing that they could use the same features for a goal meaningful to them.

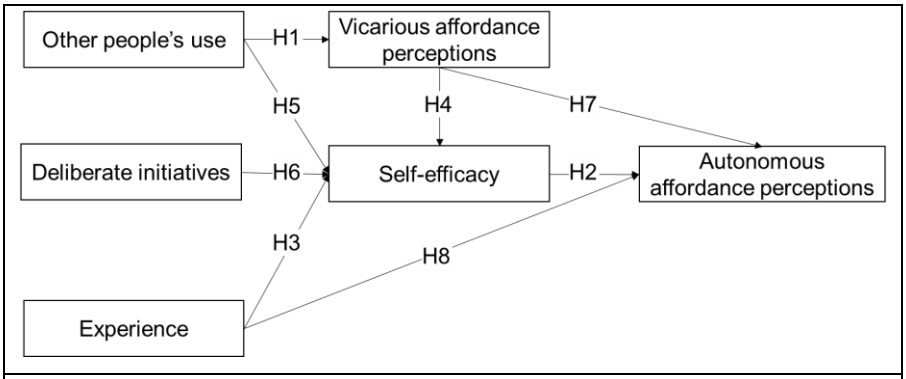

Figure 1. Research Model

Vicarious affordance perceptions are likely to occur serendipitously rather than due to forethought and intentional action. Given the rather unimportant role of forethought and intentions, the users' beliefs about their ability to perceive an affordance are unlikely to affect the amount of vicarious affordance perceptions. Moreover, since vicarious affordance perceptions rely on imitating other people's patterns of use, users may perceive affordances vicariously even when they lack profound knowledge of the IT.

In contrast, given the reliance on information from social sources, a key determinant of the amount of vicarious affordance perceptions is likely *other people's use* (see Table 1 for definitions) (Sun 2012). Although a user may not always recognize how to imitate other people's use for a purpose meaningful to the user, higher amounts of other people's use give users greater opportunities to recognize use patterns suitable for imitation. Hence, ceteris paribus, higher other people's use will likely lead to higher amounts of vicarious affordance perceptions. This also resonates with Sun's (2012) finding that other people's use is positively related to adaptive system use. We hypothesize:

H1: Other people's use is positively associated with vicarious affordance perceptions.

Autonomous Affordance Perceptions: Efficacy-Based Explanations

In contrast to vicarious affordance perceptions, autonomous affordance perceptions do not rely on information from social sources but are demanding in terms of self-efficacy and knowledge. They are demanding in terms of self-efficacy because the activities through which users can perceive affordances autonomously are uncertain search activities. These activities include interpreting the symbolic expressions of the IT and leveraging that information to try out new ways of using the artefact (exploring), or reflecting about own current ways of using particular features and finding ways to re-apply the same features to support actions thus far not performed with the help of the artefact (transferring). It is possible that users spend long time trying to adapt the IT to enable new actions, but that these behaviors do not result in the perception of a new affordance. From the user's perspective, these behaviors can involve the risks of wasting time and of experiencing the personal failure of being unable adapt the malleable IT to enable a new affordance.

A key tenet of SCT is that users anticipate these unfavorable outcomes. As Bandura put it, "expectations determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences" (Bandura 1977, p. 194). Hence, the efforts that users put into the behaviors that may or may not result in autonomous affordance perceptions are likely to depend on the user's self-efficacy.

More specifically, users assess how likely it is that they will perceive a new affordance through a search process in which they attempt to adapt the IT for a new use. We therefore define self-efficacy in the context of our study as the user's belief in her ability to adapt the malleable IT for identifying new affordances. A key role of self-efficacy is in line with Lehrig et al.'s (2017) finding that exploring relies on self-efficacy and with the finding in the feature use literature that self-efficacy is positively related to feature use and to particular IT adaptation behaviors (Benlian 2015; Compeau et al. 1999; Schmitz et al. 2016). We hypothesize:

H2: Self-efficacy is positively associated with autonomous affordance perceptions.

If self-efficacy is an important predictor of autonomous affordance perceptions, this raises the question of which factors contribute to self-efficacy beliefs. According to SCT, sources of self-efficacy beliefs include performance accomplishments, modelling, and persuasion (Bandura 1977, pp. 195–198). In the context of malleable IT use, two kinds of performance accomplishments may enter into self-efficacy beliefs. The first is experience in using the malleable IT. The longer people use the malleable IT, the more confidence they can gain in their ability to adapt the IT (Benlian 2015). The second kind of performance accomplishment consists in past successful affordance perceptions. If users have successfully perceived affordances in the past, they will have gained confidence in their ability to adapt the malleable IT for identifying new affordances. Given Lehrig et al.'s (2017) finding that vicarious affordance perceptions typically precede autonomous affordance perceptions, it appears likely that users start gaining self-efficacy from successful vicarious affordance perceptions, which present a relatively simple performance accomplishment. Our arguments on the two types of performance accomplishments suggest:

H3: Experience (in using the malleable IT) is positively related to self-efficacy.

H4: Vicarious affordance perceptions are positively related to self-efficacy.

A second source of self-efficacy beliefs is modelling. When users observe how others successfully use the malleable IT, they do not only learn about potential ways of using the IT (see H1); they also gain self-efficacy (Bandura 1977, p. 197). Seeing their colleagues use the malleable IT in their work practices instills confidence that the users, too, are able to identify useful ways of using the malleable IT, even if the outcomes of the search activities are uncertain. We therefore anticipate:

H5: Other people's use is positively related to self-efficacy.

