# Examining Technology Resistance: A Cognitive Load Perspective

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## Abstract

Technology adoption has been studied through two perspectives – of acceptance and of resistance. While acceptance has been sufficiently researched, resistance is understudied resulting in a less comprehensive understanding of technology adoption. This study examines technology resistance within the framework of task-technology interaction. Task-technology interaction has been defined based on the level of task-technology integration which has led to the identification of two types of interaction: intrinsic and extrinsic tasks to the technology. Within this framework, the study adopts cognitive load perspective to argue that introduction of a technology generates cognitive load by challenging the status quo of required working memory to perform the task which results in the technology resistance. The study further argues that level and influence of cognitive load on resistance are higher in extrinsic tasks compared to intrinsic tasks to the technology.

**Keywords**

Technology resistance, technology adoption, intrinsic and extrinsic task, cognitive load

## Introduction

Technology adoption is one of the central themes of research in Information Systems (IS) discipline. It has two crucial components: 'acceptance' and 'resistance'. Both are different constructs and require different theoretical frameworks (Van Offenbeek et al. 2013). However, extant research has either given little attention to 'resistance' or has studied it under the same theoretical models used for 'acceptance' (Bhattacherjee and Hikmet 2007). This limited attention to resistance dwarfs our understanding of the technology adoption phenomenon. This gap is reflected in one of the tracks '*Resistance or Change? Static and Dynamic Perspectives on Individual Resistance to IT Innovations*' of AMCIS 2016 as well, that calls for the studies focusing on factors which cause technology resistance and mechanisms to reduce it. The present study responds to this call by identifying 'cognitive load' as one of the factors which cause technology resistance.

Cognitive load is an experience where individuals feel the pressure to invest more working memory than they have or generally invests (Sweller 1994; 1988). This study argues that introduction of a new technology to perform a task challenges the status quo of the required working memory for that task. Hence, faced by the challenge of changing status quo, individuals will resist the adoption of that technology. The study examines cognitive load and its influence on technology resistance within the framework that distinguishes between two types of tasks based on its level of integration with the technology: intrinsic and extrinsic tasks to the technology. The study argues that the extents of cognitive load experienced in the context of intrinsic task to the technology is low compared to the load experienced in the context of extrinsic task to the technology. Hence, the influence of load in extrinsic context to resist technology will be more than intrinsic context. More specifically, the present study has following two objectives:

(1) To examine the influence of cognitive load on technology resistance.
(2) To examine the varying influence of cognitive load in intrinsic and extrinsic tasks to the technology perspectives.

Rest of the paper is organized as following. Section 2 presents the existing literature on technology resistance. Section 3 presents the definition of intrinsic and extrinsic tasks to the technology. Section 4 explains the cognitive load theory. Section 5 integrates the concept of cognitive load to intrinsic and extrinsic task contexts to come with the propositions. The paper concludes with the expected contributions and suggestions for future research in section 6.

# Literature on Technology Resistance

## Acceptance vs. Resistance

Bhattacherjee and Hikmet (2007) trace three definitions of resistance. First by Lewin (1947), who defines resistance as a tendency to resist change for maintaining status quo. second by Zaltman and Duncan (1977), who define resistance as any conduct to maintain the status quo in the face of pressure that alters it, third by Keen (1981), who defines resistance as 'social inertia' to change. Bhattacherjee and Hikmet (2007) make two observations based on the above definitions that explain why resistance is different construct from acceptance. First, unlike acceptance, it is not targeted to a specific technology; it is an opposition to change because of the expected adverse consequences. Second, unlike acceptance, it is not a behavior; it is a cognitive force precluding behavior. Hence, resistance is not the opposite of acceptance; it is an antecedent to acceptance. Therefore, resistance must be overcome if technology is to be accepted.

## Extant Work on Technology Resistance

Literature focusing on technology resistance has used five major theoretical models: interaction theory (Markus 1983), equity theory (Joshi 1991), model of passive resistance misuse (Marakas and Hornik 1996), attribution model of individual reactions (Martinko et al. 1996), and multilevel theory of resistance (Lapointe and Rivard, 2005). Markus (1983) studies resistance in terms of interaction between the implemented technology and the context of its use. She argues that technology will be resisted if it threatens the position of power. Joshi (1991) uses equity theory to propose a model wherein individuals resist technology based on the perceived equity at three levels, namely, technology, organization and reference groups because of the change(s) brought by it. Marakas and Hornik (1996) used model of passive resistance misuse to explain resistance as passive-aggressive responses to threats that technology creates. According to Martinko et al. (1996), individual's previous experience with similar technology evokes causal attribution, which in turn influences expectations regarding future performance that drive affective and behavioral reactions toward technology. Lapointe and Rivard (2005) identified five interacting components to propose multilevel model of resistance: (1) initial conditions (2) subject of resistance (3) object of resistance (technology) (4) perceived threats and (5) resistance behaviors. In addition, there are some other factors as well such as habits, switching costs, inertia etc. (Kim and Kankanhalli 2009; Polites and Karahanna 2012) which have received the attention of prior literature

