Acceptance or appropriation? A design-oriented critique on technology acceptance models

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Abstract

Technology acceptance models are tools for predicting users' reception of technology by measuring how they rate statements on a questionnaire scale. It has been claimed that these tools help to assess the social acceptance of a final IT product when its development is still underway. However, their use is not without problems. This paper highlights some of the underlying shortcomings that arise particularly from a simplistic conception of "acceptance" that does not recognize the possibility that users can invent new uses for (i.e., appropriate) technology in many situations. This lack of recognition can easily lead one to assume that users are passive absorbers of technological products, so that every user would adopt the same usages irrespective of the context of use, the differences in work tasks, or the characteristics of interpersonal cooperation. In light of recent research on appropriation, technology use must actually be understood in a more heterogeneous way, as a process through which different users find the product useful in different ways. This paper maintains that if, in fact, a single technology can be used for multiple purposes, then subscribing to the thinking arising from technology acceptance model research may actually lead one into suboptimal design solutions and thus also compromise user acceptance. Therefore, this paper also presents some starting points for designing specifically for easier technology appropriation.

1 Introduction

Understanding and predicting how new technologies will be received by their potential users is one of the central topics both when planning design processes and during the actual design activity. In order to be successful in making predictions, understanding both the users' mindsets and their activity contexts have been found to be crucial. As a reaction to these needs, various methods have been devised, borrowing techniques from, for example, ethnography (e.g., Beyer & Holtzblatt, 1998), dramaturgy and theatre (Mehto, Kantola, Tiitta, & Kankainen, 2006; Svanæs & Seland, 2004), and, as a third example, the topic of this book chapter, questionnaire-based quantitative studies to assess technology acceptance (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003).

Research on technology acceptance models (TAMs) has had an important impact on design thinking lately. This field has introduced into user-centered design terms like user acceptance, social acceptance, diffusion, and adoption. As a consequence, it is nowadays very common in design meetings to hear discussions on social acceptability and user acceptance and their relevance to the success of the product.

Wrapping the thinking about design processes around this kind of terminology has implications for the actual design practice as well. Naturally, this does not always take place without problems. One caveat is that adoption and acceptability are concepts that refer to masses of users and tend to make one think only about an "average user" who represents the whole user population. This paper intends to rise up against this thinking by showing that the different technology acceptance models actually do not address a central characteristic of information technology artifacts: Users' active sense-making processes contribute significantly to the use of the product and its acceptance. Therefore it is not always possible to talk about users as a uniform segment of people, and TAMs are not adept at assessing the real acceptance of technologies.

2 Technology acceptance models

TAMs have been developed in response to a need to evaluate users' subjective satisfaction rates, and to use such rates as a predictor of a system's success (Davis, 1989; Davis et al., 1989). Different theories and models conceptualize the acceptance in various ways, but a common characteristic is that all of them belong to the research tradition of social cognition, a field that tries to account for human action by applying psychological constructs such as attitudes, values or norms. For example, Fishbein's and Ajzen's (1975) theory of reasoned action (TRA) and theory of planned behaviour (TPB) have been used extensively in various information technology attitude measurement scales (see Dillon & Morris, 1996.)

Davis' (1989) TAM is based on Fishbein and Ajzen's (1975) TRA, but it has been streamlined in comparison to the original theory. The main idea of the model is to describe the external factors affecting the internal attitudes and use intentions of the users and, through these, to predict the acceptance and use of the system. The model consists of two attitudinal dimensions: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). It is postulated that these are directly related to the use of an information system. PU is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). PEOU in turn is defined by user's subjective evaluations on how much cognitive work she or he must expend when using the system.

Building on previous research, Davis et al. (1989, p. 987) postulate that these dimensions are distinct but related constructs. They can be measured individually, therefore, even though PEOU has a direct effect on PU (see Figure 1). Davis et al. also claim that PU is directly linked to intentions of use (contrasting it with TRA, which postulates that all intentions are mediated by formation of attitudes). Thus, according to TAM, a user's acceptance of an information system is dependent on two factors: perceived usefulness and perceived ease of use. Together, these factors determine the attitude toward using the technology. This in turn affects the behavioral intentions of use, which then leads to actual use.

