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# Examining the Role of the Communication Channel Interface and Recipient Characteristics on Knowledge Internalization

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## ABSTRACT

Recent reviews of the HCI literature acknowledge that the effect of the IT interface on individual learning has received limited attention in the past, and should be the focus of future research. At the same time, a review of the knowledge transfer literature also suggests a limited examination of the factors affecting the latter phase of transfer (i.e., knowledge internalization and recipient learning). The current manuscript attempts to bridge the HCI and knowledge transfer literatures by empirically examining the effect of the communication channel interface and the recipient's characteristics on the recipient's knowledge internalization.

## Keywords

Knowledge internalization, Media Synchronicity Theory, communication channel interface, recipient.

## INTRODUCTION

While research in the area of human-computer interaction (HCI) has grown exponentially in recent years (Zhang and Li 2005; Siau 2005), in their review of the HCI literature, Zhang and Li (2005, p. 254) concluded that the focus of current research has been predominantly on understanding the impact of IT use on "cognitive beliefs and behavior," "performance/production," and "attitude and satisfaction with IT," with very limited research on other critical issues related to the user-IT interaction such as the effect of the IT interface on knowledge transfer and individual "learning."

On the other hand, in spite of the realization among knowledge transfer researchers that due to a wide variety of factors such as features (or interface) of the communication channel being used (Kwan and Cheung 2006; Daft and Lengel 1986), the sharing of knowledge and the subsequent learning can become "laborious, time consuming, and difficult" (Szulanski 2000, p. 10), there have not been any systematic investigations into the effect of the communication channel characteristics on knowledge sharing and learning. The current manuscript attempts to address this void by examining *the effect of the features of the communication channel on the extent of an individual's knowledge internalization*. In addition, past research on knowledge transfer (Szulanski 2000, p. 13) also argues that "the attributes of the recipient are ..

important." Thus, in this manuscript, we also examine *the effect of the recipient's characteristics on his/her extent of knowledge internalization*.

## THEORETICAL BACKGROUND

### Knowledge Internalization

While knowledge internalization has typically been viewed, or measured as a form of learning (or absorption) by the recipient (Szulanski 2000; Davenport and Prusak 1998), recent researchers have suggested that knowledge and its internalization be viewed more as "knowing," which can only be understood as "concrete ... human action." Prior researchers specifically emphasize that in order to understand what a recipient has learned as a result of the transfer, it is not only important to assess what knowledge they "possess", but also to examine "what they do" or how they apply it (Cook and Brown 2002, pp. 78-79). Thus, in this study, we examine both what they "know or possess" as a result of the knowledge internalization process, and how they "apply" that knowledge. We believe that this is an important contribution since prior research acknowledges that "improved practice" is not always the "product of acquiring more knowledge," but a result of "using knowledge already possessed" (Cook and Brown 2002, p. 79).

### Channel and Recipient Characteristics

Previous literature examining the transmission channel and its impact on the extent of knowledge transferred has suggested that "richer transmission channels ... [result] in greater success in knowledge transfer" (Kwan and Cheung 2006; Daft and Lengel 1986). However, recently the "richness" concept has been criticized with IS researchers rejecting the idea that richness is an "invariant, objective" property of the communication channel, and that higher use of a rich medium can have positive outcomes (Ngwenyama and Lee 1997, p. 148).

Dennis and Valacich (1999) proposed the media synchronicity theory (MST), and argued that the richness of the channel depends not only on its characteristics, but also on its "information processing capabilities." Given that MST provides researchers with a more robust definition of the concept of "richness," and a comprehensive taxonomy of channel characteristics with

which to evaluate various media, we draw on MST in this study. The five specific channel characteristics proposed by MST are: (1) Immediacy of Feedback, (2) Symbol Variety, (3) Parallelism, (4) Reprocessability, and (5) Rehearsability (Dennis and Valacich 1999). Among these five characteristics, *symbol variety* and *reprocessability* tend to affect the recipient's learning (Dennis and Valacich 1999). Thus, in examining the role of the channel, we specifically focus on these two characteristics.

Prior research has identified several recipient-related characteristics that are critical to knowledge internalization and learning, notably, the recipient's *absorptive capacity* (e.g., Matusik and Heely 2005; Cohen and Levinthal 1990). Further, the recipient's *motivation* to encode and internalize new knowledge has also been identified as an important factor (e.g., Szulanski 2000; Hayes and Clark 1985), however, limited research has investigated its effect. Thus, in this study, we focus on the role of the two above-mentioned characteristics on knowledge internalization.

