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Abstract

This study took place within the context of a larger project seeking to identify the factors that are associated with the acceptance and use of electronic recordkeeping systems in public sector organizations. This class of system relies on ordinary end-users to choose to select and file appropriate records into the system in order to comply with organizational and legislative recordkeeping requirements. The use of such a system necessarily includes a social or organizational context dimension to explain the intention to use.

This paper focuses on the construct validity associated with social influence within the research model. This particular construct traces its roots back to the 1970s and appears in much of the technology acceptance literature as the subjective norm. The measures and techniques for identifying construct validity prior to the development of a survey instrument, and subsequent measures and techniques for detecting construct validity after gathering the detailed survey dataset, are discussed.

The techniques used to group the measurement items by construct, and thus into a survey instrument, included card sorting and the use of cluster analyses and dendrograms. After the survey instrument data collection activity, the detailed construct validity analysis utilized the circle of correlations based on a principal component analysis.

The research found that the traditional measures of social influence constructs cluster well, but are in fact multidimensional. Furthermore, the dimensionality revealed by the statistical analysis aligns with and supports the predicted interactions of society as put forward in Giddens' Structuration Theory. This finding lends empirical support to Structuration Theory and underscores the importance of construct validity, particularly in the current push to increase the "social" aspects of technology.

Keywords: construct validity, structuration theory, social influence, technology acceptance.

1 INTRODUCTION

Much of the research into the adoption of enterprise information systems relies increasingly on a social aspect to explain the acceptance and use of that technology. In the context of large organizations, foundational systems such as shared electronic recordkeeping systems are both used and referenced by the members of a society of workers. They cannot help but influence each other and set a (subjective) norm for how their shared technology platform will be used, if at all.

In situations such as these, the traditional technology acceptance measures and constructs, such as perceived ease of use (effort expectancy) and/or perceived usefulness (performance expectancy), fail to capture the added complexity that occurs when using a shared technology within an organizational context (Venkatesh & Davis, 2000; Venkatesh et al, 2003). Developing and testing new models and theories in these circumstances can be challenging. However, increasingly sensitive tools such as partial least squares path modelling (PLS-PM) and other members of the structural equation modelling (SEM) family are providing methods to measure these *a priori* theoretical models with actual empirical data.

These models rely on the relationship between a research construct (the latent construct) and its pool of measurement items. The construct validity associated with the measurement items must be high, for the measure of these items will eventually reflect or form the latent construct within the statistical analysis. The purpose of this research is to detect the construct validity for the subjective norm (or more broadly, social influence) and to propose a method for interpreting the findings.

2 THEORETICAL BACKGROUND

Fishbein and Ajzen's Theory of Reasoned Action (1975) introduced the proposition that a behavioral intention was determined in part by one's internal attitude toward the behavior and in part by the external social influence or pressure from others concerning that behavior. Their early model introduced a construct that sought to measure the external social influences associated with a particular behavior or subjective norm, defined as “the person's perception that most people who are important to him think he should or should not perform the behavior in questions" (p. 302).

The subjective norm became a widely used construct, applied specifically to technology-use by Ajzen (1991), and Taylor & Todd, (1995b) and was later combined with other technology acceptance constructs, where it was hypothesized to have effects on both the intention to use a technology and the perceived usefulness of that technology (Schepers & Wetzels, 2007; Venkatesh & Davis, 2000).

The construct was later re-cast as social influence in Venkatesh et al’s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT). Social influence was meant to be a slightly broader construct made up of similar overlapping constructs from the literature including: subjective norm (Ajzen, 1991; Fishbein & Ajzen, 1975; Mathieson, 1991; Taylor & Todd, 1995a, 1995b), social factors (Thompson, Higgins, & Howell, 1991), and image (Moore & Benbasat, 1991). Venkatesh et al (2003, p. 451) observed that “while they have different labels, each of these constructs contains the explicit or implicit notion that the individual’s behavior is influenced by the way in which they believe others will view them as a result of having used the technology.” Social influence is similarly defined as: “the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). This paper will refer to social influence in order to encompass subjective norm and its other designations in the literature.

While social influence developed its roots as a construct in the late 1970s, Structuration Theory was emerging in the 1980s in sociology. Structuration Theory is a general theory of social organization (Giddens, 1984). It is a commonly accepted theoretical foundation upon which we view and consider people’s actions and the structure of society as they recursively evolve over time (Jones & Karsten,

2008; Jones et al, 2004). The theory attempts to explain the relationships between individuals (agents) and the structure of the society in which they operate (structure).