A third source of self-efficacy beliefs is persuasion. If people are persuaded that they can perform particular behavior, they will "mobilize greater sustained effort than if they harbor self-doubts and dwell on personal deficiencies" (Bandura 1986, p. 400). A construct from the feature use literature that is related to persuasion is *deliberate initiatives*, i.e., situations "when a person is asked explicitly to try out new features or use known features in a different way" (Sun 2012, p. 461). Deliberate initiatives signal to users that searching for new uses of the IT is both possible and welcomed, helping the user to mobilize greater efforts. We therefore propose:

H6: Deliberate initiatives are positively related to self-efficacy.

Autonomous Affordance Perceptions: Knowledge-Based Explanations

We argue that autonomous affordance perceptions are not only demanding in terms of self-efficacy beliefs; they are also demanding it terms of IT knowledge, given that users cannot simply copy from others but need to identify novel ways of using the IT themselves (Lehrig et al. 2017). Since such relatively complex search processes require rather substantial knowledge of the IT, users will require at least some enactive learning until their mental representations of the functioning of the IT are robust enough to guide users through complex search processes (Bandura 1977, pp. 106–112). Enactive learning relies heavily on feedback, which helps refine mental representations of the IT. Such enactive learning transpires both through experience in using the malleable IT and in vicarious affordance perceptions, which generally precede autonomous affordance perceptions. Hence, vicarious affordance perceptions and experience will not only affect autonomous affordance perceptions by engendering greater self-efficacy (see the mediated relationships represented by H3, H4 and H2) but also by engendering IT learning (i.e., beyond the effect that is mediated by self-efficacy). We anticipate:

H7: Vicarious affordance perceptions are positively related to autonomous affordance perceptions.

H8: Experience (in using the malleable IT) is positively related to autonomous affordance perceptions.

Methods

We performed a survey study to test our hypotheses. In this section, we present details on the study setting, data collection, and data analysis.

Study Setting

Our target population consisted of users in an organizational context that can perceive affordances provided by a malleable IT. The setting of our study was the organization Alpha, which recently introduced Microsoft Sharepoint to improve collaboration. Alpha was a medium-sized mechanical engineering organization with main locations in Switzerland and Germany and factories in China, the U.S. and the Czech Republic. Alpha had implemented Sharepoint three years before the survey, although not all users were aware of its implementation at that time. Sharepoint allowed users to create and configure their own environments, so-called "sites". Users could create and configure several sites based on the provided features and could support different use cases with these sites. After the IT department made Sharepoint available to users, it provided only minimal support for the creation and configuration of sites due to scarce resources. Thus, it was up to the users to perceive and actualize the potentials on their own.

We selected Alpha and Sharepoint for several reasons. First, Sharepoint was a prime example of malleable technology. While Sharepoint provides generic features such as lists, alerts, and workflows, it is up to the users to perceive how they can apply these generic features to support particular actions meaningful to the users (e.g. production planning). Similar applications like Lotus Notes or other collaboration platforms have been used in previous studies that focused on user-driven technology appropriation processes (Maruping and Magni 2015; Orlikowski 1996). Second, we had conducted qualitative studies in the organization before (Lehrig et al. 2017; Lehrig and Krancher 2018) and had in-depth information about the environment and direct access to the Sharepoint system for validation purposes. Third, collecting data within one organization allowed us to control for firm-level antecedents of affordance perceptions, which were not our theoretical interest.

Data Collection

Table 3 shows measures used for independent and dependent variable, including Cronbach alpha values, means, and standard deviations. With the exception of the manifest variable *experience*, all items were measured with Likert scales ranging from 1 (don't agree at all) to 7 (fully agree). Where possible, we relied on established measures from the literature to ensure validity and reliability. This applies to all independent variables in our model. Thus, we used existing measures for self-efficacy (Kankanhalli et al. 2005), other people's use (Sun 2012), and deliberate initiatives (Sun 2012). Since we were not aware of any measures of (the amounts of) vicarious and autonomous affordance perceptions, we developed these measures systematically following prescriptions from the scale development literature (DeVellis 2012; MacKenzie et al. 2011). The development process comprised the following steps: (1) reviewing the feature use and affordance literatures, (2) performing a qualitative study of affordance perception processes (Lehrig et al. 2017), (3) creating definitions of different categories of affordance perceptions, (4) developing potential items for each category, (5) conducting a content adequacy test (Yao et al. 2008), (6) pretesting the survey among students, and (7) pilot-testing the survey among a subsample of users at Alpha, the company at which we deployed the final survey. The final items for vicarious affordance perceptions and autonomous affordance perceptions began with: "Since [name of the Sharepoint system] has been made available, I often perceived new possibilities of using [Sharepoint] by", followed by a variety of vicarious or autonomous processes. The items include the adverb "often" because our constructs focused on the amount of affordance perceptions, hence the frequency at which the event of perceiving an affordance has occurred. Since the predictor experience (in using the malleable IT) was a manifest variable, we measured it through a single-item question, asking informants how long they had been using Sharepoint, including in any previous organization.

We included a number of control variables to account for alternative antecedents to affordance perceptions: education, gender, age, tenure, and personal innovativeness in IT. We included personal innovativeness in IT because it was found to be related to adaptive technology use in prior research (Schmitz et al. 2016; Sun

2012) while not immediately related to our theoretical framework grounded in SCT. Since the control variables referred to manifest (as opposed to latent) variables, they were measured through single items, with the exception of personal innovativeness in IT, which was measured by four items (alpha = .92) derived from Agarwal and Prasad (1998).

