The Mediating Role of Curiosity in Stimulating Creative Use of IT

Abstract

Creative use of IT can enhance organizational performance. It is essential to identify factors influencing the creative use of IT. Based on self-determination theory, this study investigates the mediating role of employees' curiosity in the relationships between inherent psychological needs (perceived autonomy support, perceived IT competence, and perceived relatedness) and employees' creative use of IT. By using quantitative method, this study develops a model regarding creative use of IT. To test the model, surveys are distributed to employees working for organizations located in one of the biggest city in Vietnam. The results indicate that curiosity has partial mediation in the relation between inherent psychological needs (perceived autonomy support, perceived IT competence, and perceived relatedness) and creative use of IT. The findings of this paper are expected to shed a new light into the study of users' behavior especially in their creative use of IT. This paper also provides valuable insight to practitioners on how to improve their employees' creative use of IT.

Keywords: Creative use of IT, Curiosity, Self-determination theory, Perceived autonomy support, Perceived IT competence, Perceived relatedness.

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1. Introduction

Information technology (IT) enables firms in strategic changing and a source of strategic advantage for organizations in the past few decades. However, as IT becomes increasingly commoditized in organizations, some researchers are now openly questioning its strategic value and contend that it is not IT per se (Carr, 2003). The deciding factor is how IT is being used in the organizations (Li et al, 2006). It is now commonly accepted that adopting IT is only partially about using it to accomplish a task for which it was designed. Rather, adoption IT also entails transformation of an initially alien and impersonal artifact into something practical and personal by modifying and repurposing it (Salovaara, 2011). One cornerstone of adoption is a creative everyday act wherein a user invents and adopts a new use of IT. For example, digital cameras are appropriated in surprising ways, as "periscopes" at rock concerts and as "scanners" of paper documents. Creative use has potential economic implications (Jasperson et al., 2005). Therefore, understanding how users employ IT in creative ways is essential for organizations; yet this issue is under-researched. Previous research have identified a variety of motivational factors leading to creative behaviors (Agarwal and Karahanna, 2000; Ahuja and Thatcher 2005; Burton-Jones and Straub, 2006; Sundaram et al., 2007). We argue that curiosity, a type of intrinsic motivation, is particularly relevant in the context of innovative use of IT. This is because to creatively use the existing IT, the users are involved in an intensive learning process to investigate and obtain new information about IT's affordance (Burton-Jones and Grange, 2013; Zhao et al., 2011). This learning process requires an ardent aspiration to not only understand the composition of the IT being used but also leverage the composition of that IT constructs to improve the ability to use it (Burton-Jones and Grange, 2013).

For this purpose, self-determination theory (SDT) is employed in this study as a theoretical lens to examine environmental factors that induce curiosity. SDT is an approach that is used to study human motivation and personality development. Although, its objective is the investigation of people's inherent growth tendencies and innate psychological needs, SDT is concerned not only with the specific nature and development of positive tendencies but also the social environments that are conducive to them. SDT argues that maintenance and enhancement of positive behavioral tendencies requires supportive conditions, as they can be readily disrupted by various non-supportive conditions. Specifically, SDT argues that intrinsic motivation such as curiosity is more likely to flourish in contexts characterized by a

sentiment of autonomy, feelings of competence, and a sense of relatedness (Deci et al., 2001).The purpose of this study is twofold. First, it aims to investigate the role of curiosity in stimulating creative use of IT. Second, this study intends to identify the contextual factors for facilitating optimal functioning of the propensities for curiosity from an SDT perspective.

2. Theoretical background and hypothesis development

2.1. Creative use of IT

Mills and Chin (2007) developed the concept of "Creative Use" to describe "the implementation of novel and useful ways of applying organizational systems to solve business problems. In this study, we defines creative use of IT as users' application of system features in novel ways to support their task performance, thereby enabling them to explore the value potential of implemented IT more fully (Jasperson et al. 2005). It means that users can use one feature or function of IT to complete multiple tasks or they also can use multiple features of system to finish one task as well as multiple tasks. Sometimes, with minor changes or different thinking the users can use simple and available functions to finish their tasks more effectively.

