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The effect of task–individual–technology fit on user attitude and performance: An experimental investigation

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ABSTRACT

Decision support research explores interactions between individuals, tasks, and technology. In this paper, I deconstruct the task–technology–individual fit model into three two-way interactions and ascertain how these interactions affect user attitude and performance. Performance is conceptualized as consisting of two dimensions, technology performance and task performance. The paper reports a controlled laboratory experiment involving 94 subjects using a purpose built decision support system. The results demonstrate several important principles. User attitude is affected by the fit between individual and technology whereas technology performance is affected by the fit between task and technology, and task and individual. Users of technology fitted to them as an individual can perceive it as more useful than it actually is, in terms of improving task performance. Finally, technology performance translates into task performance. Technology performance is a necessary but not sufficient precursor to task performance.

1. Introduction

This paper uses a well established model [23] to frame an in-depth investigation of the effects of fit on decision support outcomes. Goodhue and Thompsons' [23] task–technology–individual fit model is deconstructed into three two-way interactions, task–technology fit (TTF), individual–technology fit (ITeF), and task–individual fit (TaIF) after Liu et al. [34]. The degree of granularity obtained by using this deconstructed model creates an opportunity to address fundamental decision support questions from a fresh perspective.

DSS performance is contextualized into two dimensions. One relates to the use of the DSS to obtain a better outcome or recommendation from the technology (technology performance), the other relates to performance on the decision task (task performance). Technology performance is about using the system; task performance is about using the outputs of the system. Prior empirical evidence demonstrates that improved technology performance leads to improved task performance [26,50]. This relationship is not necessarily direct given that a user could use the system but not rely on the information it provides, in which case the DSS would affect technology performance but not task performance. Alternatively, a user could elect to use the system and to rely on the outputs, affecting both technology performance and task performance.

If technology performance is a necessary, but not sufficient, condition for improved task performance other questions arise. What prompts users of DSS to reply on DSS outputs? Under what conditions does technology performance affect task performance? The answer appears to lie in the attitude of users towards the DSS, with many prior studies linking users' attitude to technology with their performance. [18,19,23,29,31,34]. In particular, the consideration of users' beliefs and attitude is particularly important where the use of the DSS is not mandated, and where the task solution is non-normative [27]. This paper looks at the impact of fit and user attitude on performance, exploring both technology and task performance. The primary research question addressed is:

> *How do task–technology–individual fit affect DSS user attitude and performance?*

The remainder of the paper is organized as follows. The research background and theoretical foundations for the work are presented in Section 2. Section 3 details the specific hypotheses while Section 4 discusses the methods and materials used to test these hypotheses. Results are presented in Section 5; Section 6 contains a discussion of the results and limitations, and concludes the study.

2. Research background and theoretical bases

2.1. Considerations of fit, user attitude and performance

Conceptually achieving "fit" is about aligning the interrelationships between individuals, tasks and technologies. Existing studies recognize that fit affects both user attitude and performance [10,23,34,53]. The task–technology fit model [23] suggests that performance depends on fit, identifying a weakly positive link between

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usage and performance. Recent work by Liu et al. [34] explored task–technology–individual fit by employing three differing fit interactions (individual–technology fit (ITeF), task–individual fit (TaIF), and task–technology fit (TTF)). These two-way interactions provide a valuable opportunity to explore the effect and implications of each type of fit separately and independently. These dimensions of fit are discussed in more detail in Sections 3.1, 3.2 and 3.3 of this paper.

The use of any technology will vary based on the fit achieved between the task, technology and individual [14,22,23,48]. Good fit is required before technology can positively impact task and/or technology performance [23]. Technology performance and task performance are not directly related; a user could elect to complete a decision task without using the DSS, or they could use the DSS but ignore any outputs generated by that DSS when making their decision. Prior literature unequivocally establishes the necessity for a user to perceive a system as useful before they will use it, if use is not mandated [5,15,16,27,29]. Perceptions of usefulness of the technology affect task performance via the degree of reliance achieved on the outputs of the technology. Selecting perception of usefulness as the user attitude of interest to this paper complements and extends Liu's exploration of user attitude and DSS models.

This paper explores performance related to use of the technology (producing a better output) and performance related to the ultimate decision (making a better decision). The paper explores relationships between perceptions of usefulness and performance for varying fit and performance dimensions, posing several related questions. Do perceptions of usefulness change technology performance and/or task performance? Does technology performance translate into task performance? These questions underpin the hypotheses posed in Section 3 of this paper.