Table 3. Survey Instrument

Code	Item	Loading	Mean	Std Dev
Vicarious Affordance Perceptions (VAP): Self developed (alpha = .90) Since [name of the Sharepoint system] has been made available, I often perceived new possibilities of using [Sharepoint] by…				
VAP1	… observing what others did.	.83	3.44	1.72
VAP2	… learning from other people`s use.	.87	3.47	1.7
VAP3	… copying from others.	.90	2.90	1.65
Autonomous Affordance Perception (AAP): Self developed (alpha = .95) Since [Sharepoint] has been made available, I often perceived new possibilities of using the [Sharepoint] by …				
AAP1	… experimenting with the features of the [Sharepoint].	.85	2.75	1.69
AAP2	… trying to find new uses of the [Sharepoint] on my own.	.83	2.72	1.66
AAP3	… trying to use the [Sharepoint] in novel ways.	.86	2.70	1.68
AAP4	… transferring my existing use to a new use case.	.95	2.94	1.65
AAP5	… reapplying my current use of the [Sharepoint] to another use case.	.90	2.84	1.68
AAP6	… extending existing ways of using the [Sharepoint] to a new use case	.90	2.62	1.59
Self-Efficacy (SE): Adapted from Kankanhalli et al. (2005) (alpha = .88)				
SE1	I have confidence in my ability to adapt the [Sharepoint].	.80	3.32	1.79
SE2	I have the expertise needed to adapt the [Sharepoint].	.93	2.82	1.72
SE3	I am confident to be successful in adapting the [Sharepoint].	.80	3.49	1.86
Other People's Use (OPU): Adapted from Sun (2012) (alpha = .94)				
OPU1	I often saw others adapt the [Sharepoint].	.87	2.42	1.39
OPU2	I often observed how others modified the [Sharepoint].	.91	2.37	1.41
OPU3	I often noticed adaptations of the [Sharepoint] by others.	.97	2.51	1.41
Deliberate Initiatives (DI): Adapted from Sun (2012), DI3 self-developed (alpha = .92)				
DI1	Others often asked me to use the [Sharepoint] in team processes.	.89	2.73	1.52
DI2	I was often urged by others to use the [Sharepoint] for team collaboration.	.86	2.88	1.63
DI3	I was often told to use the [Sharepoint] for use cases by others.	.91	2.77	1.63
Experience (EX): Single-item manifest variable				
EX	Please indicate how long you have been using Sharepoint in total (including previous organizations): (1) < 6 months, (2) 6 months to 1 year, (3) 1 to 2 years, (4) 3 to 5 years, (5) > 5 years	1	2.71	1.13

The sampling frame comprised all users of Sharepoint based on the permissions provided by the production system (739 total users). We distributed the survey via email to all users in January 2018. We received complete surveys from 167 users. We deleted thirteen unengaged responses, leaving us with a final sample size of 154 (response rate: 20.8%). Table 4 shows the sample characteristics. The sample was characterized by a high rate of men (91%), reflecting the high fraction of men in Alpha's workforce. Tests for non-response bias based on the last-wave method (Armstrong and Overton 1977) yielded no indications of bias.

Table 4. Sample Characteristics

Variables	*Sample Composition*		*Variables*	*Sample Composition*	
Age	< 25 years	0.6 %	Tenure	0 to 2 years	6.5 %
	25 to 29 years	5.2 %		3 to 5 years	23.4 %
	30 to 34 years	13.0 %		6 to 10 years	13.0 %
	35 to 39 years	16.9 %		Over 10 years	57.1 %
	40 to 44 years	14.3 %	Education	High school degree	12.3 %
	45 to 49 years	12.3 %		Professional degree	20.1 %
	Over 49 years	37.7 %			
Gender	Female	9.1 %		Bachelor's degree	26.0 %
	Male	90.9 %		Master's degree	39.0 %
				Doctoral degree	2.6 %

Data Analysis

We used the partial least squares (PLS) structural equation method for data analysis. We conducted several tests to ensure convergent validity, discriminant validity, and reliability. To ascertain convergent validity, we verified that the average variance extracted (AVE) for all reflective variables was greater than .50 (Fornell and Larcker 1981). To ascertain discriminant validity, we conducted three tests: Fornell and Larcker criterion (Fornell and Larcker 1981), significant loadings of latent variables with measurement items (Gefen and Straub 2005), and heterotrait-monotrait (HTMT) ratio (Henseler et al. 2015). The results of all tests demonstrated discriminant validity. Reliability was corroborated by Cronbach alpha values well above .7 (see Table 3).

We also examined multicollinearity and common-method bias. Variance inflation factors were below 2.2, indicating no multicollinearity concerns. Since we obtained the data for independent and dependent variables from the same person, we tested for indications of common method bias (Podsakoff et al. 2003). We executed two tests: Harman's single factor test (Podsakoff et al. 2003) and a full collinearity analysis for all dependent latent factors, which is a recently suggest technique for diagnosing common-method bias (Kock 2015). Both tests failed to produce any evidence of common-method bias.

We estimated the model by using the consistent PLS algorithm in the software package SmartPLS (version 3.2.7) and a bootstrapping sample size of 5000. We linked all control variables not only to the dependent variable but also to all mediating variables in order to effectively control for alternative explanations.

Results

Table 5 shows bi-variate correlations. Table 6 presents the PLS results. Figure 2 depicts these results graphically in a path model. The model produced relatively high adjusted R^2 values of .49 for vicarious affordance perceptions and of .71 for autonomous affordance perceptions, indicating high explanatory power of our model.