Not shown to preserve the copyright. For an image with the same contents, see e.g. http://jcmc.indiana.edu/vol13/issue1/park.html, Figure 1

Figure 1. The original technology acceptance model by Davis et al. (1989, p. 985). Reprinted by permission, ©1989 The Institute for Operations Research and the Management Sciences (INFORMS).[1]

Technology acceptance in the model presented by Davis (1989) is measured with 20 questions (10 questions for usefulness, 10 questions for ease of use) that ask the user to rate statements like "Using X in my job would enable me to accomplish tasks more quickly" (see Davis, 1989, p. 340). The result is an estimate of the system's acceptance. Later, different variants of the original TAM and the questionnaire have been presented (for a review, see Dillon & Morris, 1996). Depending on the research questions of each study, questionnaires have been administered at different points in time, ranging from immediate responses after an initial training to arrangements that have covered longer timespans.

3 Scope of the original model and subsequent criticisms

In his original paper, Davis (1989) claimed that the results obtained through measuring users' subjective ratings in these ways can provide trustworthy estimates of acceptance both when the users are very familiar with the technology (e.g., having experience of 6 months of use) and when they have had only a half an hour's experience of using it. To scope this claim, Davis et al. listed some boundary conditions for the applicability of their model. They acknowledged that their primary interest is in workplace settings in which utility is the primary value of user acceptance (1989, p. 986). This was also evident in how the statements in the measurement questionnaire were formulated (see the example statement above). As another boundary condition, their TAM was focused on measuring opinions of individual workers (Davis, 1989, pp. 998–999) and, in doing so, it did not take into consideration the effects of the social organization, such as distribution and delegation of work, different worker roles, or joint work routines at the workplace. Later, more TAMs have been proposed, but they have been based on similar starting points (e.g., see a synthesis of these models by Venkatesh et al., 2003).

However, criticism has started to emerge about such constraints in TAM studies and the research approach in general. One part of the criticism has been directed at the research designs. For instance, based on a review of 101 articles, Lee, Kozar and Larsen (2003) point out that many studies base their measures on users' self-reported amounts of use and short exposures with the technology in question. Lack of longitudinal studies (i.e., ones containing multiple measurement points) is another issue, also mentioned by Benbasat and Barki (2007). Both Lee et al. and Benbasat and Barki raise the concern that the existing models "do not adequately capture or describe the dynamic interplay that usually occurs between the various user behaviors" (Benbasat & Barki, 2007, p. 215). Longitudinal studies are hypothesized to

[1] Reprinted by permission, Fred D. Davis, Richard P. Bagozzi, Paul R.Warshaw. 1989. User acceptance of computer technology: A comparison of two theoretical models, Management Science, volume 35, number 8, August, 1989. Copyright 1989, the Institute for Operations Research and the ManagementSciences (INFORMS), 7240 Parkway Drive, Suite 310, Hanover, MD 21076 USA.

counter this problem by addressing the issues of adaptation and learning that takes place during an extended use.

Naturally, some longitudinal TAM studies have been carried out. For instance, temporality was explicitly addressed in a study by Venkatesh and Davis (2000), resulting in an extension in the model with four PU-related social influence factors (image, subjective norm, experience, and voluntariness) and three new PEOU-related "cognitive instrumental process" factors (job relevance, output quality, result demonstrability). In four case studies on two mandatory and two voluntary organization-wide workplace systems, the new TAM2 model was found to explain 60% of the variance in judgments of perceived usefulness (Venkatesh & Davis, 2000, p. 198). However, in light of the findings from qualitative studies (as opposed to quantitatively oriented TAM studies) on groupware systems in similar settings, finding such neat correlations should be interpreted with a grain of salt. For example, a study on Lotus Notes groupware system by Orlikowski and her colleagues showed that a system's use can evolve over time, often in a stepwise manner (Tyre & Orlikowski, 1994). At many different stages during the years that their study lasted, both the workers and managers perceived both the system and its usefulness in different ways (Orlikowski, 1996). Because Venkatesh and Davis (2000) do not provide much information about the workplace contexts in their studies, this discrepancy between their findings and the ones by Orlikowski and Tyre is difficult to explain.

