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# Investigating the Link between Learning Style and IT-Appropriation

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## ABSTRACT

Individuals learn to use information technologies (IT) in many ways, and some ways are more effective than others. As organizations become more dependent upon IT, the need increases to understand how individuals learn to use IT effectively. In this paper we analyze eight theoretically sampled cases to discover patterns in learning to use IT. Extreme cases were selected in terms of age and IT-competency. Findings suggest that differences in dichotomous learning styles are associated with dichotomous differences in competency and usage behavior (appropriation), while age-based differences were less manifest. Implications for managers, designers, and researchers are discussed.

## Keywords

Appropriation, Learning Styles, IT-use, IT-learning, IT-ability, Digital immigrants, Digital natives

## INTRODUCTION

New IT capabilities are released at an increasing rate, to the effect that individuals and organizations find themselves adopting and learning to use these capabilities on a regular basis. We take here a broad view of IT to mean any combination of software and hardware that carries out digital information processing – anything from word processing to the use of cell phones. Just simply adopting an IT tool, or intending to adopt an IT, however, does not ensure proficiency or competency in their use (Petter et al., 2008, p. 130). Even the commonly used construct of computer self-efficacy (CSE) that reflects users' confidence of using IT effectively does not address how users actually learn to become effective in IT use (Bandura, 1982; Marakas et al., 1998). Consequently, there is a critical need to understand better how users become proficient and competent with new IT capabilities and what explains the variance in these outcomes. Understanding how users learn to use IT will lead to more efficient training of IT, adaptable tools, more competent users, and improved effectiveness of knowledge work. Thus, greater scrutiny is needed to understand the way users learn to use IT tools (DeLone and McLean, 2003, p. 16), and whether some ways are more effective than other ways.

To address these issues we investigate, *in situ*, learning and IT appropriation behaviors. Appropriation here refers to how technology is actually used to accomplish tasks, whether that usage is faithful to the intent of the IT-designers, or not (DeSanctis and Poole, 1994, p. 129; Orlikowski, 2000, p. 407). Research on learning styles abound in education and psychology literature (e.g., Kolb and Kolb, 2005; McCune and Entwistle, 2000; Pask, 1988), but relevant research in information systems (IS) on different learning styles has mainly focused on how IT impacts learning (e.g., Gulek and Demirtas, 2005) rather than showing how learning styles affect learning to use IT.

Users vary in many dimensions, but most relevant in the context of IT-learning and usage are age and competence: age, because currently individuals of all ages need to learn new technologies, and age has been shown to play a major role in human computer interactions and learning styles (Prensky, 2001, 2003, 2009); and competence, because competence varies greatly among users, and use without competence leads to poor outcomes. By investigating those who are competent, as well as those who are less competent, we can reveal differences and see patterns in their respective learning styles and IT-use.

In this study we address the following research questions:

- 1) What is the relationship between learning styles and appropriation?
- 2) How is learning and appropriation different between different kinds of users?
- 3) How, under what circumstances, and why do users appropriate?
- 4) How are users able to appropriate, or, what enables a user to appropriate?

## RELEVANT RESEARCH BACKGROUND

### Learning Styles

Our intention in reviewing learning styles is to provide theoretical foundation to categorize styles of IT-learning as evidenced by learning behaviors associated with IT use. Learning styles are thus perspectives and methods individuals employ to acquire skills and knowledge in concrete situations (Kolb and Kolb, 2005; Schmeck, 1988). They accordingly affect learning outcomes such as knowledge acquisition, retention, and comprehension related to IT and its use (Felder and Henriques, 1995; Perry, 1996). Multiple taxonomies of learning styles have been developed to account for different learning preferences and strategies as summarized in Table 1.