While all of the above mentioned studies focus on various aspects, they do not address one important aspect; interaction of technology with the task it is used/introduced for. Interaction theory of Markus (1983) has studied the interaction of technology with the context. Lapointe and Rivard's (2005) multilevel model of resistance has considered the interaction of technology with four variables but task characteristics. The present study asserts that task technology interaction and associated cognitive load will have an important role in technology resistance. Importance of task and technology interaction has been shown by Task-Technology Fit (TTF) theory (Goodhue and Thompson 1995) in acceptance research. However, technology resistance research has not focused on this aspect yet. The present study examines task technology interaction based on the level of integration of task with technology. This concept of interaction yields two types of tasks: intrinsic and extrinsic tasks to the technology. The study subsequently argues that the level of interaction of task and technology in both types will produce different levels of 'cognitive load' which will further have varying influence on technology resistance.

# Intrinsic and Extrinsic Tasks to the Technology

In an early effort, Gefen and Straub (2000) distinguish between intrinsic and extrinsic tasks to the technology based on whether use of technology is the primary end of task or technology is only a platform to achieve the primary end of task. They call the former 'intrinsic task to the technology' and the latter 'extrinsic task to the technology'. The present study only partially agrees with this distinction. The study argues that a task should be called extrinsic only when the individuals need to engage in any simultaneous

activities while using the technology to achieve the primary end of the task. Therefore, even in the situation where the technology is just a platform but individuals do not need to perform any simultaneous activities in addition to using the technology, task is intrinsic to the technology. Explanations with the examples will make this point concrete. Consider two examples: a production manager using inventory management system and a physician using computer system while providing consultation to the patients.

In the first example, inventory management system provides the information about re-order level, economic order quantity, lot size etc., which is the ultimate goal of inventory management. Production manager does not need to do any simultaneous activity in addition to using the inventory management system. Even though technology is only a platform here, primary end of the task is achieved with the technology itself. Hence, it is an example of intrinsic task to the technology. In the second example, the primary goal of physician is to provide consultation to the patient, which includes talking and making eye-contact with them. These activities are external, but has to be done along with using computer systems. They are simultanoeus acitivies (Shachak et al. 2009). Physician can't use computer system for some activities like noting down the disease symptoms, duration of disease etc. either before or after the consultation. All of these activties need to be done while providing consulation. Thus, use of computer systems is physically separated but mentally integrated because they are done simultenously. Hence, it is the example of extrinsic task to the technology. Intrinsic task also includes endogenous tasks which do not have any existence without technology. Examples of these tasks include email-writing, internet browsing, Googleing etc. Thus, this study distinguishes between intrinsic and extrinsic tasks to the technology based on whether task is *integral* to the technology. Tasks integral to the technology are called intrinsic whereas the tasks requiring some simultaneous activities in addition to using the technology are extrinsic.

## Cognitive Load Theory

Cognitive load is an experience where individuals feel the pressure to invest more working memory than they have or generally invests (Sweller 1994; 1988). It is of three types (De Jong 2010; Sweller 1988): (1) Intrinsic Load (IL), (2) Extraneous Load (EL) and (3) Germane Load (GL). IL relates to inherent characteristics of the content of the task. It is defined as the experienced difficulty of the subject matter (Sweller and Chandler 1994). EL refers to those cognitive resources devoted to elements that do not contribute to learning. It is caused primarily by the design of the instructional materials. If the instructional materials are not properly designed, learner might need to spend some of the cognitive resources which will not contribute to learning. One of the sources of EL is split attention (De Jong 2010; Mousavi et al. 1995). Split attention happens when individuals need to divide their attention among mentally integrated but physically separated multiple sources of information (De Jong 2010; Sweller and Ayres 2006). One example of split attention effect is solving a geometry problem by a student which is presented in two different formats; statement and diagram (adopted from Mousavi et al. 1995). While solving the problem, student must simultaneously hold in working memory both, the diagrammatic information and the information associated with the statements. In other words, the student needs to mentally integrate two physically separated sources of information which requires additional working memory resources. This additional requirement of working memory creates EL. GL is the mental resources devoted to acquiring and automating schemata in long-term memory. It is generally considered useful in reducing EL.