The problems related to measuring information system usage have also received much attention. Many researchers have expressed worries about simplistic operationalizations on how systems are used. Schwarz and Chin (2007, p. 232) lament that "most studies to date typically measure usage as extent or frequency of use" and that "IT acceptance is predominantly about predicting a particular mode of use (i.e., degree or amount of use)." Naturally, measuring only the extent of use means that the above-mentioned "dynamic interplay" (Benbasat & Barki, 2007, p. 215) cannot be fully captured in TAM research. To solve this problem, Burton-Jones and Straub (2006) have proposed a two-stage research method that requires the researchers first to define what system usage entails in their study and what are its underlying assumptions. In the second stage, they have to select which measures for each "structural element" of usage—the system, the user, or the task—are to be used. With this procedure, the conceptual impreciseness of usage is properly clarified, leading to better explanations of usage–performance relationship.

Another suggestion for sensitizing TAM research to different types of usage has been proposed by Jasperson, Carter and Zmud (2005). Their interest is in the postadoptive behaviors, that is, longitudinal observations of use that follow the initial adoption into use. They suggest lowering the analysis to the level of individual system features, thus increasing sensitivity to changes.

The third reason for criticism has been the insensitivity to different use contexts. The models do not take into account the possibility that a technology may be initially accepted but later abandoned, or vice versa. Nonetheless, they are meant to serve as predictors of the future success of a technology. For example, Davis et al. stated that "in contrast, TAM's U [usefulness] and EOU [ease of use] are postulated a priori, and are meant to be fairly general determinants of user acceptance" (1989, p. 988) and that the contextual variation is included in the model only as an "external variable" (p. 987, see also p. 989). Due to such postulations, TAMs are not sensitive to cases in which the context of use is changing or the relevant aspects of use are somewhat unknown. This complicates comparisons across cases as well as generalizations from the results.

In later research, insensitivity to different contexts has been addressed by developing different variations of TAM for different technologies. The goal to develop a family of

models is justified by a recent metareview of 63 studies that showed that the type of technology is likely to have a significant moderating effect on acceptance (Schepers & Wetzels, 2007). The authors categorized the various studies into four types of technology: specific software applications (e.g., word processors), Internet-related technologies (e.g., search engines), microcomputers (e.g., PC), and communications technologies (e.g., e-mail). However, due to the meta-analysis methodology, they could not compare uses within each type of technology in more detail, and the type of use could only be measured as a unidimensional variable (amount of use).

The final aspect that has been criticized has been directed at the nature of the technology models and how the different models have been improved over the years. Calls have been raised to extend the models backwards, toward the antecedent features of technology based on which users assess the usefulness and ease of use in the way they do (Benbasat & Barki, 2007, p. 215). The dominance of PEOU and PU as the primary factors contributing to acceptance has also been questioned (Benbasat & Barki, 2007, p. 213). Barki and his colleagues have continued the critique in another article (Barki, Titah, & Boffo, 2007), where they developed a new model (ISURA, which stands for information systems use related activity) that is *not* an extension of the original TAM and attempts to cover a broader spectrum of information on use-related activities, including the actual technology interaction, task–technology adaptation, and individual adaptation. At the time of writing, though, no other articles about ISURA have been published.