At the time of Giddens' work, there were two competing traditions in sociology. On the one hand, there was the tradition of naturalistic sociology (positivism) that argued that strong social laws and social structures acted on individual actors (Proctor, 2005); and on the other hand there was an interpretive tradition that saw the actions of individuals (through phenomenology and ethnomethodology) as producing the phenomena of larger social structures (Jones et al., 2004, p. 300). Giddens found this dualism to be unsatisfactory, and proposed that both societal structure and human agency should be seen as a "mutually constitutive duality". Structuration further attempts to reconcile the "apparent theoretical dichotomies" of social systems such as agent/structure, micro/macro, and subjective/objective (Giddens, 1984). As it deals at a "theory of theories" level, Weaver and Gioia go so far as to state that "Structuration is a *bona fide* meta-theory" (Weaver & Gioia, 1994, p. 579). The term "structuration" invokes the impression of societal structures being in a constant state of creation as an outcome of every day social practices (Jones & Karsten, 2008, p. 131). Structuration Theory also forms a theoretical basis for digital recordkeeping practice (Upward, 1997) so is particularly germane to this research context. To assist with analysis, Giddens created a model with three dimensions of structure (signification, dominance, and legitimation) that interact with three dimensions of interaction (communication, power, and sanction) via what he terms as modalities (interpretive schemes, facility, and norms).

3 THE RESEARCH MODEL

The research presented in this paper took place within the context of a larger research project focusing on the factors that influence a user's intention to contribute documents and records into an electronic recordkeeping system (Lewellen, Hooper, & Oliver, 2013). The larger research model combined constructs sourced from three areas: technology acceptance, organizational context, and knowledge interpretation as an approach to modelling use behavior in the context of public sector electronic recordkeeping technologies. Figure 1 reproduces the research model and illustrates the proposed effect of the two organizational context constructs: social influence and perceived power security (Ong, Lai, Wang, & Wang, 2005). The model sought to incorporate constructs that would reflect Giddens' structurational interactions of communication, power, and sanction. The various measurement items associated with social influence were anticipated to reflect the communication and perhaps the sanction interactions, while the perceived power security measures were anticipated to reflect Giddens' power interaction. This paper focuses primarily on the organizational context constructs.

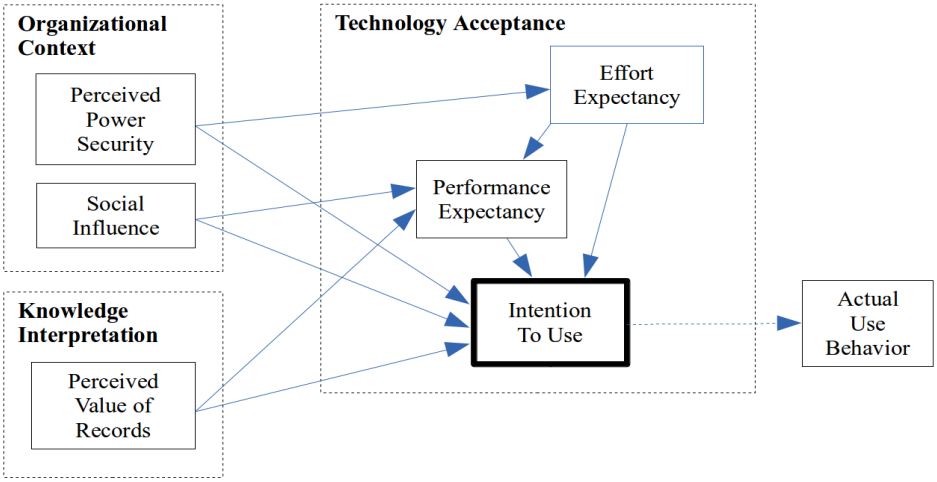

Figure 1 Factors that contribute to the use of an electronic recordkeeping system

4 METHODOLOGY

The larger project sought to develop a valid survey instrument consisting of sets of validated measurement items reflecting the research model's latent constructs. A set of well-crafted measurement items would also support higher level statistical analysis techniques such as structural equation modelling, or in our case, partial least squares path modeling (Vinzi, et al, 2010). To that end, the measurement items went through a series of careful refining techniques in order to test their construct validity and refine their ability to effectively load onto their designated research construct.