Learning Style	Description	Source
Diverging	Prefer feeling through concrete experience and watching through reflective observation	(Kolb and Kolb, 2005; Kolb, 1984; Kolb et al., 2001)
Assimilating	Prefer thinking through abstract conceptualization and watching through reflective observation	(Kolb and Kolb, 2005; Kolb, 1984; Kolb et al., 2001)
Converging	Prefer thinking through abstract conceptualization and doing through active experimentation	(Kolb and Kolb, 2005; Kolb, 1984; Kolb et al., 2001)
Accommodating	Prefer feeling through concrete experience and doing through active experimentation	(Kolb and Kolb, 2005; Kolb, 1984; Kolb et al., 2001)
Analytic	Tend to think things out rationally, logically, and carefully, and reflect on decisions made, learns step by step	(Kirby, 1988; Schmeck, 1988)
Field-independent	Makes specific concept distinctions with little overlap, has analytic perspective	(Witkin and Goodenough, 1981)
Field-dependent	Make broad general distinctions among concepts, see relationships, has global perspective	(Witkin and Goodenough, 1981)
Serialistic	Focus on operations and procedures to gain an understanding, work linearly at a low level	(Pask, 1988)
Holistic	Create conceptual maps or broad overviews of the learning situation and fill in the gaps later, maintain high level/global view of relationships in learning	(Marton, 1988; Pask, 1988)
Left-brained	Logical, sequential, rational, analytical, and objective thinker; looks at parts	(Kane, 1984)
Right-brained	Random, intuitive, holistic, synthesizing, and subjective thinker; looks at wholes	(Kane, 1984)
Atomistic	Focuses on detail, in isolation and in sequence	(Marton, 1988)
Sequential	Linear thinking process, learn in small incremental steps	(Felder and Henriques, 1995, p. 25; Gregorc, 1982)
Global	Holistic thinking process, learn in large leaps	(Felder and Henriques, 1995, p. 25; Kirby, 1988; Schmeck, 1988)
Random	Organize information in a nonlinear, galloping, leaping, and multifarious manner, chunks of information learned at a time	(Gregorc, 1982)

**Table 1. Learning Styles****Appropriation of IT**

Appropriation refers to how a user draws upon IT capabilities at hand to accomplish a task (DeSanctis and Poole, 1994, p. 129; Orlikowski, 2000, p. 407). Appropriations can also be faithful to the intent of the IT designers, or not (Sun and Fricke, 2009; Sun and Zhang, 2006). Studies on appropriation focus on ways users interact with and learn to use IT capabilities. Appropriation has been approached through multiple lenses, each summarized below.

*Adaptive System Use* explains that appropriation “includes dimensions such as trying new features..., feature combination (using two or more features together to perform a task for the first time), feature substitution (replacing a currently used feature with a new feature), and feature repurposing (using a feature in a way that is not intended by the developer)” (Sun and Fricke, 2009, p. 2).

*Enactment of IT structures* is an alternate way of looking at appropriation but nevertheless arrives at roughly the same conclusion as Sun & Fricke, namely: users can and do use IT as intended, but they also can use IT in ways unimagined by the designers “either ignoring certain properties of the technology, working around them, or inventing new ones that may go beyond or even contradict designers' expectations and inscriptions” (Orlikowski, 2000, p. 407).

*Adaptive Structuration Theory* (AST) is a “framework for studying variations in organization change that occur as advanced technologies are used” (DeSanctis and Poole, 1994, p. 122). According to AST, the way IT is used depends on its features and “spirit” of the IT (spirit is the “general intent” of the IT design), the organizational and intergroup contexts, and the evolving of the use of the IT (e.g., learning and adapting) (DeSanctis and Poole, 1994, p. 126).

*Technology Adaptation* proposes that discrepant events trigger appropriating behaviors, and appropriations occur in order to make adjustments that will lead to positive outcomes (Majchrzak et al., 2000).

**SAMPLING**

We sampled eight subjects who were treated as eight separate cases. Subjects were selected using theoretical sampling based on age and IT-competence (Brady and Collier, 2004; Glaser and Strauss, 2006; Ragin, 1989) (sampling at the extremes of the dependent variable and known influential independent variables in order to maximize variance) – see also (Pettigrew, 1990) for a good example of sampling at the extremes. According to Eisenhardt (1989), theoretical sampling should aim for 4-10 cases (p. 545). Our sampling resulted in four different user categories of two cases each: savvy digital natives, IT-impaired digital natives, savvy digital immigrants, and IT-impaired digital immigrants. Each subject participated in a semi-structured interview.

**DISCUSSION**

We will proceed by answering our research questions based on our analysis of the interview data.

1) *What is the relationship between learning style and appropriation?*

The way individuals prefer to learn seems to have a strong connection with whether they engage in appropriating behaviors. For example, all four IT-impaired individuals reported getting coaching to be their primary enabler of competency, and preferred step by step tutorials over high level conceptual maps. They even reported not wanting to know how things work, just how to work them. This type of learning harks back to the analytic, field-independent, serialistic, left-brained, and atomistic learning styles. This IT-impaired group also conformed uniformly with respect to ALL appropriating behaviors. They did not try new things, actively seek new ways of using IT, combine multiple IT for single tasks, repurpose IT, or use IT in ways unintended by the designers.