Another starting point for questioning the dominance of PEOU and PU has been their utility-oriented objective. Motivated by the difficulties arising from this emphasis, van der Heijden (2004) has presented an alternative model for hedonic information systems, which are characterized not by their instrumental value but with their "fun-aspect," perceived enjoyment, and self-fulfillment value. To prove his point on the need for another model, van der Heijden mentions that acceptance studies on the use of the Web have provided conflicting results regarding the relative importance of perceived usefulness versus perceived enjoyment. To reconcile this discrepancy, he suggests that the Web might have actually represented different things to different users. If this is true, he says, the studies have not actually measured the Web acceptance from the same perspectives (van der Heijden, 2004, p. 697). He states as an implication for future research that "progress in user acceptance models can be made by focusing on the nature of system use (whether utilitarian or hedonic), in addition to the inclusion of additional determinants" (p. 699).

We believe van der Heijden's conclusions point to the most crucial issue regarding technology acceptance models that has not been explicated even within the critically aligned articles mentioned above. The fact that users have different orientations toward technology poses a serious weakness in technology acceptance models currently in use. In spite of this weakness, the standard view of technology acceptance retains, year after year, an important position in managerial design thinking, and therefore also in how the design processes are normally carried out. In the following sections, we attempt to explain why different orientations and interpretations of technology use are such a central question, and why disregarding this viewpoint might severely hamper creative, productive design work. We also propose an alternative viewpoint that breaks away from the current limited concept of acceptance in favor of a more heterogeneous view of appropriation.

4 The problem and related evidence of TAMs' inherent limitations

Van der Heijden's (2004) remark questions the validity of technology acceptance when measured with questionnaire scales. In fact, it asks whether we know, in the first place, what

the scales are measuring when they ask users to assess their perceptions of a particular technology. The conflicting results on the Web acceptance point to a possibility that users might actually respond to the questions based on completely different orientations: one group perceiving the Web through its potential utility, another group through its potential for providing enjoyment. In such a case, if the questionnaire does not attempt to cover the possible orientations, the respondents might in fact be asked wrong questions. One is then unable to tell if the study reveals anything reliable about the real preconditions of user acceptance. The answers based on different orientations should be treated in different ways in subsequent analysis, but in the standard TAM approach this is impossible since it is assumed that all users are subscribing to the same orientation.

Understanding that users may have different perceptions and interpretations of technology reveals also other implicit assumptions in the use of TAMs that prove themselves as problematic. While different users might perceive a certain technology in different ways, it is also possible that a technology can represent multiple purposes even for a single user. For instance, an e-mail program might serve as a way to communicate, but also as a means to store documents (even to an extent that a user might occasionally send e-mails to himself or herself to make some documents more accessible in later situations). In addition, the technology may be perceived in different ways in different situations. These possibilities make discovering the real antecedents of acceptance with the help of predefined questions even more difficult.

As a result, it is unfortunate that that the TAM scales do not even have an open-ended text field in which users could describe what they use the technology for*,* what purpose of use it represents to them. As stated above ("TAM's U and EOU are postulated a priori"; Davis et al., 1989, p. 988), TAM research is based on a principle that it is the researcher who decides what use is evaluated, even if it is not clear if the users actually represent that kind of use. In reality, the relationships between system's functionalities and user's tasks may vary between users and serve completely different ends than expected by the researcher.

This problem can also be investigated on a more fundamental level. As noted above, TAMs are built on the model of attitude formation found in the TRA, a model of cognitive processing in which attitudes serve as a basis for cognitive calculation in order to determine the intention to act in a given situation (Fishbein & Ajzen, 1975, pp. 216–287). By emphasizing the individual cognitive calculation, TRA ignores the point of view that attitudes (such as perceptions of usefulness and ease of use) are not just individual cognitive processes, but rather are tied to the social contexts of use. This aspect has been the basis of the critique presented by Billig (1987). He points out that humans tend to make particularizations in their attitudes depending on the current context. So when talking about a computer program in different contexts, the meanings and evaluations related to that object may differ. Different situations call for different interpretations of a "computer program." This is also why the computer program—as an attitude object—varies across the situations as it is contextually situated within differing evaluative relations. Thus, Billig's (1987) critique of traditional attitude research can be extended also to the TAMs. When researchers present propositions to users by referring to the system in a structured form (e.g., by means of a questionnaire), they have no knowledge about the contexts in which the users situate and understand these propositions. In fact, the researcher has no way of knowing the meaning of the user's attitude toward the object under evaluation when she or he is replying to the statements.

