MEASURING IS-SUPPORT: A CONCEPTUAL MODEL

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Abstract

This paper reports on a conceptual model of a larger research effort proceeding from a central interest in the importance of assessing the IS-Support provided to key-user groups. This study conceptualised a new multidimensional IS-Support construct with four dimensions: training, documentation, assistance and authorisation, which form the overarching construct – IS-Support. We argue that a holistic measure for assessing IS-Support should consist of dimensions, and measures, that together assess the variety of the support provided to IS key-user groups. The proposed IS-Support construct is defined as the support the IS key-user groups receive to increase their capabilities in utilising information systems within the organisation. With two interrelated phases, conceptualisation phase and validation phase, to rigorously hypothesise and validate a measurement model, the IS-Support model, proposed in this study, is intended to include the characteristics of analytic theory.

Keywords: IS-Support, Formative constructs, Partial least squares, Model validation.

1 INTRODUCTION

IS-Support has long been an important issue to IS academics and practitioners (e.g. Chang & King, 2005; Rabaa'i, Gable, Bandara, & Fielt, 2010; Saunders & Jones, 1992; Wixom & Todd, 2005), as the benefits realised from large investments in IS are much influenced by the support provided to IS users (Rabaa'i & Gable, 2012; Shaw, DeLone, & Niederman, 2002; Shaw, Lee-Partidge, & Ang, 2003; Wixom & Todd, 2005). Notably, various research studies have shown that users' satisfaction with the IS is considerably enhanced by providing IS users with appropriate levels of support (e.g. Myers, Kappelman, & Prybutok, 1998; Palvia, 1996; Rabaa'i & Gable, 2012; Rainer & Carr, 1992; Shaw et al., 2002; Wixom & Todd, 2005; Yaverbaum & Nosek, 1992).

IS researchers tend to measure IS-Support by evaluating the performance of the Information Services Function (ISF) within the organisation. However, the question of how best to measure the ISF performance remains a vexing management challenge, review of the literature (see following) suggesting views and related concepts and measures are scattered, limited to a single perspective, and lacking a common theme.

Given the issues in prior IS-Support studies, this paper reports on preliminary findings of a larger research effort proceeding from a central interest in the importance of assessing the IS-Support provided to key-user groups[1]. The study aims to conceptualise and validate a new multidimensional IS-Support measurement model. The new IS-Support construct proposed in this study, is defined as *"the support the IS key-user groups receive to increase their capabilities in utilising information systems within the organisation"*. The overall study aims to address the main research question: *"How can the support provided to IS key user groups be effectively and efficiently measured?"*

The remainder of the paper will first present an abridged literature review of past research on IS-Support. Next, the research approach and methodology are presented; introducing the conceptual model, specifying the proposed IS-Support model in this study, and the study design. Finally, the paper concludes with a summary and a research outlook.

2 ABRIDGED LITERATURE REVIEW

Prior research has generally linked IS-Support to the ISF unit within the organisation, it being the main unit having responsibility for providing IS users the IS-related support needed (e.g. Chang & King, 2005; Rabaa'i, 2010). It is believed that the ISF *"is an integral part of achieving organizational success"* (Chang & King, 2005, p: 86). However, IS users can receive different types of support from different sources, not just from the ISF, such as: their colleagues, IS application manuals and documentation, external training, etc.

Rabaa'i et al. (2010) note that the ISF is expected to provide various support services to end-users: (1) across a variety of different packages and configurations, (2) on hardware and software maintenance, upgrades and installation (Jiang, Klein, & Carr, 2002), and (3) on data backup and recovery, and to provide this support in a cost- and time-effective manner (Shaw et al., 2002). The perceived importance of the ISF is evident from its prominence in various issues studies (e.g. Chang & King, 2005; Munkvold, 2003; Pitt, Watson, & Kavan, 1997; Saunders & Jones, 1992; Shaw et al., 2002; Velsen, Steehouder, & Jong, 2007). For instance, evidence suggests that poor ISF performance is a serious inhibitor to good business performance (e.g. Carlson & McNurlin, 1992; Chang & King, 2005; Rabaa'i et al., 2010). However, the question of how best to measure the ISF performance remains a vexing management challenge (Chang & King, 2005; Rabaa'i et al., 2010; Shaw et al., 2002).

[1] Key-user groups are: *"the main groups of direct users of the IS – those users who access the system directly, or who use its direct outputs"* (Gable, Sedera, & Chan, 2008, p: 386).