The savvy group was less uniform with regards to learning style, but completely uniform with regards to appropriating. The digital immigrants were classic cases of converging, field-dependent, holistic, right-brained, global, and random learning styles. The digital natives are harder to pin down to any of the dichotomous approaches to learning. They like understanding the big picture, but they also like jumping right in and trying things out and tinkering right at the get-go. They do not like step by step procedures or serialistic learning, but their first line of attack also is not to step back and reflect on the grand picture. Thus, whereas the savvy immigrants were clear cases of Kolb's converging learning style (prefer thinking through abstract conceptualization and doing through active

experimentation), the savvy natives were more akin to Kolb's accommodating learning style (prefer feeling through concrete experience and doing through active experimentation).

Perhaps the main difference between the savvy and IT-impaired groups with regards to learning style was the preference for serialistic learning. The savvy group all regarded step by step instructions or tutorials as a waste of time. One said that he would end up "not paying attention fairly early on in the process". The IT-impaired group depended on, and highly valued, step by step instructions and reported not being able to grasp things at this higher level when it comes to IT. Thus, there seems to be some support for saying that serialistic types of learning styles are not well suited for appropriating behaviors; whereas, global and holistic types of learning styles seem to be well suited.

## 2) *How is learning and appropriation different between different kinds of users?*

If we distinguish by age, we can see that learning for the natives is done first through tinkering and second through obtaining outside help. For the immigrants, learning is dependent upon ability. Savvy immigrants will try on their own, or through whatever materials are available (a bricolage approach), to develop a conceptual map of the mechanics of the IT. The IT-impaired immigrants will go straight to competent others ("coaches") to try to get step by step instructions. If we distinguish by ability, the savvy users prefer learning on their own, and the IT-impaired users prefer getting help from others. As for appropriation, it is only applicable to the IT-savvy users, regardless of age. Those who were savvy engaged in all forms of appropriation regularly and intentionally; whereas the IT-impaired users found appropriating laughable or incomprehensible.

## 3) *How, under what circumstances, and why do users appropriate?*

From our literature review on appropriation we can see *how* users appropriate i.e., through combining, repurposing, and trying out and actively seeking features of IT. These appropriation behaviors seem consistent with our findings, although, tinkering around and actively experimenting were also mentioned by the subjects as appropriating behaviors. The literature review also provides some support for *under what circumstances* individuals appropriate i.e., appropriation is triggered by novel situations, discrepancies, and deliberate initiatives, and are also enabled or hindered by the malleability or rigidity of the IT and the context of use. Subjects also mentioned the need to appropriate when the IT in use is not adequate for accomplishing the task at hand. For example, one subject mentioned that doing graphics in MS Word was a pain in the neck, so he would use PowerPoint as a graphics tool and then just import the graphics into Word. Task complexity was also a major trigger for appropriating; the more complex the task, the more appropriating had to be done, mostly in the form of combining IT. Another situation triggering appropriation is repetitive or long-term use of a feature. If the user repeatedly had to use a particular feature, this created an incentive to actively seek out a more efficient way to do it.

## 4) *How are users able to appropriate, or, what enables a user to appropriate?*

We have noted that serialistic learning styles are not conducive to appropriating; whereas, global or holistic learning styles seem to be very conducive – or at least, they seem to occur together. Why? Learning new IT is, in some ways, like finding your way around a new city. This analogy is fairly simple, but is worth explaining. Similar to navigating a new city, individuals find themselves navigating new IT quite often. Those who are able to gain a high level conceptual "map" of the underlying mechanics or relationships within the IT will be able to reconnoiter when the need arises and take multiple routes through a technology – there is no "one right way" for these users. They are also more likely to discover new paths since they are not restricted by step by step instructions on how to perform specific functions. These individuals are also more likely to feel comfortable using the IT in ways possibly not intended by the designer since they are aware of how the overall IT works and are not afraid to "break it", as one respondent said. This is analogous to being willing to step off the path, or stray from the directions when navigating a new city – a holist would be just fine doing this since she knows generally where she came from and where she's going; whereas a serialist would feel that such behavior is very risky since the instructions she has written down don't include these other paths. The serialist is more likely to get lost if she strays from known instructions.