H1 predicted a positive relationship between other people's use and vicarious affordance perceptions. We found this relationship to be positive and significant, supporting thus H1 ($\beta = .34$, $p < .01$). In line with H2, we found that self-efficacy was significantly positively associated with autonomous affordance perceptions ($\beta = .25$, $p < .01$). H3 through H6 aimed at predicting self-efficacy beliefs by experience (H3), vicarious affordance perceptions (H4), other people's use (H5), and deliberate initiatives (H6). We found a significant positive relationship only between experience and self-efficacy ($\beta = .27$, $p < .01$, providing support for H3). In contrast, other people's use ($\beta = .20$, $p = .09$), deliberate initiatives ($\beta = .01$, $p = .91$), and vicarious affordance perceptions ($\beta = .13$, $p = .40$) were not significantly related to self-efficacy, providing no support for H4, H5, and H6. Autonomous affordance perceptions were significantly predicted not only by self-efficacy but also very strongly by vicarious affordance ($\beta = .58$, $p < .001$), providing support for H7. In contrast, H8, which predicted a positive relationship between experience and autonomous affordance perceptions, was not supported ($\beta = .09$, $p = .17$).

Table 5. Bi-variate Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Age	1										
(2) Autonomous Afford. Perceptions	-.16	1									
(3) Deliberate Init.	-.07	.50	1								
(4) Education	-.11	.02	.05	1							
(5) Experience	.07	.46	.33	.00	1						
(6) Gender	.05	.00	-.03	.10	.04	1					
(7) Oth. people's use	-.15	.61	.53	-.02	.27	-.07	1				
(8) Pers. Innovat.	-.02	.35	.21	.12	.29	.07	.24	1			
(9) Self-efficacy	-.16	.59	.34	.00	.42	.00	.41	.27	1		
(10) Tenure	.48	-.19	-.19	-.15	-.02	-.02	-.19	-.01	-.26	1	
(11) Vicarious Afford. Perceptions	.05	.75	.61	.03	.40	-.11	.58	.22	.39	-.12	1

Table 6. PLS Results

To the right: Dependent Variables Below: Independent Variables	Vicarious Affordance Perceptions	Self-efficacy	Autonomous Affordance Perceptions
Other people's use	**.34** (.11)**	.20 (.12)	.15 (.08)
Self-efficacy	-	-	**.25** (.09)**
Deliberate initiatives	**.38*** (.11)**	.01 (.12)	-.08 (.08)
Vicarious affordance perceptions	-	.13 (.14)	**.58*** (.11)**
Experience	**.17* (.07)**	**.27** (.09)**	.09 (.07)
Age	**.15* (.08)**	-.08 (.09)	**-.15** (.06)**
Education	.04 (.04)	-.04 (.08)	-02 (.05)
Gender (1 if male)	-.09 (.06)	.01 (.07)	.07 (.04)
Personal Innovativeness in IT	.01 (.07)	.11 (.09)	**.11* (.06)**
Tenure	-.05 (.08)	-.17 (.09)	.03 (.06)
R^2	.52	.33	.73
Adjusted R^2	.49	.29	.71

***p <.001, **p <.01, *p <.05, n = 154, figures are standardized path coefficients (standard errors in parentheses), significances based on bootstrapping with sample size 5000, significant number in bold

The PLS model also yielded some unhypothesized significant effects (see also the dashed arrows in Table 2). Vicarious affordance perceptions correlated positively with deliberate initiatives ($\beta = .38$, $p < .001$), experience ($\beta = .17$, $p < .05$), and age ($\beta = .15$, $p < .05$). Autonomous affordance perceptions correlated positively with personal innovativeness with IT ($\beta = .11$, $p < .05$) and negatively with age ($\beta = -.15$, $p < .01$).

The results as presented in Figure 2 suggest that the three independent variables (other people's use, deliberate initiatives, and experience) could have significant indirect effects on autonomous affordance perceptions via the mediating variables vicarious affordance perceptions and self-efficacy. To examine whether there are indeed significant mediation effects, we examined the significances of the indirect effects and total effects via bootstrapping (Preacher and Hayes 2008). Table 7 presents the results.

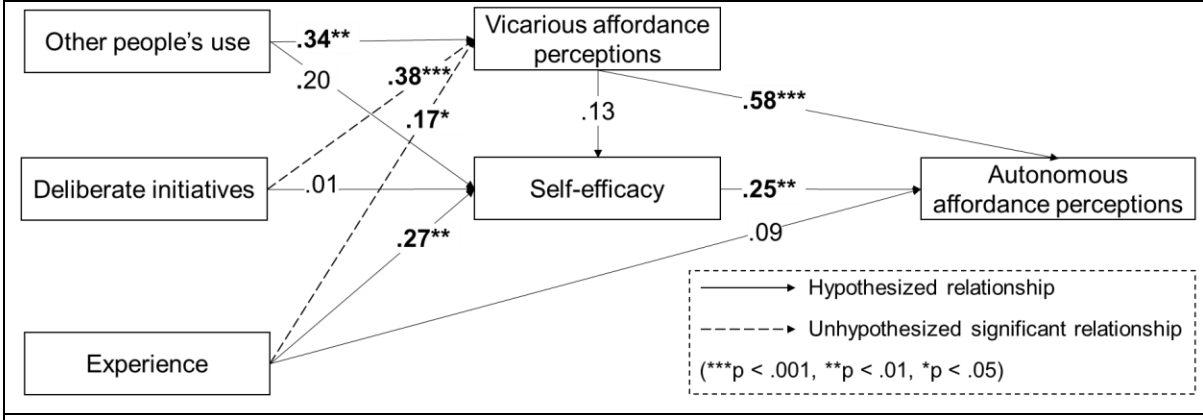

Figure 2. PLS Path Model Results

Table 7. Indirect and Total Effects

Indirect effect	Indirect effect	Total effect (indirect + direct effect)	Mediation supported?
Other people's use → autonomous affordance perceptions	.25**	.40***	Yes (mediators: vicarious affordance perceptions)
Deliberate initiatives → autonomous affordance perceptions	.24**	.16	No
Experience → autonomous affordance perceptions	.17**	.26***	Yes (mediators: vicarious affordance perceptions and self-efficacy)