Instruments for gauging IS-Support derive from three main alternative sources: (i) the User Information Satisfaction (UIS) instrument (Iivari, 1987), (ii) a grounded approach yielding a new custom instrument (e.g. Chang & King, 2005), or (iii) the service quality (SERVQUAL) instrument from the marketing literature (e.g. Jiang et al., 2002). To gauge the products and services of the ISF, User Information Satisfaction (UIS), has been frequently employed (Iivari, 1987; Ives, Olson, & Baroudi, 1983; Joshi, 1990). This instrument has been the focus of a series of studies (e.g. Bailey & Pearson, 1983; Ives et al., 1983) which identified its major dimensions as: (1) the quality of information products produced by the ISF; (2) the level of user's knowledge and involvement in system development and ISF activities; and, (3) user attitudes towards ISF staff and services. While versions of user satisfaction with the ISF (USISF) instruments have been widely used, research has found problems with these measures and has suggested improvements (e.g. Galletta & Lederer, 1989; Iivari, 1987; Joshi, 1990; Melone, 1990; Srinivasan, 1985). For example, Baroudi and Orlikowski (1988) state that the original development and subsequent refinement of the USISF measure tended to be in an era of large centralised transaction processing systems rather than today's personal computing and network-based service environment. Moreover, Zmud (1984) notes that the role of the ISF has changed significantly from principally a manufacturing activity, involving development and operation of large scale hardware and software systems, to include additional roles of distribution and technology transfer that require higher levels of user interaction and service delivery. Given the changed role of the ISF, researchers have suggested that the USISF instruments' operationalisation may need to incorporate more items and cover additional dimensions to provide richer information (Baroudi & Orlikowski, 1988; Galletta & Lederer, 1989; Joshi, 1990; Melone, 1990)[2].

Saunders and Jones (1992) developed the *"IS Function Performance Evaluation Model"* which was used to describe how measures should be selected from multiple dimensions of the ISF relative to specific organisational factors and based on the perspective of the evaluator. The authors reported a Delphi study followed by senior executive interviews aimed at determining the important dimensions and their measures for evaluating ISF performance. Yet, their proposed model had the following issues: (1) the model focused on top management's perspective of ISF performance, (2) they offered a very limited and inadequate list of suggested measures for each dimension, and (3) their study sample was relatively small, which leads to questions regarding the generalisability of the results. Additionally, based on a theoretical input-output model of the ISF's role in supporting business process effectiveness and organisational performance, Chang & King (2005) developed a functional scorecard to measure "IS Performance". The instrument consists of 18 uni-dimensional factors (measures) within the three model dimensions: systems performance, information effectiveness, and service performance. Generated items were refined through a two round Q-sort technique (as described by Moore & Benbasat (1991)). However, the authors cautioned the use of the instrument until it is revalidated, as the sample size was relatively small. On the other hand, some items, such as: "IS training" and "flexibility of services", were borderline with respect to reliability. The authors stressed the need for further studies to explore and improve these items.

Several researchers (e.g. Jiang et al., 2002; Kettinger & Lee, 1994, 2005; Rabaa'i & Gable, 2012; Shaw et al., 2002; Watson, Pitt, & Kavan, 1998) recognise the importance of the services provided by the ISF and adapted the service quality (SERVQUAL) measure, originally developed in marketing (Parasuraman, Berry, & Zeithaml, 1991), to measure the quality of the services provided by the ISF. Shaw et al. (2002) , for example, examined support factors across multiple user groups. Using the SERVQUAL instrument, they looked at the gap between support level expected and support level provided for each of the support factors examined and for each of the user groups[3]. Their results

[2] Ross (2011) and others have reported on further changes in the roles of ISF, especially in the use of outsourcing strategies on various IS functions. As well as the introduction of cloud computing models, such as software as a service –these IS innovations have further changed the roles of ISF.

[3] The use of IS SERVQUAL has been the subject of considerable debate (Fisk, Brown, & Bitner, 1993; Kettinger & Lee, 1994; Parasuraman, Zeithaml, & Berry, 1993; Pitt et al., 1997; Van Dyke, Kappelman, & Prybutok, 1997; VanDyke,

showed larger gaps in IS staff response time, staff technical competence, software upgrades, ease of access to computing facilities, documentation to support training, cost effectiveness of systems, users understanding of the system, and data security and privacy. Shaw et al. had a generally dissatisfied user population and concluded that future studies should test the robustness of their results with a more highly satisfied user group[4].

In summary, the scope, perspectives and approach of past IS-Support studies, have varied. Additionally; *"the overall performance of the IS function has proved to be difficult to conceptualize and to measure"* (Chang & King, 2005, p: 86). And as aforementioned, IS users can receive different types of support from different sources, not just from the ISF. While prior literature offers several avenues to IS-Support measurement, existing discussions on this issue are scattered, limited to a single perspective, cannot be aggregated in any comprehensive way, and lack a common theme (Rabaa'i et al., 2010, p: 524). Consequently, no commonly accepted measure of ISF's performance has appeared (Chang & King, 2005).