Ability also seems to occur together with appropriation, and a lack of ability occurs with lack of appropriation. Is there some causal or temporal relationship here? *Does appropriating lead you to become savvy? Or does being savvy enable you to appropriate?* We cannot, at this point, answer this question with certainty. However, we are disposed to believe that they strongly interact. For example, the savvier I am, the more comfortable I feel engaging in appropriation, because I have more tools under my belt and a better understanding of how the IT works. Similarly, the more I appropriate, the more savvy I become because I am acquiring new tools and more understanding of the IT. The question is, then, if an individual has a certain type of learning style, is he doomed to

mediocrity? Our interviews indicate not. After the interview of one of the dentists (IT-impaired native), he commented.

*“You know, it’s interesting, because I have never really thought of it [technology] that way [that it was possible, or even an option to engage in appropriation]. But in other areas of my life, yeah, especially in dentistry, I understand that you do things a certain way generally, but that doesn’t mean they can’t be done a different way, and that doesn’t mean one instrument can’t be used for twenty different things.”*

Thus, in his area of expertise, he was very comfortable engaging in appropriation, and he saw things from a more holistic perspective; whereas with IT, he didn’t even consider appropriation, and he saw things from a serialistic perspective.

## **IMPLICATIONS AND CONTRIBUTIONS**

The contributions of this study are found in the implications for research and for practice. This section summarizes and discusses those implications, first for research, then for practice.

### **Implications for research**

Dichotomous learning styles seem to be well suited for studying IT learning. At least, when studying the extreme ends of the spectrum, clean dichotomous distinctions in learning processes and outcomes can be made. This clean distinction may grow muddier as less extreme cases are studied. As more diverse samples are examined, we may find that Kolb’s learning styles are more appropriate for categorizing users learning styles than using a simple dichotomous categorization.

Appropriation is a completely foreign behavior and phenomenon to some users. In our study we observed that only IT-savvy users engaged in appropriation. This implies that post-adoption research needs to take into account the ability or competence of the users being studied. Many studies do measure computer self-efficacy (CSE) (e.g., Bandura, 1982; Igarria and Iivari, 1995; Marakas et al., 1998); however, we found in our study that the digital natives all reported to having at least moderate CSE, even if they felt they were not competent computer users. Thus the measures of efficacy and competence capture two different beliefs. And, whereas competency occurred consistently with appropriation, CSE did not. This further implies that research specifically studying appropriation needs to distinguish between the types of users in their study with regards to IT-competence. Up to this point however, few studies on appropriation have focused on variance between users at an individual level.

Growing up around IT doesn’t necessarily determine competency. However, we had more difficulty finding young IT-impaired users than old IT-impaired users. The implication here is that while there do seem to be some minor differences between age with regards to learning and using IT, these differences can be overcome through appropriation. For example, while the IT-impaired immigrants used computers regularly and extensively, just like the savvy immigrants, exposure and usage was not enough to increase their competence. The difference between these two groups was in *how* they used IT – i.e., did they engage in appropriation or not.

Interestingly, questions about adoption had the least convergence within groups, which implies that adoption motivations, intentions, beliefs, and behavior seem to have no bearing on whether the user will become competent with the technology. For example, even if a user reports that she believes a technology will be easy to use and useful, and that she intends to use it, this does not mean that when she uses it she will be a competent user. Thank goodness the drivers’ test at the department of motor vehicles includes measures more useful than attitude and beliefs about driving!

We have also observed that adoption constructs seem to have little to no bearing on post-adoption learning and competency. IT adoption has been extensive and its use is now unavoidable in modern organizations. Consequently, the issue of individuals’ adoption of IT, though still important, is being replaced by questions of whether individuals can use IT effectively (Benbasat and Barki, 2007, p. 215; DeLone and McLean, 2003, p. 16; Lucas and Spitzer, 1999; Sun and Fricke, 2009). In this context our findings are encouraging and call for new and different type of research related to IT use and learning.