### Hypothesis Development

MST researchers propose that the symbol variety and the reprocessability of a channel results in a higher degree of information processing on the part of the *recipient* (e.g., Dennis and Valacich 1999, pp. 2-3). Symbol variety is defined as the "height of the medium" or the number of ways in which information can be communicated. On the other hand, reprocessability refers to the "extent to which a message [or information] can be reexamined or processed again." Knowledge that is conveyed through a large number of symbols (i.e., high symbol variety), and can be reexamined by the recipient several times (i.e., high reprocessability), will not only result in the transmission of a higher volume of knowledge, but will also enhance the recipient's ability to process and apply that knowledge. Thus, we argue:

H1: *The symbol variety of a channel will positively affect the extent of knowledge internalized by a recipient (both in terms of what they possess and how they apply it).*

H2: *The reprocessability of a channel will positively affect the extent of knowledge internalized by a recipient (both in terms of what they possess and how they apply it).*

Absorptive capacity of the recipient has often been associated with higher knowledge transfer (e.g., Szulanski

2000; Cohen and Levinthal 1990). Absorptive capacity has been defined as the recipient's "ability to exploit outside sources of knowledge." Szulanski (2000, p. 12) argues that high absorptive capacity demonstrates a recipient's readiness in "discarding old practices" and building new ones, and in reaping "the rewards of a transfer" by applying the new knowledge. Thus, we argue:

H3a: *The recipient's absorptive capacity will positively affect the extent of knowledge internalized (both in terms of what they possess and how they apply it).*

We also argue that the characteristics of the channel will play a moderating role on the relationship between absorptive capacity and the extent of knowledge internalized, specifically, the recipients' ability to apply that knowledge. For example, a channel that provides the recipient with high symbol variety and the ability to reprocess the knowledge/information will augment a recipient's low absorptive capacity, and increase their ability to apply their new knowledge. Thus:

H3b: *Symbol variety will moderate the relationship between absorptive capacity and the extent of knowledge internalized by a recipient (especially, their ability to apply that knowledge).*

H3c: *Reprocessability will moderate the relationship between absorptive capacity and the extent of knowledge internalized by a recipient (especially, their ability to apply that knowledge).*

As discussed earlier, motivation has been identified as an important factor affecting knowledge internalization. Motivation of the recipient has been viewed/defined as either intrinsic or extrinsic (Brock and Kim 2002) or as a more complex domain specific construct such as motivation to *learn* composed of an individual's subjective competence, perceived relevance of the material, task attractiveness, and interest in the subject (Bures, Amundsen, and Abrami (2002). Irrespective of how motivation is viewed or defined, Szulanski (2000, p. 12) argues that recipient's lack of motivation not only leads to their "passivity" and "feigned acceptance," of the new knowledge they have received, but would also result in poor "use" or application of that new knowledge. Thus:

H4: *Motivation to learn will positively affect the extent of knowledge internalized by a recipient (both in terms of what they possess and how they apply it).*

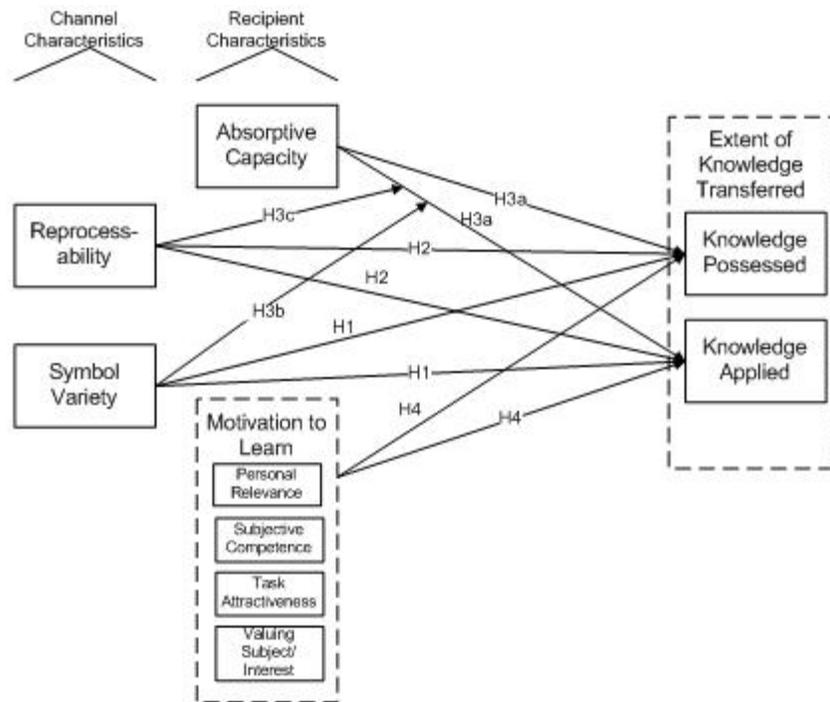


Figure 1. Research Model

**METHOD**

An experimental study involving the manipulation of symbol variety and reprocessability was conducted to test the model. The sample consisted of 284 undergraduate students (33.4% females and 66.6% males) enrolled in an introductory MIS course at a large US University.