There is also empirical research evidence that such an interpretive heterogeneity actually is very common among users, and therefore the answers given on a technology's acceptance really are based on different orientations. This can be the case even if the users themselves are not aware of such heterogeneity. Tamminen (2001) used TAM propositions in open-ended

interviews on a team coaching program (Tiimivalmentaja Plus). He interviewed 18 users (about 10% of all the trained users). After the analysis of the responses (the interview material), the program appeared to reflect three very different evaluative objects in the users' speech.

First, the program was evaluated in relation to the tools and the theory it contained. Second, the program was evaluated as an artifact with a constructed interface. Third—and this was a surprising finding—the program was evaluated regarding on how well it worked as a vehicle for organizational change. Thus, when the users were talking about the ideas and tools the program contained, they were evaluating how useful it was in relation to their team processes (TAM's PU dimension) and when they talked about the program as an artifact, the users were evaluating the effectiveness of the actual interaction process between themselves and the program interface (TAM's PEOU dimension). But thirdly, distinct from the two prior attitude objects, when the users were talking about the program as a vehicle for organizational change, they were evaluating its effectiveness as a rhetorical tool for changing the prevailing work practices. Users claimed they could use the program to remind or outright argue with managers that, in implementing this program, the managers had also subscribed to a rearrangement of the initial work activity. The TAM propositions of effectiveness were, in this case, situated in relation to the organizational use context of the program—it was evaluated in terms how well it could by used in the organizational persuasion for novel ways for managing work tasks and reconfiguring power relations between managers and workers. These evaluative situations yielded a quite surprising interpretation of the attitude propositions and of the effectiveness of the program itself. Tamminen (2001, p. 650) concludes, "The users actually evaluate different things, depending on the context of the proposition. When the different attitude objects are evaluated, the users give differing explanations for their agreement or disagreement with the proposition, depending again on the context."

The possibility that there is no single basis for comparisons between responses can of course be devastating to any research that relies on quantitative measurements. The strength of TAM models in predicting technology acceptance has been claimed to rest on reliable psychographical data. The reason why a more varied and heterogeneous view of computer use has not been embraced in technology acceptance research might lie within the field's positivistic tradition that advocates hypothesis creation and testing rather than a more descriptive approach. The descriptive approach is more common in qualitative research, which does not make a priori assumptions about the similarities between multiple situations (e.g., Silverman, 1993).

Despite the limitations, the use of TAM models for assessing the quality of technology might still be useful in situations in which the system's functionalities provide only very limited opportunities for different uses. Examples of such technologies are ATMs that one can only use to draw cash, or interfaces for databases that restrict user tasks to specific queries and inputs only to specified formats. More examples of this kind can be found by looking at, for example, booking systems and logistics applications. In other cases, however, seeing the system use in such a limited way may not be fruitful for good design.

5 Acceptance models and design thinking: An uneasy combination

While the researchers in management science are probably aware of the inherent limitations (and strengths, of course), as well as the methodological and philosophical commitments, of technology acceptance models, many of the concepts developed in their research field have

spread into everyday design discourse. Terms like social acceptability of technology, technology adoption, and technology diffusion all stem from the same thinking about technology acceptance models. This etymology is not always considered when the terms are used beyond the information systems research circles.

