Introduction

Toward a Better Evaluation of the USE of E-Health Systems: Comparing USE IT and UTAUT

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Abstract

Developing, implementing, and using information technology in organizations is a complex social activity. It is often characterized by ill-defined problems or vague goals, conflicts and disruptions that result from organizational change. Successfully implementing information systems in healthcare organizations appears to be a difficult task. Information technology (IT) is seen as an enabler of change in healthcare organizations, but (information) technology adoption decisions in healthcare are complex because of the uncertainty of benefits and the rate of change of technology. In this book we compare the quantitative
Table 1. USE IT compared to UTAUT (Unified Theory of Acceptance and Use of Technology; Venkatesh, Morris, Davis, & Davis, 2003) compared to IS success model (Delone & McLean, 2002)

<table>
<thead>
<tr>
<th>USE IT vs. UTAUT vs. IS Success model</th>
<th>User Domain</th>
<th>IT Domain</th>
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<tr>
<td><strong>Product</strong></td>
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<tr>
<td>Relevance / Performance expectancy/</td>
<td></td>
<td>Requirements/ Effort expectancy / Information quality</td>
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<td>Net benefits</td>
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<td><strong>Process</strong></td>
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<td>Resistance/ Attitude &amp; social influence</td>
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<td>Resources/ Facilitating conditions</td>
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<td>User satisfaction</td>
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<td>Systems quality</td>
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The process in the innovation dimension refers to the innovation process, similar to the process defined by Saarinen and Sääksjärvi (1992) and the innovation process structure of Larsen (1998). The product is the result of this innovation process. This corresponds with the definition of the product by Saarinen and Sääksjärvi and the artifact structure in the framework of Larsen. Also, the IT domain is part of the artifact structure; the user domain represents the organizational structure in Larsen’s framework.

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**The UTAUT Analysis**

The first section starts with the basic constructs of quantitative evaluation studies on user acceptance; the editor summarized the work of Davis (1989), Ajzen (1991) and Rogers (1995). Then the quantitative models are applied in two chapters on different e-health systems. The main result of the work of Chismar and Wiley-Patton (*Chapter II*) is that job relevance is the most important determinant of e-health success. They used an extended technology acceptance model (TAM). Horan and his colleagues combined the TAM and theory of planned behavior models and add contextual determinants (*Chapter III*). They found that IT infrastructure, organizational processes related to IT, and the physician’s experience with computer use in a clinical setting were more significant for behavioral intention than general attitudes. In *Chapter IV*, Suomi and Raitorharju used a quantitative analysis to show the relationship between stress and IT. The section closes with the questionnaire (Venkatesh et al., 2003) in *Chapter V*. A short summary of this major work is given below.

Venkatesh et al. (2003) reviewed eight prominent models of user acceptance and managed to create a unified view with his UTAUT model. Seven constructs appeared to be significant determinants of usage in one or more of the individual underlying models:

1. Performance expectancy
2. Effort expectancy
3. Social influence
4. Facilitating conditions
5. Attitude toward technology
6. Self efficacy
7. Anxiety
Performance expectancy is the degree to which an individual believes that using the system will help him or her to attain gains in job performance. It relates to perceived usefulness, extrinsic motivation, job fit, relative advantage, and outcome expectations.

Effort expectancy is defined as the degree of ease associated with the use of the systems. Related constructs from the underlying models are perceived ease of use, complexity, and ease of use.

The social influence is the degree to which an individual perceives that important others believe he or she should use the new system. Related constructs are subjective norm, social factors, and image.

Facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. The constructs related to this determinant are perceived behavioral control, facilitating conditions, and compatibility.

The last three determinants are theorized not to be direct determinants of intention. Self-efficacy and anxiety have been modeled as indirect determinants of intention fully mediated by perceived ease of use.

But attitude is a different determinant. Venkatesh et al. (2003) defined it as an individual’s overall affective reaction to using a system. Four constructs of existing models are related to this determinant, namely attitude toward behavior, intrinsic motivation, and affect toward use and affect. In three cases the relation between attitude and behavioral intention is significant, so we cannot agree with the choice of Venkatesh to make it an indirect determinant. In Chapter VII we conclude that attitude is the cumulative consequence of effects from the other determinants. Still, the initial attitude is something personal and will influence behavioral intention. To measure the UTAUT determinants, a set of 31 questions are proposed for survey purposes. The questionnaire items are given in Chapter V.

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**USE IT Analysis**

The Second section starts out with the basic notions of IS success. DeLone and McLean, and Garrity and Saunders are summarized in Chapter VI. In Chapter VII, Lapointe and her colleagues show a qualitative, in-depth case study with the dynamics of IT adoption. Resistance and adoption factors lead to a better understanding of the challenges to be faced in redesigning work
processes in an interorganizational setting in healthcare. In *Chapter VIII*, Suomi studies innovation adoption paths for the electronic patient record. The section ends with the USE IT model, summarized in the following section.