2.2. Perceived autonomy support

According to Deci and Ryan (2002) perceived autonomy support refers to one's desire to feel that his/her action is volitional and done freely. In other words, perceived autonomy support can be defined as the extent to which the user perceives the organization has supported them, such as spiritual support and material support (Zhao et at., 2011). Spiritual support refers to the positive attitude and encouragement from company. When IT use is encouraged by company, users will consider their actions as permitted and commended. Thus, they are more likely to get highly involved in the activities rather than worrying about being blamed. Given the right conditions and stimuli, users will be more inclined to generate and implement creative ideas of using IT (Mills and Chin, 2007). Thus, we propose that:

- *H1: The perceived autonomy support has positive impact on creative use of IT.*

2.3. Perceived IT competence

Perceived IT competence is the abilities to perform specific IT tasks for diverse applications. It is a predictor of actual behaviors and is widely applied in IT usage-related research (Compeau and Higgins, 1995). Individuals with high IT competence enjoy using IT at a higher degree and experience less anxiety. A positive perception of ability will be more likely to induce intrinsic motivation than a negative perception of ability. Competence can reduce the anxiety of technology use, and individuals will feel more comfortable about using the IT. Therefore, we propose that:

- *H2: The perceived IT competence has positive impact on creative use of IT.*

2.4. Perceived relatedness

Bhattacherjee (2000) also classified social influence into external influence and interpersonal influence. External influence involves informational influence such as mass media reports, expert opinions and other non-personal information, while interpersonal influence includes word-of-mouth influence by friends, colleagues and superiors. However, in our study context we will just focus on interpersonal influence. Ryan and Deci (2000) posit relatedness plays an important role as individuals are inclined to be intrinsically motivated when they are in a secure and supportive environment. If in the same company, some users use IT in creative ways, or if the advisors have experiences in using IT in creative ways, other users would also be affected to use IT creatively, because for users, supervisor and colleagues are important sources of personal influence. So, we predict that:

- *H3: The perceived relatedness has positive impact on creative use of IT.*

2.5. Curiosity

Curiosity can be defined as the recognition, pursuit, and intense desire to explore novel, challenging, and uncertain events. When curious, we are fully aware and receptive to whatever

exists and might happen in the present moment. Curiosity motivates people to act and think in new ways and investigate, be immersed, and learn about whatever is the immediate interesting target of their attention (Litman, 2005). The more organization encourages users or provides enough technical support (hardware, software, and facilitates) to encourage them to use particular type of IT in creative ways, the more curious they are, since they may feel that maybe there are potentials for something new. Moreover, the more people feel IT is easy to use, and does not require mental effort to use, the more it helps them to arouse their curiosity. In addition, most of users' works in organization involve interaction with other people, including with their boss or colleagues. Users can be influenced by the surrounding people's actions as they listen to what people say or observe what people do, and they may be intrigued and have questions when they want to decide whether they should follow other people to pursue creative use of IT or not. Therefore, the hypotheses related to curiosity were posited:

- *H4: The perceived autonomy support has positive impact on curiosity.*
- *H5: The perceived IT competence has positive impact on curiosity.*
- *H6: The perceived relatedness has positive impact on curiosity.*

Users that will apply creative use of IT have a desire to learn more about those around them. They take in their surroundings, the inner workings of the society as well as its needs and therefore are able to develop new ways to use IT that facilitates their tasks. When curious, people ask questions (Peters, 1978), manipulate interesting objects (Reeve and Nix, 1997), read deeply (Schiefele, 1999), examine interesting images (Silvia, 2005), and persist on challenging tasks (Sansone and Smith, 2000). Therefore, if the users think about new ways to use IT which have not been applied, they are willing to find the new solution. In other words, the more curious a user becomes when using IT, the more creative he/she may in using the IT. Thus, we propose that:

- *H7: Curiosity has positive impact on creative use of IT*

Creativity research also suggests two relevant lenses for studying individuals' creativity: personality and environment (Ahuja and Thatcher, 2005). Given the right conditions and stimuli, all individuals have the potential to generate and implement creative ideas in some domain (Amabile, 1983). However, in some cases, even though the company provides enough support for users, and users are surrounded by people that recommended and encouraged them to apply their ideas, or users have high IT competence, they still won't apply IT in creative ways if they found that they are not driven to find a new solution in using IT. Even if users receive ideas or suggestion from their surrounding people, there is nothing to guarantee that they will follow their friends or colleagues' ideas to use IT in creative ways. Thus we posit that there is indirect relationship between creative use of IT and the perceived autonomy support, perceived IT competence, perceived relatedness. Moreover, we argue that curiosity plays a mediating role in this relation. The curious persons are naturally motivated to discover new ways of problem solving in order to adapt successfully and continually (Reio, Wisewll, and Thongsukmag, 2006). Therefore, despite the availability of resources, if the users are not curious, it is difficult to lead them to use IT in creative manner. Moreover, if users, who have IT ability and work in favorable working condition, are not curious, they may also not use IT in creative ways. Therefore, we propose that:

- *H8: Curiosity mediates the relation between perceived autonomy support and creative use of IT*
- *H9: Curiosity mediates the relation between perceived IT competence and creative use of IT*
- *H10: Curiosity mediates the relation between perceived relatedness and creative use of IT*

Based upon the above theories, we propose our research model in Figure 1. As the figure shows, we assume perceived autonomy support, perceived IT competence, and perceived relatedness to affect users' curiosity. Furthermore, we posit that curiosity influences creative use of IT. In addition, in this model we consider two control variables which are task complexity and technology flexibility.

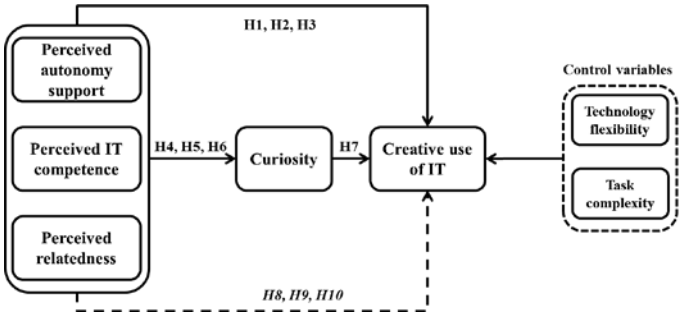

Figure 1. Research framework

3. Methodology

3.1. Sampling

A questionnaire package, including a cover letter and the questionnaire, was sent to 1000 randomly selected employees who are working for companies in Danang City of Vietnam. Demographic features of the sample are shown in Table 1. Since the complexity of task and the flexibility of system are believed to influence the creative usage, these are included as control variables in the analysis.

Table 1: Demographic information

Items	Categories	Number	Percentage
Age	Less than 20	3	3
	20-35	104	87
	36-50	12	10
	More than 50	0	0
Gender	Male	56	48
	Female	63	52
Computer experience	Less than 1 year	3	3
	2-3 years	6	5
	4- 5 years	6	5
	6-7 years	15	12
	More than 8 years	89	75
Highest education	High school	3	3
	Bachelor	74	62
	Master	36	30
	Higher than Master	6	5
	Other	0	0
Total sample size: 119			

3.2. Measurements

To ensure the reliability and validity of the constructs, we selected most of the items from the existing studies. These items were measured with five-point Likert scales ranging from "strongly disagree" to "strongly agree". The items used to measure each variable are in English and listed in Table 2.

Table 2: Research variables and measurements

Constructs	Items
Perceived autonomy support (PAS) (Adapted from Igbaria et al., 1996 and Taylor and Todd, 1995)	My company always encourage me to use existing IT **(PAS1)** My company are providing most of the necessary assistance and resources for us to get used to existing IT quickly **(PAS2)** I am always supported and encouraged by my company to make decision related to use existing IT **(PAS3)**
Perceived IT competence (PIC) (Adapted from Hsu and Chiu, 2004)	I feel comfortable using existing IT on my own **(PIC1)** I can easily operate existing IT on my own **(PIC2)** I understand how to use existing IT even if there was no one around to help me **(PIC3)**
Perceived relatedness (PR)	My peers/colleagues/friends think that I should use the existing IT **(PR1)**

(Adapted from Martins and Kellermanns, 2004)	People I know think that using existing IT was a good idea**(PR2)** People I know have influenced me to try out existing IT **(PR3)**
Curiosity (CU) (Adapted from Huang, 2003**)**	Using the IT excites me to explore more functions**(CU1)** Using the IT makes me want to investigate more functions**(CU2)** Using the IT arouses my imagination about other functions**(CU3)**
Creative use of IT (CUT) (Adapted from Ahuja and Thatcher, 2005)	I have discovered new uses of existing IT to enhance my work performance **(CUT1)** I have used existing IT in novel ways to support my work **(CUT2)** I developed new methods/ways based on existing IT to support my work **(CUT3)**

4. Data analysis and results

We used partial least squares (PLS) analysis to test the items' reliability, convergent validity, and discriminant validity (Chin, 2001). The results of Table 3 show that all constructs have high reliability since the factor loadings are greater than 0.70. There are no measuring elements that should be deleted because the ICT of all measurements are greater than 0.30. Moreover, we also found that all AVE are greater than 0.5 and CR greater than 0.7. So, it is concluded that the measurements also have high convergent validity and discriminant validity. In addition, as shown in table 4, most constructs have good distribution because the skewness is less than two and kurtosis less than five.