As was noted earlier, adopting concepts and terminology from neighboring research fields is not without problems. Some of the concepts undergo a translation and are subsequently understood in a way different than their original meaning. Take *social acceptance* as an example. By noticing that acceptance models have been developed with a single-user paradigm in mind, and that the social influence is addressed only on the level of the possible effect on the user's attitudes (and not on the level of shared use of digital tools, or negotiation of their use, for example), one can remark that adding *social* in front of *acceptance* extends the original thinking into territories in which the underlying premises are no longer applicable. Seen from the alternative angle, social acceptance is a result of a cultural process that can be studied only with a reference to a particular setting and time: What is not socially acceptable in one setting today might be acceptable in the same setting tomorrow. Also the system itself can bring about a change in the attitudes, as was noticed in the study by Tamminen (2001). As a result, the concept of social acceptance is subject to continuous change. Referring to it as a measurable, objective value oversimplifies the understanding how technology is used in reality and what the contexts of its use are like.

In summary, the concepts arising from TAM research are not always fruitful in design, although they are applicable for evaluation purposes in certain specified work settings, especially if quantitative measures are needed to prove one's point. Although Davis et al. (1989, p. 1000) originally envisioned that TAM could be used in the early stages of product design, ultimately it has been found that the concepts presented do not seem to be able to *drive* design, they can be used only to *verify* it.

6 Appropriation: A heterogeneous view of technology acceptance

As an alternative perspective—one that would serve as a generator of new design—*appropriation* is a concept that can be more useful than user acceptance. Understanding technology acceptance as appropriation means recognizing that a user is an active agent who is able to adapt technology to serve personal or shared goals when needed.

> Appropriation is the way in which technologies are adopted, adapted, and incorporated into working practice. This might involve customization in the traditional sense (that is, the explicit reconfiguration of the technology in order to suit local needs), but it might also simply involve making use of the technology for purposes beyond those for which it was originally designed, or to serve new ends. (Dourish, 2003, p. 467).

For a designer to design for appropriation means developing systems that empower the user with functionalities that enable the accomplishment of tasks that might vary from user to user, and from one setting to another. This also means that a technology used for purposes not envisioned by the designer can be viewed as good design. The rationale behind this thinking is that if the technology is used beyond the scope of its original intent and its users are able to orient to its functionalities in creative ways, then it has succeeded in winning new users and use contexts.

Compared to TAMs, fewer papers have been published about appropriation and evolving use practices. The works that have been published focus primarily on three different lines of research. The first one consists of the attempts to establish a theoretical standpoint for appropriation. Such explorations include presentations of Giddens' structuration theory (DeSanctis & Poole, 1994; Orlikowski, 1992), activity theory (Pargman & Wærn 2003; Petersen, Madsen, & Kjær, 2002), Weick's sensemaking framework (Bansler & Havn, 2006), ethnomethodology (Brown & Perry, 2000; Salovaara, 2007), and phenomenology (Chalmers & Galani, 2004).

The second line of research consists of attempts to capture the necessary properties of appropriable technologies. These papers are focused most directly on making straightforward design-related contributions. Often different qualifiers and adjectives are presented in these papers, including suggestions for design based on openness (Dourish, 1997; Höök, 2006), looking at data from multiple viewpoints (Dourish, 2003), tailorability (MacLean, Carter, Lövstrand, & Moran, 1990), configurational technologies (Williams, Stewart, & Slack, 2005), or technologies as equivoques (Huysman et al., 2003).

The third line of research has presented and analyzed appropriations in particular contexts or use and shown the related design opportunities (e.g., Jacucci, Oulasvirta, Ilmonen, Evans & Salovaara, 2007; Salovaara, 2007; Voida & Mynatt, 2005). In addition, there have been a large number of more general presentations on design implications found out from open-ended field trials with functional prototypes. Essentially, most of these papers can be seen as reports on appropriations in various settings.

From this large variety of appropriation-related studies the conclusion can only be that a commonly agreed-upon view of appropriation and the implications for how one can design for it are still only emerging. Currently there are only approximate suggestions for understanding the phenomenon theoretically, and similarly only approximate directions for the kinds of designs that are desirable. In addition to this, the body of case studies that considers field trials particularly from appropriation perspective is only being built up.