**Procedure**

Online activity diagramming tutorials manipulating symbol variety and reprocessability were created. The low symbol variety condition presented the tutorial in a text only format. The high symbol variety condition presented the tutorial with the same text (as the text only condition), but also included images of the different components of activity diagrams. Reprocessability was manipulated by allowing participants to keep the tutorial window open on the desktop as they worked on the activity diagramming task (i.e., high reprocessability), or by disabling the browser’s back button and erasing the URL, such that participants were unable to retrieve the tutorial once they had reviewed it (low reprocessability). During the experimental sessions, participants were randomly presented with one of the four on-line tutorials mentioned above. After completing the tutorial, participants were given the narrative of a business process and asked to draw an activity diagram to represent it. After completing the activity diagram, participants responded to an online survey assessing the strength of the manipulations, their absorptive capacity, motivation to learn, and extent of knowledge internalized.

**Measures**

Absorptive capacity was measured using three items adapted from Szulanski et al.’s (1996) scale. Motivation to learn was measured using Bures et al. (2002) instrument, which consisted of four sub-constructs: subjective competence, personal relevance, task attractiveness, and valuing interest. Extent of knowledge “possessed” was assessed using a perceptual measure, seven self-reported items (four drawn from Ko et al. (2005) and Sarker et al. (2005), and three newly developed items). Knowledge “applied” was measured by an objective assessment of the quality of participants’ activity diagrams by two independent raters (inter-rater reliability was over .80. The average of the two raters’ ratings was used as a measure of knowledge “applied.”

**Results**

PLS-Graph Version 3.00 was used to analyze the data which enabled us to assess the validity and reliability of the measurement model, and the significance of the hypothesized relationships. Results of the confirmatory factor analysis indicated adequate convergent and discriminant validity. Specifically, all items loaded significantly on their respective constructs, the composite reliabilities of each of the constructs were above .70, and the square root of the Average Variance Extracted (AVEs) of a construct exceeded all correlations between that factor and other constructs within the study (Gefen and Straub 2005).

In the following phase of the analysis, the significance and strength of the hypothesized relationships were examined. To test the moderating effects, the interaction terms were created following the approach suggested by Chin et al. (2003).

Motivation to learn was modeled as a second-order factor, where a hierarchical component model using repeated manifest variables was created (Chin et al. 2003). The path coefficients from Motivation to Learn to its four dimensions ranged from .59 to .84 suggesting that "motivation to learn" is indeed indicated by the underlying first order factors.

To assess the strength of the manipulations, we administered two items to the participants, one for each manipulation. Results indicated that there was a significant correlation between the participants' assessments of the manipulations and the actual manipulations (symbol variety:  $r = .376, p < .01$ , reprocessability:  $r = .299, p < .01$ ).

Results provided strong support for most of the hypothesized relationships in the model. We summarize the results in Table 1.

**DISCUSSION**

As indicated in Table 1, results did not provide strong support for the prediction that reprocessability will significantly affect the extent of knowledge internalized. One possible reason for this is the fact that there was little delay between the presentation of the knowledge and the performance of the task. This could have led to little (or no) deterioration of the encoded knowledge, even for those who were in the low reprocessability condition, and therefore contributed to the lack of a significant effect of reprocessability. We believe that the effect of

reprocessability will become more pronounced after a time delay between presentation of the knowledge and performance of the task, when those in the high reprocessability condition will retain more of the knowledge than those in the low reprocessability condition.

Overall, we believe that the study makes some significant contributions to both the literature on knowledge transfer and HCI. The study enhances prior and limited research on the role of channel and recipient characteristics on knowledge transfer in the following ways: 1) it draws on more contemporary literature on channel characteristics, and illustrates the effect of media characteristics on knowledge internalization, which we believe, has not been examined before; and 2) is one of the first to empirically examine the effect of channel and recipient characteristics on both the knowledge "possessed" by the recipient and the knowledge "applied" by the recipient. The study's focus on the critical role of the dimensions of the IT interface (i.e., symbol variety and reprocessability) on the knowledge recipient's learning makes an important contribution to the rich body of HCI literature, where the impact of IT on individual learning has received very little attention (Zhang and Li, 2005). We would also like to note that this study makes some important methodological contributions, especially in the domain of research on communication channel characteristics. While the theoretical concepts of MST have been widely adopted within the IS discipline, this study is among the first to specifically manipulate the characteristics proposed by MST, and empirically examine their effects. In any case, there is much to be learned about the role of IT on an individual's knowledge internalization, and we hope this study makes some progress towards that objective.

| H#  | Independent variable                   | Dependent Variable            |                                  |
|-----|--|-------------------------------|----------------------------------|
|     |  | Knowledge Possessed<br>(Beta) | Knowledge Internalized<br>(Beta) |
| H1  | Symbol variety                         | .141***                       | .391***                          |
| H2  | Reprocessability                       | .059*                         | .081*                            |
| H3a | Absorptive capacity                    | .509***                       | -.041 <sup>ns</sup>              |
| H3b | Symbol variety * Absorptive capacity   | Not hypothesized              | -.219**                          |
| H3c | Reprocessability * Absorptive capacity | Not hypothesized              | .035 <sup>ns</sup>               |
| H4  | Motivation to learn                    | .235***                       | .110**                           |

\*\*\* -  $p < .01$ ; \*\* -  $p < .05$ ; \* -  $p < .10$ ; <sup>ns</sup> - not significant

**Table 1: Results of Hypothesis Testing**

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