***p <.001, **p <.01, *p <.05, †p< .1

As Table 7 shows, other people's use had a significant indirect (effect size = .25, p < .01) and a significant total effect (size = .40, p < .001) on autonomous perceptions. In concert with the significant direct paths shown in Figure 2, this implies that the effect of other people's use on autonomous affordance perceptions is mediated by vicarious affordance perceptions. Although deliberate initiatives had a significant indirect effect on autonomous affordance perceptions (effect size = .24, p < .01), the total effect was insignificant (effect size = .16, p = .11) due to the partially compensating negative direct effect of deliberate initiatives on autonomous affordance perceptions (β = -.08, see Table 6). Hence, there is no mediation relationship that links deliberate initiative to autonomous affordance perceptions. Experience had a significant indirect (effect size = .17, p < .01) and a significant total effect (effect size = .26, p < .001). In conjunction with the significant direct paths shown in Figure 2, this shows that the effect of experience on autonomous affordance perceptions is mediated both by vicarious affordance perceptions and by self-efficacy.

Discussion

This research is motivated by the lack of studies that explain variation in the amount of affordance perceptions. We argue that understanding the antecedents of affordance perceptions is particularly relevant in the context of malleable IT use, where organizations often rely on their employees to perceive novel uses that help them accomplish their work more effectively or efficiently. We build on SCT and on the literatures on affordances and adaptive feature use to argue that two distinct types of affordance perceptions rely on distinct prerequisites. Vicarious affordance perceptions rely on information from social sources and, hence, on the possibility to observe other people's use. In contrast, autonomous affordance perceptions rely on self-efficacy and knowledge given the uncertain and complex search activities. The results provide support for these ideas but also some unexpected insights.

Vicarious Affordance Perceptions

In line with our expectations, our results suggest that vicarious affordance perceptions depend strongly on the possibility to observe other people's use. The more a user was surrounded by others that used the malleable IT, the higher was the amount of affordances that the user perceived for her own work from these observations. This finding extends the foundational idea in the affordance literature that affordance perception depends on information (Bernhard et al. 2013; Pozzi et al. 2014) by clarifying that an important element of such information are observations about other people's use. Moreover, the finding is in line with evidence of positive associations between other people's use and adaptive system use (Sun 2012) and with Lehrig et al.'s (2017) contention that advice networks are a necessary condition for vicarious affordance perceptions. While the effect of other people's use on vicarious affordance perceptions is as hypothesized, two unhypothesized significant effects are noteworthy.

The first concerns deliberate initiatives, which had an unexpected, strong positive relationship with vicarious affordance perceptions. A possible explanation for this is that the malleable IT in our study (Microsoft Sharepoint) was a collaboration platform. Possibly, our measures of deliberate initiatives captured when our informants were urged by their collaborators to use Sharepoint for their collaboration. Although this constituted a form of persuasion in sense of SCT, it also constituted a vicarious learning opportunity because users could observe their colleagues' use of Sharepoint when colleagues urged users to collaborate over the platform. This interpretation is corroborated by the strong bivariate correlation between other people's use and deliberate initiatives ($r = .53$).

A second unhypothesized relationship concerns the positive relationship between the user's experience in using the malleable IT and vicarious affordance perceptions. It seems that, although vicarious affordance perceptions may not require the same amount of knowledge as autonomous affordance perceptions, it is cognitively demanding to transfer another person's use of the malleable IT to an action meaningful to the user. This may require at least basic knowledge of the malleable IT from the user, as reflected by the positive effect of experience.

Taken together, our findings show that users of malleable IT perceive affordances vicariously when they are surrounded by many other users of the malleable IT, when other users urge them to use the malleable IT, and when users have basic experience in the use of the malleable IT. These findings support the idea that vicarious affordance perceptions rely on information from social sources but also points to the need for some amounts of enactive learning through the use of the malleable IT prior to vicarious affordance perceptions.

Autonomous Affordance Perceptions

In line with our expectation that autonomous affordance perceptions are both uncertain and cognitively complex, our results indicate that autonomous affordance perceptions can be partially explained by efficacy-based reasoning and partially by knowledge-based reasoning. In line with efficacy-based reasoning, we found a positive relationship between self-efficacy and autonomous affordance perceptions. This extends the affordance literature, which does not consider the role of self-efficacy beliefs for enabling or preventing the uncertain search processes through which users may perceive affordances (Bernhard et al. 2013; Pozzi et al. 2014). Our findings on self-efficacy do broadly echo findings in research on adaptive feature use, which found that self-efficacy predicted usage and particular technology adaptation behaviors (Benlian 2015; Compeau et al. 1999; Schmitz et al. 2016). However, our findings go beyond these studies not only by focusing on a different dependent variable (affordance perceptions) but also by providing evidence related to the sources of self-efficacy beliefs. Although we examined sources related to performance accomplishments, modelling, and persuasion, only one antecedent related to performance accomplishments significantly predicted self-efficacy: experience in using the malleable IT. Thus, it appears that people gain the necessary confidence to set out for autonomous affordance perception through the prolonged use of the malleable IT, rather than through prior vicarious affordance perceptions (another performance accomplishment), through observation of other people's use (modelling) or through deliberate initiatives (persuasion). Interestingly, this is in line with research on the treatment of phobia, which found that performance accomplishments have by far the strongest effect on self-efficacy and behavioral change (Bandura 1977). It appears that users, too, need to spend some time using the malleable IT before they lose their fears related to the uncertain search activities that result in autonomous affordance perceptions.