Table 3: Standard loading, item-construct correlation, and reliability estimate

Constructs	Items	Factor loading	t-statistic	ITC
Perceived autonomy support	PAS1	0.903	46.424	.575
Alpha: 0.933	PAS2	0.961	42.752	.643
	PAS3	0.944	45.439	.535
Perceived IT competence	PIC1	0.892	53.263	.637
Alpha: 0.828	PIC2	0.854	55.364	.613
	PIC3	0.830	52.435	.535
Perceived relatedness	PR1	0.780	45.973	.533
Alpha: 0.752	PR2	0.878	56.587	.655
	PR3	0.757	47.383	.443
Curiosity	CU1	0.7911	45.896	.679
Alpha: 0.923	CU2	0.943	44.546	.633
	CU3	0.939	41.946	.579
Creative use of IT	CUT1	0.926	48.708	.702
Alpha: 0.926	CUT2	0.932	50.178	.642
	CUT3	0.942	46.454	.660

All significant at p< 0.05

Table 4: Skewness, kurtosis, CR, square roots of AVE, and construct correlation

Construct	Mean	M3	M4	CR	PAS	PIC	PR	CU	CUT
PAS	3.829	-.564	0.151	0.955	**.936**				
PIC	4.00	-1.232	3.104	0.894	.596	**.909**			
PR	3.91	-0.889	1.967	0.848	.540	.510	**.867**		
CU	3.722	-0.665	0.809	0.951	.222	.289	.470	**.960**	
CUT	3.952	-1.0130	1.628	0.953	.236	.531	.399	.768	**.962**

Note: Diagonal elements (bold) are the square root of AVE between the constructs and their measures.
Off-diagonal elements are correlations between constructs.
M3: Skewness; M4: Kurtosis.
K-S: Kolmogorov-Smirnov statistic with Lilliefors significance correction (all p > .05)

By applying the bootstrapping technique (N = 1000) (Jorg et al., 2009), the path estimates and t-statistics were calculated for the hypothesized relationships. Three models were tested. Model 1 consisted merely of control variables, technology flexibility (TF) and task complexity (TC), while Model 2 consisted of all predictors or testing the relation between independent variables (perceived autonomy support, perceived relatedness, and perceived IT competence) and dependent variable (creative use of IT). Model 3 fully tested all variables included in Model 1 and Model 2, and the mediating variable – curiosity.

Table 5 presents the standardized regression coefficients (β), R^2, change in R^2 ($^{\Delta R2}$), and effect size. TF and TC account for about 8% of the variance explained for CUT. Model 2 accounts for 44% of the variance in CUT. In addition, the magnitude of the effect size has a direct impact on the power of the statistical test and helps researchers determine whether the observed relationship is meaningful (Hair et al., 2010). The effect size and significance of the change in variance explained between models were then measured by an f^2 statistic,

formulated as $(R_2^2 - R_1^2)/(1 - R_2^2)$, where f^2 of .02, .15, and .35 have been suggested to pertain to small, moderate, and large effect sizes, respectively (Cohen, 1988). By adding three SDT factors, R^2 of model 2 increases by 36% in variance explained. R^2 increases significantly ($f^2 = 0.65$, $F = 40.54$, $p < 0.001$), suggesting that organizations environment play an important role in explaining creative use of IT. Model 3 established for detecting mediating effects accounts for 74% of the variance of creative use of IT, increasing by 30%. R2 increases significantly ($f^2 = 1.12$, $F = 40.54$, $p < 0.001$), indicating the presence of mediation effects.

With regard to the hypothesis testing, as shown in Table 6, while H2, H3, H5, H6, H7 and H9 are supported, H1,H4, H8, and H10 are not (Model 2 and Model 3). This means that curiosity does significantly impact creative use of IT and mediates the relationship between perceived relatedness and creative use of IT. However, curiosity has no mediating effects on the relation between perceived autonomy support, perceived IT competence, and creative use of IT. The results also show that while perceived relatedness and perceived IT competence does affect curiosity, perceived autonomy support has no influence on curiosity. In regards to control variables, while task complexity is shown to have significant positive impact on creative use of IT, IT flexibility does not impact creative use of IT (Model 1).