The following steps were followed in order to create and validate suitable measurement item pools:

1. *Conducting interviews* – twelve participants recruited from the New Zealand public sector were interviewed using a semi-structured interview questionnaire. Analysis of transcripts produced a set of themes that had emerged from the interviews relating to various factors that individuals may take into account when considering whether to participate in organizational electronic recordkeeping.
2. *Compiling set of measurement items* – a set of pre-validated measurement items associated with each of the research model constructs was then assembled from the literature. Where the published measurement item aligned with one of the emergent interview themes, the pre-validated measurement item was retained (or in some cases, adapted to the context of the research model). All other themes not covered by existing measurement items were transformed into suitable measurement items in an effort to capture all emergent thematic dimensions and thus provide improved measurement of the parent construct.
3. *Proof reading* – an additional ten volunteers were selected from two New Zealand public sector organizations and were asked to review the pool of measurement items.
4. *Card Sorting* – an additional twenty-four participants (12 for each variant) were then recruited from the New Zealand public sector to take part in a card sorting exercise to develop and explore the measurement item-to-construct validity (Lewellen, Hooper and Oliver, 2013). Based on the card sorting evidence, which provided empirical support for the measurement item to construct mapping, a final survey instrument was created, utilizing a 5 point Likert scale (Strongly agree – Strongly disagree).
5. *Online Survey* -- an invitation to participate in an online survey was sent to 254 employees of a large New Zealand public sector organization, achieving a 76% useable response rate. The resulting data set was used for the final quantitative analysis in support of the research model.

5 ANALYSIS

The analysis described in this section focuses on the two quantitative methods used to provide construct validation with specific attention paid to social influence as the construct pool of interest.

5.1 Card sorting analysis

Having compiled the pool of measurement items, the authors tentatively assigned those measurement items to one of the research model's constructs. Where a construct came with validated measurement items, these were retained; however, in the case of new measurement items, the validity of this construct assignment required additional testing.

The card sorting activity provided the first set of quantitative data for use in construct validity analysis. The data were analyzed using a cluster analysis technique (Jaccard coefficient matrix) using R Statistics (R Core Team, 2013), with an output in the form of dendrogram or "tree diagram" (Faiks & Hyland, 2000; Hinkle, 2008; Salmoni, 2012; Sanchez, 2012).

The dendrograms were configured to statistically create clusters. The measurement items were coded by construct abbreviation so as to be easily identified within the dendrogram as follows: social influence (SI), perceived power security (PPS), effort expectancy (EE), performance expectancy (PE), and perceived value of records (PVR). SI measurement items were found to be the most highly clustered (and thus demonstrate high construct validity by this analysis). As such, the SI measurement items demonstrated excellent construct validity in both the closed and open card sorts and were deemed "good" for use in the final survey instrument. The survey data was collected.

5.2 Circle of Correlations Principle Component Analysis

Before the research model could be tested using structural equation modeling, each measurement item pool had to first be re-tested for construct validity using the survey data. We used a graphical visualization called a circle of correlations based on Principle Component Analysis (PCA) (Sanchez, 2013). The goal of PCA's circle of correlations is to "extract the important information from the table, to represent it as a set of new orthogonal variables called principal components, and to display the pattern of similarity of the observations and of the variables as points in maps" (Abdi & Williams, 2010). The visualization is created by using the first two principal components as axes. A high correlation on the first and second principal components indicate that the measurement items are sufficiently similar to perform well in structural equation modelling, where they would adequately reflect their latent construct. Items that fall on the circle are fully explained by the first two principal components, whereas items falling within the circle would require additional information to fully explain them. The majority of the measurement items for SI were either directly sourced or adapted from the literature (see Appendix). As such, it was expected that they would form a single cluster in the orthogonal principle component space, just as they had clustered in the card sorting dendrogram. Figure 2 shows the *circle of correlations* visualization for the measurement items associated with SI. Rather than a single cluster, three separate groups were detected using this technique.