Our results also provide support for knowledge-based explanations of autonomous affordance perceptions. We found a very strong effect (β = .58) of vicarious affordance perceptions on autonomous affordance perceptions. Since we controlled for self-efficacy, this effect cannot be attributed to self-efficacy gains during vicarious affordance perceptions. We, hence, argue that this effect reflects knowledge acquisition during vicarious affordance perceptions, which typically occur before autonomous affordance perceptions (Lehrig et al. 2017). It appears that once users succeed in perceiving a number of affordances vicariously, they possess the necessary knowledge to tackle the more complex autonomous affordance perceptions. This finding extends the affordance literature (Bernhard et al. 2013; Pozzi et al. 2014) by clarifying that affordance perception involves not only perceiving information from the environment; affordance perception is also the result of an active search process that critically depends on the users' knowledge. Knowledge is critical for enabling users to interpret the symbolic expressions of the IT and to identify ways to extend their current ways of using the IT to enable new actions.

Our mediation analysis reveals the total effects of three independent variables on autonomous affordance perceptions. Other people's use had the strongest total effect (.40) on autonomous affordance perceptions. Hence, somewhat paradoxically, the more users are surrounded by others using the malleable IT, the more likely are these users to autonomously perceive affordances, i.e., to perceive affordances without copying from others. The mediating variable vicarious affordance perceptions helps explain this seemingly surprising finding. Opportunities to observe other people's use are critical for promoting vicarious affordance perception, which allow the knowledge acquisition that subsequently enables autonomous affordance perceptions. While this echoes Sun's (2012) finding that other people's use is positively associated with adaptive system use, the specific focus on affordance perceptions in our study allows to attribute this fact, at least in part, to affordance perception processes.

Experience had the second strongest total effect (.26) on autonomous affordance perceptions. The effect of experience on autonomous affordance perceptions was fully mediated by self-efficacy and by vicarious affordance perceptions. Hence, prolonged experience in using the malleable IT allows users to gain the self-efficacy that is required before users dare to engage in the uncertain search processes needed for autonomous affordance perceptions. Moreover, prolonged experience may yield learning that allows users to more easily perceive affordances vicariously, which subsequently results in greater autonomous affordance perceptions. The fact that experience has no direct effect on autonomous affordance perceptions but an indirect effect via vicarious affordance perceptions further supports the finding that vicarious affordance perception processes tend to precede autonomous affordance perception processes (Lehrig et al. 2017). Taken together, this evidence points to a three-step individual-level learning process that enables users to perceive affordances from malleable IT. Users, first, need to gain some experience in using the malleable IT before they, second, are sufficiently knowledgeable to perceive affordances vicariously and, third, are sufficiently knowledgeable and self-efficacious to perceive affordances autonomously. These insights into the individual-level process of perceiving multiple affordances go beyond existing affordance research, which has thus far focused on dependencies between the *organizational-level or team-level* process of *actualizing* multiple affordances (Krancher et al. 2018; Strong et al. 2014). While that research has revealed that actualizing one affordance may produce outcomes that subsequently allow actualizing another affordance, our study adds that perception processes, too, depend on the outcomes from prior processes.

It is also insightful to compare our findings on experience with Benlian's (2015) finding that changes in feature use become less substantial to the extent that users become more experienced in an IT. Although our results do not allow the same kind of quantitative, dynamic inference as in Benlian's study, our findings suggest that the more substantial changes (i.e., autonomous affordance perceptions) may occur only after users have gained sufficient self-efficacy and acquired sufficient knowledge through some amount of experience. An explanation for these somewhat discrepant findings may lie in the focus of the study and in the type of IT examined. Benlian focused on change of feature use in the realm of purpose-specific IT (e.g. word processing systems). Users may struggle to further extend their feature use after they have started using those feature of purpose-specific IT that are most important for their work. In contrast, our focus lies on affordance perception and malleable IT. Even if users are already using important features of a malleable IT, there may still be vast opportunities to transfer existing ways of using these features to support new actions; experience in using the malleable IT may just enable the user to recognize these potentials. This highlights that our findings on affordance perceptions in the realm of malleable IT use may not necessarily transfer to settings of purpose-specific IT use.

Although deliberate initiatives also promote vicarious affordance perceptions, they do not have a significant total effect on autonomous affordance perceptions. This parallels Sun's (2012) finding that deliberate initiatives were not significantly related to adaptive system use. Sun argues that "the hypothesized positive impact of [deliberate initiatives] on [adaptive system use] may be offset by reduced autonomous climate for innovation, which discourages [adaptive system use]" (p. 470). In line with this idea, deliberate initiatives may have discouraged the innovating behaviors that result in autonomous affordance perceptions.

In sum, we find that users of malleable IT perceive affordances autonomously when they have gained sufficient self-efficacy through prolonged use of the malleable IT and when they have acquired sufficient knowledge through prior vicarious affordance perceptions. This supports the foundational idea that autonomous affordance perceptions rely both on efficacy and knowledge requirements.