We can use a wide range of sources that discuss user perspectives in IT introduction.

This section gives a short overview of intriguing literature. First, we present the dimensions of the USE IT-model to predict and evaluate innovation and diffusion of information systems: the innovation dimension and the domain dimension, which results in four determinants for success: relevance, requirements, resistance, and resources.

The **relevance** determinant is defined by Spil, Schuring and Michel-Verkerke (Chapter IX) as “the degree to which the user expects that the IT system will solve his problems or help to realize his actually relevant goals.” The word *expects* expresses that relevance is a factor that is important in the course of the adoption process, not only in evaluation. The word *actually* is crucial in their view of relevance. Relevance is not to be confused with the degree to which the user considers outcomes as being positive. The set of outcome-dimensions that someone considers “positive” is larger than the set of outcome-dimensions that are relevant. Imagine a physician, who basically considers IT outcomes of a computer decision support system, such as assistance in diagnosis, disease prevention, or more appropriate dosing of drugs, as positive. This does not automatically imply that the IT adoption is relevant to him; it is only relevant if these dimensions are high on his or her goal agenda.

Relevance defined in this way comprises relative advantage (Rogers, 1995), net benefits (DeLone & McLean, as cited in Chapter VI), perceived usefulness (Davis, 1989) and job relevance (Chismar & Wiley-Patton, Chapter II) and results in task support satisfaction, which is a criterion for user satisfaction (Garrity & Sanders, 1998). Within the framework of Venkatesh et al. (2003), it would overlap performance expectancy.

**Resistance** is the personal attitude of all stakeholder groups towards the introduction of an information system (Spil, 2003). The main IS quality aspect of resistance is the attitude and the willingness to change. Pare and Elam (1999) also focus on the attitude of the professional when they assess clinical information systems. The end users have an important role because their norms and values determine the effectiveness of the information system. Resistance was found to be the cumulative effect of the other three determinants (Spil, Schuring, & Michel-Verkerke, Chapter VIII).

Expectance of reduced quality of work-life satisfaction, high complexity, and the lack of trialability can result in resistance (Garrity & Sanders, 1998; Rogers,

**Resources** are defined as the degree to which material and immaterial goods are available to design, operate and maintain the information system (Spil, Schuring, & Michel-Verkerke, Chapter IX). The main focus of the determinant resources will be on the people and on the costs these people cause. Next to that, the reliability of the information technology and the information systems are considered. Resources defined in this way refer to service and system quality (DeLone & McLean, as cited in Chapter VI), management support, and mature IS function (Saarinen & Sääksjärvi, 1992). Resources (human, physical and monetary components; Ansoff, 1965) are needed to implement the new information system into the organization. The human resources can both be insufficient in time and in experience (risk of technology). Insufficient material resources (Offenbeek, 1996) will have a limiting influence on the other three risk domains. Resources is closely related to the construct of facilitating conditions (Venkatesh et al., 2003) and therefore also related to compatibility and perceived behavioral control.

The **requirements** determinant evaluates the meaning of the information system. Requirements are defined as the degree to which the user needs are satisfied with the product quality of the innovation (Spil, Schuring, & Michel-Verkerke, Chapter IX). This includes such aspects as the functional capability, the ease of start up, and the ease of use.

Meeting the end user’s requirements results in high information quality (DeLone & McLean, as cited in Chapter VI), high interface satisfaction (Garrity & Sanders, 1998), and high compatibility (Rogers, 1995).

To measure the determinants, the USE IT tool consists of structured interviews. In this way, a more precise insight can be obtained in the nature and relevance of problems and solutions, before implementation and this insight can be tested with the same tool during the evaluation of the implementation. The interview protocol is given in Chapter XI.

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**E-Health Evaluation**

It is evident that the use of modern information and communication technology offers tremendous opportunities to improve healthcare. However, there are also hazards associated with information technology in healthcare. Evaluation
is a means to assess the quality, value, effects and impacts of information technology and applications in the healthcare environment, to improve health information applications and to enable the emergence of an evidence-based health informatics profession and practice (Ammenwerth et al., 2004).

In the final section, a plea is made for a hybrid evaluation method. In Chapter XII, Kaplan shows that a quantitative evaluation can show what is wrong but not why. Therefore, we need a qualitative method to go into depth. Ammenwerth and her colleagues successfully apply this for a nursing information and communication system (Chapter XIII). Both the validation of the results and the completeness of the results can be supported by triangulation. In Chapter XIV, Turunen proposes a new model for evaluation that encompasses both quantitative and qualitative models. Van der Meijden uses both quantitative and qualitative methods to evaluate electronic patient records in Chapter XV. Nykänen shows the vision and evaluation of e-health in Chapter XVI. In Chapter XVII, Wickramasinghe, Geisler, and Schaffer give a possible approach to assessing e-health. This section is closed with the Declaration of Innsbruck, a roadmap of evaluation in healthcare, in Chapter XVII.

References