## Cognitive Load and Technology Resistance

As suggested by cognitive load theory, individuals have limited working memory. When they require adopting a technology to perform a task that demands additional use of working memory than earlier, it challenges their status quo and creates cognitive load. The status quo in this case would be the individual's previous experience of the required working memory to perform the same task. As explained in the earlier section and also argued by Kim and Kankanhalli (2009), individuals resist adopting that technology which challenges their status quo. Hence the introduction of technology which challenges their status quo of required working memory would stimulate them to resist its adoption. Therefore, the study makes the following proposition:

*P1: Introduction of technology to perform a task that creates cognitive load by challenging the status quo of required working memory than earlier invites resistance to itself.*

### Cognitive Load in Intrinsic and Extrinsic Tasks

Among the three types of cognitive load discussed above, the study considers only IL and EL which are relevant to intrinsic and extrinsic task contexts. As GL is associated with the process of learning which includes acquiring and automating schema, it would not result either from the characteristics of the task or the level of integration of task with technology. As defined earlier, in the context of intrinsic task to the technology, no components of the task are outside the technology. Hence all the components are both physically and mentally integrated. Task and technology become a single entity. In such a situation, the individuals will only experience IL resulting from the technology characteristics. However, in the context of extrinsic task, few components of the task are outside the technology. These components, though physically separated, need to be mentally integrated to perform the task which will cause split attention and thereby result in EL. In the example of physicians' use of computer system while providing consultation, components such as making eye contact, talking to the patients etc., are physically separated but mentally integrated from using computer system. This is because while using computer system, physician has to dedicate some working memory to these components as well. This physically separated but mentally integrated nature of task will result in split of attention which will cause EL. However, this EL will be in addition to the IL. IL here would result from both task and technology characteristics because they are two different entities in this context. Therefore, the overall cognitive load in extrinsic task context will be the summation of IL and EL resulting from the split attention effect. Figure 1 shows the amount of cognitive load in both intrinsic and extrinsic task contexts. This varying level of cognitive load in intrinsic and extrinsic task contexts leads to the following propositions:

*P2: While in the context of intrinsic task to the technology, individuals experience only intrinsic cognitive load; in the context of extrinsic task to technology, individuals experience both intrinsic and extraneous load.*

*P2a: While in the context of intrinsic task to the technology, individuals experience intrinsic load only from the technology characteristic; in the context of extrinsic task to technology, individuals experience intrinsic load from both task and technology characteristics.*

*P2b: Since the source and amount of cognitive load is more in the context of extrinsic task to the technology than intrinsic, individual will face more challenge to their status quo of required working memory and hence are more likely to resist technology in extrinsic task context than intrinsic.*

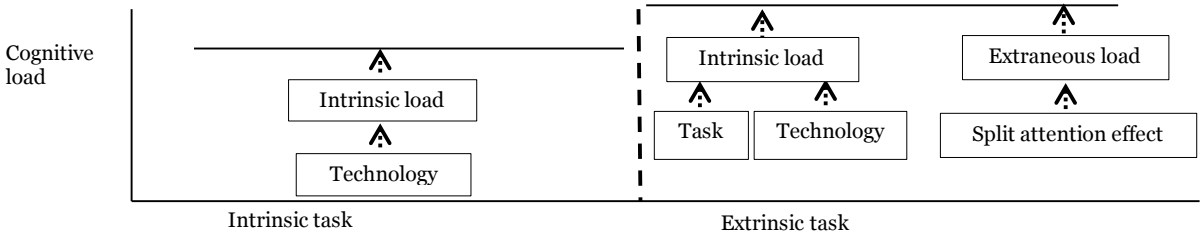


**Figure 1: Cognitive load in Intrinsic and Extrinsic task**

## Expected Contributions and Future Research

The study makes a number of contributions. First, it is unique in terms of explaining technology resistance from the cognitive load perspective which is missing in existing literature. Second, by adopting this perspective, this study wishes to contribute to understanding of technology resistance from the perspective of task-technology interaction. The study looks at task-technology interaction based on the level of integration of task with technology, which leads to the distinction between intrinsic and extrinsic tasks to the technology. This distinction is a contribution to the broader technology adoption research. Future research can examine these propositions empirically. Since cognitive load is a new concept to technology resistance, first attempt towards testing propositions would be to understand cognitive load in this context. Sequential mixed method approach would be appropriate (Johnson and Onwuegbuzie 2004) where a qualitative study can be used to understand cognitive load and quantitative study can test the resulting hypotheses. Measures of cognitive load are already available (e.g., Paas et al. 1994).

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