Contributions

Our study makes two key contributions to the affordance literature. First, drawing on SCT and on prior fieldwork, we propose and empirically substantiate a distinction between two types of affordance perceptions, vicarious and autonomous, which rely on distinct perquisites. This goes beyond the basic idea that affordance perceptions, in general, depend on information available to the user (Bernhard et al. 2013; Pozzi et al. 2014). Second, our study sheds light on the individual-level learning processes that enable users to perceive affordances from malleable IT. Our findings point to a three-step process, starting with malleable IT use, followed by vicarious affordance perceptions, and ultimately autonomous affordance perceptions. These insights into dependencies between affordance *perception* processes go beyond existing affordance research, which focusses on dependencies between affordance *actualization* processes (Krancher et al. 2018; Strong et al. 2014). But understanding how users progress from malleable IT use to autonomous affordance perceptions provides not only process-theoretic insights; it also allows better explaining variation in the amount of affordance perceptions by shedding light on the factors that lead to vicarious and ultimately autonomous affordance perceptions. Such insights into the amount of perceptions is particularly valuable in the realm of malleable IT, where users can perceive multiple affordances from the same features.

Limitations and Future Research

We note a number of limitations of our study, which point to opportunities for future research. First, our data stems from single informants. Despite the lack of evidence for bias, it is possible that common-method bias is not absent in our results. Future research may combine archival data with survey data. Second, our study is cross-sectional and correlational, which does not allow determinate causal assertions. Yet, we believe that if paired with insights from longitudinal case studies (Lehrig et al. 2017), our survey study offers useful and valid insights. Still, a longitudinal quantitative study on affordance perceptions, mirroring Benlian's (2015) research design, could yield important insights. Third, our sample contained a very high percentage (91%) of men. While this reflected the demographic characteristics in the case company, future research could test our framework in a more balanced sample. Fourth, while we focused on affordance perceptions, we did not examine the relationships between affordance perceptions, affordance actualization, and impact. It might be that some kinds of affordance perceptions result, once actualized, in more fundamental changes in work routines (Lehrig and Krancher 2018) than others. This remains future research.

Implications for Practice

When organizations deploy malleable IT (e.g. Microsoft Sharepoint), their investments will lead positive impact only if users in the organization realize what action potentials the malleable IT provides for their particular work. Organizations will likely realize the highest benefits if users are able to autonomously recognize these potentials (i.e., to autonomously perceive affordance). Our findings suggest that, somewhat paradoxically, the most effective strategy for enabling users to autonomously recognize potentials is to surround them with other users of the malleable IT. Although this may lead users to copy other people's use, this is an important first step for subsequently enabling users to autonomous recognize action potentials. Hence, organizations should carefully design seeding strategies where they select, train, and socialize key users such that potential users of the malleable IT have sufficient opportunities to copy from key users. Workshops in which users share their ways of using the malleable IT may also be a means for users to recognize potential use cases, which may help trigger learning journeys. Experience in the use of malleable

IT is another important prerequisite for enabling autonomous affordance perceptions. Although there are no shortcuts for gaining experience (Ericsson et al. 2007), organizational technology choices may affect the possibility for users to gain experience. Organizations should consider focusing on one malleable IT product in a particular area and rely on this product over a long period such as several years. This will help ensure that users can gain sufficient expertise and self-efficacy in order to be able to autonomously recognize the action potentials offered by the IT.

References

Agarwal, R., and Karahanna, E. 2000. "Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage," *MIS Quarterly*, pp. 665–694.

Agarwal, R., and Prasad, J. 1998. "A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology," *Information Systems Research* (9:2), pp. 204–215.

Anderson, C., and Robey, D. 2017. "Affordance Potency: Explaining the Actualization of Technology Affordances," *Information and Organization* (27:2), pp. 100–115.

Armstrong, J. S., and Overton, T. S. 1977. "Estimating Nonresponse Bias in Mail Surveys," *Journal of Marketing Research*, pp. 396–402.

Bandura, A. 1977. "Self-Efficacy: Toward a Unifying Theory of Behavioral Change.," *Psychological Review* (84:2), pp. 191–215.

Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*, Prentice-Hall, Inc.

Bandura, A. 2001. "Social Cognitive Theory: An Agentic Perspective," *Annual Review of Psychology* (52:1), pp. 1–26.

Bandura, A., Blanchard, E. B., and Ritter, B. 1969. "Relative Efficacy of Desensitization and Modeling Approaches for Inducing Behavioral, Affective, and Attitudinal Changes.," *Journal of Personality and Social Psychology* (13:3), p. 173.

Benlian, A. 2015. "IT Feature Use over Time and Its Impact on Individual Task Performance," *Journal of the Association for Information Systems* (16:3), p. 144.

Bernhard, E., Recker, J., and Burton-Jones, A. 2013. "Understanding the Actualization of Affordances: A Study in the Process Modeling Context," in *Proceedings of the Thirty-Fourth International Conference on Information Systems*, Milan, Italy, p. 11.

Burton-Jones, A., and Volkoff, O. 2017. "How Can We Develop Contextualized Theories of Effective Use? A Demonstration in the Context of Community-Care Electronic Health Records," *Information Systems Research* (28:3), pp. 468–489.

Compeau, D., Higgins, C. A., and Huff, S. 1999. "Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study," *MIS Quarterly*, pp. 145–158.

DeVellis, R. F. 2012. *Scale Development*, Thousand Oaks, CA: Sage.

Ericsson, K. A., Prietula, M. J., and Cokely, E. T. 2007. "The Making of an Expert," *Harvard Business Review* (85:7/8), pp. 115–121.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, pp. 39–50.