Table 5: Alternative model, R^2, and effect size

Structural paths	Model 1		Model 2		Model 3	
	β	T-Statistic	β	T-Statistic	β	T-Statistic
TF → CUT	-0.247	3.028	-.325	4.230	-.126	2.071
TC → CUT	**0.140***	1.388	-.065	0.6454	-.096	1.390
PAS → CUT			-.233	2.588	-.133	1.730
PIC → CUT			**.476*****	3.413	**.440*****	4.594
PR → CUT			**.405*****	3.127	-.0003	0.041
PAS → CU					-.094	0.751
PIC → CU					**.108***	0.766
PR → CU					**.467*****	3.152
CU → CUT					**.673*****	9.294
R^2	0.082		0.444		0.738	
Differ of R^2			0.362		0.294	
Test of diff R^2			40.544		32.634	
Effect size			large		large	

TF: technology flexibility; TC: task complexity; PAS: perceived autonomy support; PIC: perceived IT competence; PR: perceived relatedness; CU: curiosity; CUT: creative use of IT
Note: * p < 0.05; ** p < 0.01; *** p < 0.001.

5. Discussion and conclusion

We suggest that SDT is useful in explaining how the basic inherent needs associated with intrinsic motivation and external environment can influence users' behavior. We find that autonomy support and IT competence have no impact on users' curiosity. This is quite inconsistent with previous research, and does not align with general supposition. The probable explanation for this might be that when users are able to access what they need (IT facilitation and encouragement), exploring new ways of using the existing IT becomes unnecessary because they already have solutions to accomplish the tasks and there is no motivation to figure out novel ways. The findings also show that curiosity play partial mediating role in the pursuit of creative use of IT. These results open a new door for researcher to investigate other mediating variables beside curiosity in the relation between perceived IT competence and creative use of IT. In addition, creative use of IT is different from intention to use or actual use. It does not only happen in post adoption use, but can happen at any time and at any task. Therefore, in investigating factors that influence creative use of IT, different approaches should be used. This study shows that curiosity has significant impact on creative use of IT. This is consistent with previous research on curiosity and exploratory behaviors (Kashdan et al., 2004 and Spielberger and Starr, 1994). It is necessary

to find solutions to enhance users' curiosity to leverage creative behavior in using IT since curiosity act as a force that motivates people to act and think in new ways (Kashdan and Silvia, 2009). In this study, curiosity is revealed to be influenced by perceived IT competence and perceived relatedness. This implies that curiosity can be enhanced by both internal and external factors. Therefore, curiosity cannot be viewed only as inherited in a person's nature, but it is something that can be enhanced by introducing stimulating factors in the work environment.

This study also provides practical implications for practitioners. First, managers might need to pay more attention on how to allocate suitable IT for users. Moreover, management should know when and where they should put pressure on users as well as the level of pressure that would make the users to enhance their creative ability in using IT. In addition, as there are many people working in non-computer environment, the importance of IT creative use is not applicable to all working functions. More attention should be put on work functions that are heavily pervaded with computer-aid tasks such as Research and Development (R&D) or Customer Relationship Management (CRM). Also, organizations should also set up forums or communities that would give their employees more chances to transfer their experiences and knowledge in using IT creatively.

Several limitations of this study should be noted when interpreting the findings. The sample used in this study is not random because responses were collected from one city in Vietnam. The respondents' rate of using information technologies in support of their jobs is confined. A more random survey should be conducted to verify our findings. The results of our study offer insights into several issues that deserve further investigation. First, we only investigated curiosity in general. In fact, curiosity can be separated into two types, namely: *sensory curiosity* (occurs when physical factors attract the attention of users) and *cognitive curiosity* (is evoked when users believe that it may be useful to modify existing cognitive structures). In the future we will expand our research framework to test the influence of different types of curiosity on creative use to build up a more comprehensive model in this topic. This study uses SDT as the theoretical lens to investigate the environmental factors that contribute to the development of curiosity. Future studies may, based on their respective contexts and theories, further investigate the influence of other factors on curiosity like reward system. Fiorillo (2011) suggests that the drive to learn new information or perform some action is often initiated by the anticipation of reward (an emotional sensation of relief and happiness). In this way, the concepts of motivation and reward are intrinsically tied to the phenomenon of curiosity. Lastly, this study focuses solely on the impact of curiosity on creative use of IT. Other factors based on different theory may be applied to expand our understanding on how to enhance creative use of IT.

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