However, there are useful lessons to be acquired. Changing the mindset from an all-too-cautious question "What designs will be accepted?" to a more generative and forward-looking question "What designs will be easy to appropriate?" suggests that designs can be improved and made more useful in a larger variety of different contexts.

7 Reconciling the two design mindsets

While the alternative perspective described above might seem promising for a designer, a question still remains regarding how it can be made compatible with the rest of the design thinking that sees the quest for user acceptance as the ultimate goal. First and foremost, it is important to notice that easily appropriable systems are likely to score high in user acceptance tests as well, even though the users might provide high ratings because of unknown reasons.

A more difficult question is whether the theoretical underpinnings of acceptance and appropriation can be made compatible with each other. At first look this seems difficult. TAM research does not attempt to take into account the users' orientations and interpretations as underlying factors that may affect the scores given by the users. In contrast, this is the fundamental starting point in appropriation-oriented design. If open-ended prestudies are arranged in which the actual technology use is first documented and classified, and then used to develop TAM scales individually for each class, there is a possibility that users' different interpretations can be incorporated also into the TAM studies with a help of more fine-grained user segmentation. But it is unrealistic to assume that such prestudy activities would become a

part of the standard TAM methodology. It would also result in an even larger family of competing acceptance models, already considered a problem now (Benbasat & Barki, 2007).

A pragmatic strategy for a designer is to remember the kind of thinking that the original concepts of acceptance, adoption, and diffusion entail, and to defend one's position whenever users' opportunities for creative use are in danger of becoming compromised. However, the ultimate goal of helping users to appropriate should be incorporated into all design process planning. In this case, whenever user-centered design would be carried out, achieving appropriability would be one of the key goals of the process. Movement towards this direction has already taken place in, for instance, von Hippel's (1988, 2001) suggestions for fostering appropriation by learning from lead-users and by building user toolkits. The importance of flexible design has also been found in studies on open-source software development and communities (e.g., Tuomi, 2002). However, there is still work to do before these new openings are turned into practical design process characteristics.

8 Designing for appropriation

How should one design for appropriation? The studies mentioned above provide some starting points for this by highlighting both the overall characteristics (openness, tailorability, configurability, and so on) and context-specific findings. However, the existing literature has not touched the question from the viewpoint of design methods. In the following, we tentatively attempt to describe some properties of design activities that will increase the possibilities for appropriation.

We find it helpful to conceptualize appropriation through the concept of *resource*. Resource is a term in ethnomethodological research used to describe features and properties in a context that provides people with means for action in everyday social interaction. This interpretation can be applied to the analysis of appropriation (Salovaara, 2007) through a notion of *technological resources*. Technological resources are the means for action provided by the system. They are based on the system's functionalities as developed by the designer, either intentionally or unintentionally, and are learned by the user through experiences within different use contexts and tasks. In this light, appropriation can be understood as a transformation process that turns mere system functionalities into personally meaningful technological resources for action.

A system is appropriable if a user can easily learn how the system's functionalities can serve as resources for action. The question of how to design for appropriation thus translates into attempts to help the user to flexibly notice the potential system functionalities in different contexts, and to understand what resources the functionalities provide for the user once they have been noticed and judged useful. We analyze these questions by providing methodological suggestions with respect to three common activities in user-centered design: user research, design activities, and system evaluations.

In early-stage ethnographic user research, attention should be paid to analyzing the users' heterogeneous uses of existing technology. By heterogeneous we mean the mixed use of different systems and technological infrastructures. For instance, users might carry out some tasks with the help of combining e-mail and instant messenger together, or by alternating between different accesses to digital resources (e.g., accessing e-mail via a desktop PC, mobile phone, or Webmail). Such an analysis shows which features in existing systems are relevant to users (i.e., what are the technological resources of each system) and how they are combined together opportunistically. This informs how the new system should be connected with the existing ones. Finally, the observer should pay attention to unexpected uses, and try

to find the underlying reasons for such appropriations in order to make similar uses possible in the system to be designed.