Gefen, D., and Straub, D. 2005. "A Practical Guide to Factorial Validity Using PLS-Graph: Tutorial and Annotated Example," *Communications of the Association for Information Systems* (16:1), pp. 91–109.

Gibson, J. J. 1979. *The Ecological Approach to Visual Perception: Classic Edition*, Reading, MA: Houghton Mifflin.

Henseler, J., Ringle, C. M., and Sarstedt, M. 2015. "A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling," *Journal of the Academy of Marketing Science* (43:1), pp. 115–135.

Hutchby, I. 2001. "Technologies, Texts and Affordances," *Sociology* (35:2), pp. 441–456.

Jasperson, J. S., Carter, P. E., and Zmud, R. W. 2005. "A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems," *Mis Quarterly* (29:3), pp. 525–557.

Kallinikos, J., Aaltonen, A., and Marton, A. 2013. "The Ambivalent Ontology of Digital Artifacts," *MIS Quarterly* (37:2), pp. 357–370.

Kankanhalli, A., Tan, B. C., and Wei, K.-K. 2005. "Contributing Knowledge to Electronic Knowledge Repositories: An Empirical Investigation," *MIS Quarterly*, pp. 113–143.

Kazdin, A. E. 1973. "Covert Modeling and the Reduction of Avoidance Behavior.," *Journal of Abnormal Psychology* (81:1), pp. 87–95.
Kock, N. 2015. "Common Method Bias in PLS-SEM: A Full Collinearity Assessment Approach," *International Journal of E-Collaboration (IJeC)* (11:4), pp. 1–10.
Krancher, O., Luther, P., and Jost, M. 2018. "Key Affordances of Platform-as-a-Service: Self-Organization and Continuous Feedback," *Journal of Management Information Systems* (35:3), pp. 776–812.
Lehrig, T., and Krancher, O. 2018. *Change of Organizational Routines under Malleable Information Technology: Explaining Variations in Momentum*, presented at the Thirty Ninth International Conference on Information System.
Lehrig, T., Krancher, O., and Dibbern, J. 2017. *How Users Perceive and Actualize Affordances: An Exploratory Study of Collaboration Platforms*, presented at the The 38th International Conference on Information Systems.
Leidner, D. E., Gonzalez, E., and Koch, H. 2018. "An Affordance Perspective of Enterprise Social Media and Organizational Socialization," *The Journal of Strategic Information Systems* (27:2), pp. 117–138.
Leonardi, P. M. 2011. "When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies," *MIS Quarterly* (35:1), pp. 147–167.
MacKenzie, S. B., Podsakoff, P. M., and Podsakoff, N. P. 2011. "Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques," *MIS Quarterly* (35:2), pp. 293–334.
Markus, M. L., and Silver, M. S. 2008. "A Foundation for the Study of IT Effects: A New Look at DeSanctis and Poole's Concepts of Structural Features and Spirit," *Journal of the Association for Information Systems* (9:10), pp. 609–632.
Maruping, L. M., and Magni, M. 2012. "What's the Weather like? The Effect of Team Learning Climate, Empowerment Climate, and Gender on Individuals' Technology Exploration and Use," *Journal of Management Information Systems* (29:1), pp. 79–114.
Maruping, L. M., and Magni, M. 2015. "Motivating Employees to Explore Collaboration Technology in Team Contexts.," *Mis Quarterly* (39:1).
Norman, D. A. 1999. "Affordance, Conventions, and Design," *Interactions* (6:3), pp. 38–43.
Orlikowski, W. J. 1996. "Improvising Organizational Transformation over Time: A Situated Change Perspective," *Information Systems Research* (7:1), pp. 63–92.
Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879–903.
Pozzi, G., Pigni, F., and Vitari, C. 2014. *Affordance Theory in the IS Discipline: A Review and Synthesis of the Literature*, presented at the Twentieth Americas Conference on Information Systems, Savannah, Georgia.
Preacher, K. J., and Hayes, A. F. 2008. "Asymptotic and Resampling Strategies for Assessing and Comparing Indirect Effects in Multiple Mediator Models," *Behavior Research Methods* (40:3), pp. 879–891.
Richter, A., and Riemer, K. 2013. "Malleable End-User Software," *Business & Information Systems Engineering* (5:3), pp. 195–197.
Schmitz, K. W., Teng, J. T. C., and Webb, K. J. 2016. "Capturing the Complexity of Malleable IT Use: Adaptive Structuration Theory for Individuals," *MIS Quarterly* (40:3), pp. 663–686.
Seidel, S., Recker, J. C., and Vom Brocke, J. 2013. "Sensemaking and Sustainable Practicing: Functional Affordances of Information Systems in Green Transformations," *Management Information Systems Quarterly* (37:4), pp. 1275–1299.
Strong, D. M., Johnson, S. A., Tulu, B., Trudel, J., Volkoff, O., Pelletier, L. R., Bar-On, I., and Garber, L. 2014. "A Theory of Organization-EHR Affordance Actualization," *Journal of the Association for Information Systems* (15:2), pp. 53–85.
Sun, H. 2012. "Understanding User Revisions When Using Information System Features: Adaptive System Use and Triggers," *MIS Quarterly* (36:2), pp. 453–478.
Treem, J. W., and Leonardi, P. M. 2012. "Social Media Use in Organizations: Exploring the Affordances of Visibility, Editability, Persistence, and Association," in *Communication Yearbook* (Vol. 36), pp. 143–189.
Yao, G., Wu, C., and Yang, C. 2008. "Examining the Content Validity of the WHOQOL-BREF from Respondents' Perspective by Quantitative Methods," *Social Indicators Research* (85:3), pp. 483–498.