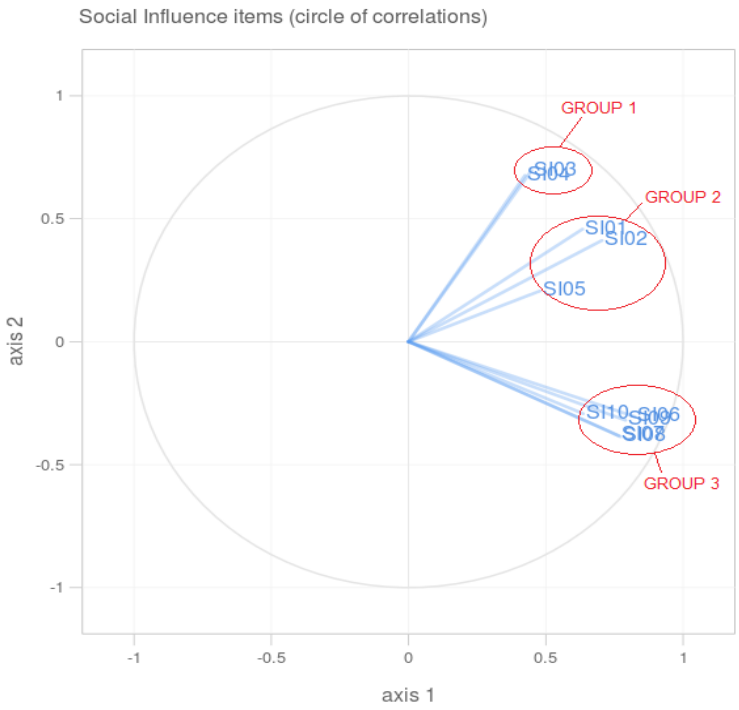

Figure 2 Circle of Correlations showing SI clusters

5.3 VALIDATION

The empirical measurement of construct validity initially used a small sample and a card sorting methodology in order to detect gross misalignment and reduce the risk of improper construct loading prior to developing a formal survey instrument. In the case of SI, the resulting dendrogram found excellent support. Furthermore, when compared to other pools of measurement items, SI items appeared to be the most mature and readily available from the literature.

However, when these same items were measured using data from the online survey and transformed into the orthogonal principal component space, the added sensitivity of the analysis technique produced three subgroupings. A theoretical basis to explain this clustering was sought from the literature, with Giddens' structurational interactions of communication, power, and sanction being selected due to their importance to recordkeeping theory and demonstrated applicability to the organizational context (Zheng, 2005).

In reviewing the measurement items in Figure 2, SI03 and SI04 that make up Group 1 reflect the role of senior management or the organization in supporting use of the system. In terms of Structuration Theory, these measurement items could be argued to reflect the structure of legitimation, and therefore encourage or discourage use of the electronic recordkeeping system though the interaction of sanction via the modality of norm. In other words, Group 1 detects the background information culture of the organization as enforced and encouraged by senior management.

Group 2 clusters items SI01, SI02, and SI05. These measurement items reflect the effect of known people (those who are important to an individual or can directly influence their behavior) and whether these individuals think the participant should use the system. It is argued that Group 2 reflects Giddens' interaction of communication by sharing opinions concerning system use among co-workers.

Group 3 clusters the remaining measurement items (including SI06, SI07, SI08, SI09, and SI10). These measurement items tend to include aspects of the implication of use. For example, people who use the system are more highly regarded or acquire a higher profile, or whether use can positively affect one's reputation. As such, Group 3 appears to focus on Giddens' final interaction: power.

To validate these findings, the measurement items that were found to cluster for a different construct, perceived power security (PPS), were added to the SI measurement item pool to see whether they clustered with Giddens' power group in the orthogonal principal component dimensions.