With regards to design, the starting point for facilitating appropriation is to build systems that fill their intended purposes of use well (a goal which is in line with any design practice)[2], but to not exclude possibilities of other kinds of usages. This is useful in supporting the contemporary knowledge work that is characterized with multitasking, workers' autonomy in deciding how to carry out dedicated work tasks, and immersion in a heterogeneous infrastructure of different mobile, wireless, wired, open or closed digital resources. In such settings, appropriation can be facilitated by building systems that are portable both physically and digitally, used in different settings, and combined easily with the existing technologies. Portability entails also that digital content should be portable between multiple systems. For instance, program code and HTML pages are portable because they can be multiplied and distributed easily. Through portability, many users can take benefit from a single user's contribution. The possibility of combining the system with existing technologies is related to the previously mentioned considerations on configurability, open interfaces for the exchange of information, and the possibilities for tailoring and personalization. To make the possibilities for appropriation noticeable, available functionalities of the system should be visualized well, so that in different situations the user is able to notice how the system is able to interact with and connect to its environment.

When arranging evaluations, assessing the system's support for appropriation requires different metrics than a standard study that often focuses on issues like speed and accuracy. Existing literature on appropriation does not contain definitions for appropriability metrics, but suitable measures are linked to a system's usefulness in various settings, and its configurability with other systems in the use contexts. Preferably, tests for appropriability should by carried out in realistic or close-to-realistic settings. Appropriation can be assessed, for instance, by asking the user carry out open-ended tasks and then observing if the switches in interaction between the new system and the existing infrastructure are fluent, or if the user makes use of the system in activities other than those expected in the task instructions.

A short description like this can of course only scratch the surface of the implications that appropriation-oriented thinking might have on design practice. For instance, the description above lacks considerations on how group processes, temporal dynamics (e.g., learning during use and the spreading of useful practices), contexts other than knowledge work, and the understanding of human perception and creative problem solving should be integrated into the framework. Such a more focused analysis must be left for the future research.

9 Conclusions

This chapter started with an analysis of the concept of technology acceptance as used in management and information systems research, and which since has been adopted into user-centered design discourse as well. It was shown that the underlying assumptions of the technology acceptance models do not reflect the reality of technology use in many situations, and that the implied thinking models might therefore lead design activities into suboptimal design solutions. In particular, it was shown that TAMs do not take into consideration the

[2] However, this starting point does not hold in cases in which the goal is to invite the user to reflect on and problematize the purpose of the system and, in this way, even force the user into creating new interpretations of the system through its nonapparent purpose of use. This approach has been suggested by Gaver, Beaver, and Benford (2003), but specifically in the context of interactive art pieces and digital entertainment. In such cases, purposely complicating the user's tasks is sometimes appropriate.

variation in purposes of use that the users of a technology might have. On the contrary, the models mostly appear to consider all use as equal. This limits considerably their capability to inform design. As a result, (user) acceptance, and related concepts like adoption and diffusion, might actually instantiate a flawed mindset for design.

As a contrast to using such conceptual terminology, this chapter has attempted to provide an alternative viewpoint on user acceptance, based on the concept of appropriation. The motivation for this attempt is that the alternative viewpoint is more helpful in guiding design. It also provides a better inspiration for design by understanding the user as a creative agent capable of finding different kinds of uses, even unexpected ones, for technologies. In many cases the emergence of creative uses is a sign of successful design. Some initial steps for realizing the appropriation-oriented design in practice were provided in the end of the chapter.

The motivation behind writing this chapter has been to provide a new orientation for design and design management in order to improve user acceptance in ways not conceived before. It has been pointed out that success in building appropriable systems in this way is not harmful to user acceptance even when understood in its traditional sense. With this in mind, we hope that this chapter continues and contributes fruitfully to forthcoming discussions on the principles and preconditions of good design of information systems.

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