2.2. Characteristics of tasks, individuals and technology

The following sections identify and detail the task, individual and technology characteristics central to this work.

2.2.1. Task characteristic — task complexity

DSS are generally considered to be more gainfully deployed when supporting complex tasks [9,38] however it is unclear whether this holds when user and technology characteristics are considered concurrently with task complexity. Task complexity needs to be calibrated independently of the decision-maker [51]; an experienced decision-maker will render even a highly complex task less difficult, whereas a novice may perceive a relatively simple task as quite difficult. Both the complexity (a task characteristic) and difficulty (a function of fit) of a task should be considered when exploring user attitude and performance. This paper examines user attitude and performance in light of the differential impacts of fit between the complexity of the task and the technology, (TTF); and the complexity of the task and the individual (TaIF).

2.2.2. Individual characteristic — task expertise

Task performance declines when there is a gap between the task expertise of an individual decision-maker, and the task expertise required to perform the task. DSSs bridge this task expertise gap, and are therefore of greater value where a decision-maker is not a task expert [2,4,35]. When a decision-maker draws on task expertise supplied by a decision support system it helps them to perform the decision task in an expert-like manner [7,12].

Novice decision makers lack sufficient task expertise to be able to determine the relevance of information offered so tend to collect information cues indiscriminately, and inappropriately weight those information cues which they do collect [13,43]. Novices also deal with individual information cues, as they have not yet begun to develop the heuristics or pattern knowledge that experts possess [6,38,40,42].

Experienced, but not expert, practitioners are better able to determine information saliency but have not fully developed the pattern knowledge required to discerningly reduce the number of information cues they endeavor to consider [43,44]. Experienced decision-makers generally seek to validate and extend their existing patterns. This paper considers user attitude and performance in light of the differential impacts of fit between task expertise and technology (ITeF), and task expertise and the task being undertaking (TaIF).

2.2.3. Technology characteristic — decisional guidance design

Design affects how, and how much, a technology will be used [21], so design choices should be deliberate and purposeful [46]. Poor or unintended design choices can create suboptimal fit and result in a technology being ignored or overridden [16,17,21]. A key issue in DSS design is whether a DSS has sufficient mechanisms in place to effectively guide the decision-maker and support their human judgment [46]. Silver (1990) identifies two broad types of decisional guidance, informative and suggestive. Informative guidance enlightens a decision-maker by providing additional information pertinent to the decision task. Suggestive guidance sways a decision-maker by providing a recommendation on how to proceed during interactions with the system. Empirical studies have established that the form of decisional guidance provided is an important explanatory variable in relation to both user attitude and performance [26,33,36,39,41,46,50]. This paper considers user attitude and performance in light of fit between complexity of the task being undertaken and the decisional guidance embedded in the technology (TTF); and task expertise and the decisional guidance embedded in the technology (ITeF).

3. Hypotheses

The three two-way fit interactions involving the task technology and individual characteristic discussed in Section 2 are examined in this section by considering direct effects of individual fit dimensions, and by examining relationships between fit, user attitude and performance as shown in the research model contained in Fig. 1.

3.1. Individual–technology fit (ITeF)

Individual–technology fit (ITeF) is the extent to which the technology (decisional guidance) fits the individual (task expertise). ITeF does not include the task characteristic of task complexity. When considering the fit between individual and technology ITeF will affect user attitude more than performance, due to the inability of novices to process cues efficiently. Novices are likely to perceive a technology providing additional information cues as useful, despite the fact that they are unlikely to be able to use that additional information to improve their performance, consequently it is argued that ITeF will affect attitude rather than performance. When experienced practitioners are provided with pattern knowledge (suggestive guidance) it helps extend and confirm their existing pattern knowledge; however unlike novices they already possess some pattern knowledge so the potential for performance improvements is minimal. Performance improvements ensue where the DSS provides a more expert pattern than the individual already possesses. In this case of good ITeF, it is anticipated that DSS will be perceived as less useful, due to the perception that it is offering knowledge the individual already possesses. ITeF primarily affects perceptions, not reality. I hypothesize therefore that fit between the technology and the user will directly affect user attitude towards the technology.

Hypothesis 1. Individual/technology fit (ITeF) affects user attitude (perceptions of usefulness) of the technology, rather than task and/or technology performance.