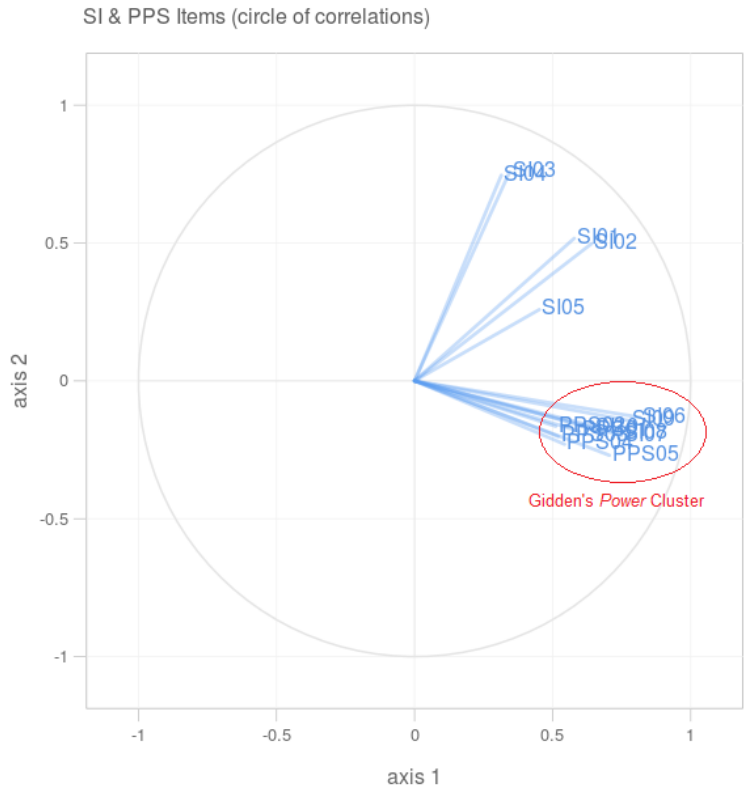

Figure 3 *The addition of the perceived power security measurement items supports the observed orthogonal principle component orientations associated with Giddens' power interaction.*

Figure 3 illustrates that the *PPS* and SI_{power} measurement items shared similar orthogonal values for their first and second principal components, which lends additional empirical support to the interpretation of the groupings via Giddens' structural dimensions and interactions.

6 DISCUSSION AND CONCLUSION

With the ubiquitous availability of sophisticated statistical tools, researchers are increasingly utilizing highly sensitive analysis techniques such as the class of tools associated with structural equation modeling (SEM). SEM-based procedures allow researchers to construct latent variables (corresponding to their research constructs of interest) and to statistically test their *a priori* theoretical models directly against empirical data (Chin, 1998, 2010).

In addition, SEM provides (and requires) increased rigour pertaining to construct validity. This family of techniques provides substantial improvements to testing many subdimensions of construct validity, including: "unidimensionality, convergent validity, discriminant validity, and predictive validity" (Garver & Mentzer, 1999). These empirical measures will ultimately provide improved research quality and may also highlight issues in past work.

The importance of construct validity comes into play when considering how the SEM techniques work. In brief, it is the correlation of aspects of a measurement item's principle components that statistically form the latent construct, which will then form the structural model under consideration. Thus, the unidimensionality of the measurement items and their ability to reflect the research construct becomes of critical importance to the success and interpretability of the final measurement model.

In this research, we found two major outcomes. First, we detected that social influence and its related constructs, as measured using traditional measurement items, are in fact multidimensional. Second, their multidimensionality supports the structures of society put forward by Giddens' Structuration Theory, where social influence = {communication, power, sanction}.

The implication is that each structurational interaction subgroup could and likely will behave differently (as evidenced by different orthogonal alignments of their principal components). It is highly probable that these differences could and will affect the interpretation of models going forward. In our example, there was a large distance between the sanction and power clusters in the circle of correlations. It is a forgone conclusion that measures of sanction and power (if treated separately) would have measurably different (and potentially significant) effects on other constructs within a SEM-based research model. In contrast, if the measures attempted to continue to reflect a single construct, the error associated with their path coefficients could be misleading or potentially insignificant. As with all research, the creation and interpretability of any research model remains a human task.

With much of information systems research embracing the social aspects of systems research, improved measures of the effects of culture and social norms on technology acceptance and technology adoption will become increasingly important. This research suggests that Structuration Theory may hold part of the key to explaining and modeling the adoption and acceptance of tomorrow's technology.

Appendix: the final pool of *subjective norm/social influence* and *perceived power security* measurement items.

Social Influence (SI)

SI01 People who influence my behaviour think that I should use the system.*
SI02 People who are important to me think that I should use the system.*
SI03 The senior management of this organisation support the use of the system.†
SI04 In general, the organisation has supports the use of the system.†
SI05 I use the system because many of my co-workers also use the system.†
SI06 People in my organisation who use the system are more highly regarded than those who do not.‡
SI07 People in my organisation who use the system are more dependable than those who do not.
SI08 People in my organisation who regularly use the system acquire a higher profile.‡
SI09 Using the system increases my chances of getting recognition in the workplace – e.g., contributes to promotion chances.
SI10 Placing my documents in the system – where other people may view them – may positively affect my reputation.

*Note: *Adapted from Ajzen and Fishbein 1975; †Adapted from Thompson et al. 1991; ‡Adapted from Moore and Benbasat 1991; all others are new.*

Perceived Power Security (PPS)

PPS01 Use of the system decreases my power over others.*†
PPS02 By recording my knowledge in the system, I will be less valuable to the organisation as a source of knowledge.
PPS03 By placing my records in the system, I feel that I have more control over them.
PPS04 By putting my documents into the system, there is a potential for people to judge my work.
PPS05 Use of the system does not affect my influence over other people. *†

*Note: *Adapted from Ong et al. 2005; †Added after card sort; All others are new.*

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