## Implications for practice

Appropriators use high level understanding to see their way through IT tasks, and would prefer to not have step by step instructions. Further, step by step instructions offer a “crutch” to those who do not spend the time to obtain a high level understanding. This crutch may actually be a ball and chain preventing them from understanding the IT at a more holistic level. Thus, designers of IT may want to consider how to enable and encourage high level learning and usage. For example, providing diagrams and conceptual maps for interrelated functionality may help users gain a quick grasp on the underlying mechanics and purpose of the IT. Increasing transparency of purpose for functionality and increasing visibility of functionality will also enable appropriation as users may be more likely to try new functionality if it is visible to them. For example, using a visual menu (like the Microsoft Ribbon system) as opposed to a traditional drop down list menu system will put more functionality in the clear view of the users. Using descriptive icons that reveal their functionality will also facilitate experimentation. Making all actions clearly undoable, may also tend to encourage appropriation through experimentation. Many widely used programs have implemented these kinds of features (e.g., office productivity software, operating systems, browsers), but niche software, such as statistics packages, math modeling, media editing, engineering tools, and so on, still lag behind despite the complexity of their functionality.

Appropriation is a good thing – at least, it seems to occur consistently with other good things, like competence. DeSanctis et al (1994) report that while unfaithful appropriations are not bad or wrong, faithful appropriations result in higher task technology fit, which has been shown to improve individual performance (Goodhue and Thompson, 1995). Despite these previous findings, we suggest that appropriations, whether faithful or unfaithful, will contribute to individual competency with the IT. As a user appropriates, he will gain a better understanding of what he can and can’t do with a technology and what the technology can be used for. Therefore, appropriation should be encouraged from a design standpoint and a managerial standpoint.

Appropriators all reported regularly (even daily) creating helps, aids, tools, and tutorials for others. Appropriators are high contributors, helpers who simplify tasks for others, decrease others’ workloads, and do it voluntarily “off the clock”. These are the kind of employees you want to have in your organization to keep things running, and to innovate new tools and processes to make work easier. Thus, when implementing IT in organizations, training should be formatted in such a way as to encourage appropriation (which is rarely done). With the increases in unfaithful appropriations (employees using IT in ways possibly not intended), business IT needs to be more flexible, robust, and less “breakable” so that errors can be made by users without affecting the system or their work.

We have appropriated (pun intended) the vast literature on learning styles to IT learning. We have found the dichotomous styles appropriately applicable to IT learning and usage, and we have made efforts to explain the possible reasons behind this connection. This new connection between learning styles and IT learning opens up a new rivulet for research in post-adoption IT usage. Along these lines, we have also observed effective and defective methods for IT learning; namely, that holistic learning methods work better than serialistic methods for building competence in IT usage.

## CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

In this study we studied eight cases of competence and learning which indicate that effective IT use seems to be associated with individual learning styles and appropriation behaviors. Dichotomous distinctions in learning styles seem to be appropriate for explaining the distinction between learning styles of IT users. The holistic, global learning styles seem to be more conducive to appropriation behaviors. In our study, only the savvy IT users engaged in appropriation. Age showed little effect on the method of learning and use of IT. Questions of adoption showed very little convergence within and between groups of IT users by age or by competence. In this study we have also begun to explore *why* users appropriate and what, within the user, enables the user to appropriate.

One limitation of this study is that only extreme cases were sampled. This provides a good method for discovering similarities within and between the two ends of the spectrum, and still allows for formulating a more generalizable theory (Brady and Collier, 2004; Eisenhardt, 1989; Ragin, 1989), but does not allow for the theory to be generalized across the whole population. Thus, future research may want to follow up with a quantitative analysis to confirm the relationships observed in this study can be generalized to other parts of the population. Another limitation of this study is the self-reported self-perceptions of self-behavior. It is possible that case subjects may have over-reported “good” behaviors, and under-reported “bad” behaviors. However, we do not believe this limited our study, as case subjects were open, honest, and frank about their responses, and many reported “bad” behaviors.

Lastly, the appropriators all reported regularly using discretionary time to create tools, helps, and aids for others. This practice of creating helps and tools encourages better understanding on the part of the tool maker. Often the tools that are made are also used to automate processes or reduce complexity. Thus, the appropriators are also skunk works innovators. Future research may want to explore the relationship between appropriation and innovation. Some work has already been done in this vein by McGann and Lyytinen (McGann and Lyytinen, 2005, 2008, 2010), who found individual *improvisations* with IT to lead to organizational change. If appropriation truly leads to innovation, appropriation is something organizations will want to strive for in their employees.

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