3 APPROACH AND METHODOLOGY

3.1 The Conceptual Model

Consistent with Au, Ngaib, and Chengb (2002) and Chang and King (2005) description/notation of support, this study proceeds from the assumption that IS-Support is a multidimensional construct. We argue that a holistic measure for assessing IS-Support should consist of dimensions, and measures, that together assess the variety of support provided to IS key-user groups. In this study, the IS-Support construct is defined as *"the support the IS key-user groups receive to increase their capabilities in utilising information systems within the organisation"*[5]. Figure 1 depicts the IS-Support conceptual model.

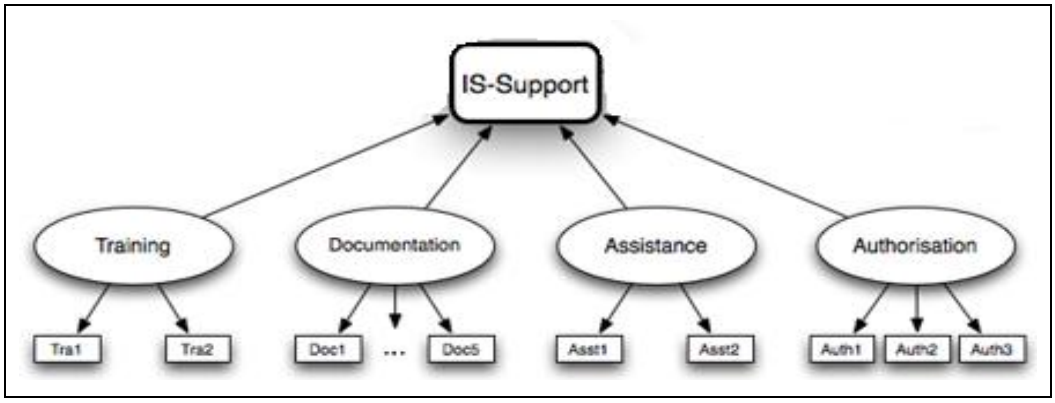

Figure 1. The IS-Support Conceptual Model.

Prybutok, & Kappelman, 1999). The focus of the debate concerns calculating differences between two possibly different constructs, expectations and perceptions (Rabaa'i & Gable, 2012).

[4] See: Tate and Evermann (2010), Rabaa'i (2010), and Rabaa'i and Gable (2012) for different issues of using IS SERVQUAL.

[5] It should be noted that the IS-Support construct conceptualised in this study is dissimilar to SERVQUAL in that the former is the extent to which the support is available to IS users (i.e. evaluating the existence of support), where the latter is: *"the quality of the support that system users receive from the IS department and IT support personnel. For example: responsiveness, accuracy, reliability, technical competence, and empathy of the personnel staff"* (Petter, DeLone, & McLean, 2008, p: 239) (i.e. evaluating the quality of support). For instance, in an online services, Business-to-Consumer, context, Cenfetelli et al. (2008) make a similar distinction between Supporting-Services Functionality (SSF) and Service Quality. The authors state that *"SSF is the extent to which IT artifacts exist to provide supporting services around a core product or service, whereas service quality is the evaluation of how well those supporting services are delivered"* (Cenfetelli et al., 2008, p: 165).

The IS-Support model is likened to Analytic (or Type 1) theory (AT), the most basic type of theory necessary for the development of all other types of theory (Gregor, 2006). AT "*describe or classify specific dimensions or characteristics of individuals, groups, situations, or events by summarizing the commonalities found in discrete observations"* (Gregor, 2006: 623)[6]. The notion of AT is valuable in conceptualising and validating a classification model, framework, or a taxonomy, or in this case a hierarchical, multidimensional measurement model.

IS-Support is conceptualised as a formative, multidimensional construct[7], wherein the four dimensions: training, documentation, assistance and authorisation, form the overarching construct – IS-Support. Good analytic theory should manifest strong positive qualities of: (1) model completeness – include all relevant dimensions and measures, where any ill-conceived additions or omissions good and bad, high and low, positive and negative may critically mask, neutralise or distort results, (2) model parsimony – where only the simplest and smallest relevant dimensions and measures are included, and (3) mutual exclusivity - where each measure addresses a unique aspect of the construct without having overlapping measures. Thus we evaluate IS-Support in terms of these qualities.

The IS literature strongly recommends relying on existing and pre-validated measurement indicators where available (e.g. Boudreau, Gefen, & Straub, 2001; DeLone & McLean, 1992, 2003) for two reasons: (1) using pre-validated measurement indicators, which have been proven to be high quality in terms of validity and reliability, will enable researchers to measure the same constructs in the same way in different settings, which in turn, will improve measurement of dependent as well as independent variables (Straub, 1989), and (2) indicators development requires extensive time and resources (e.g. Lewis, Templeton, & Byrd, 2005). Table 1 provides a description of the IS-Support model's dimensions and the adopted indicators and their lineage.

Training: The amount and adequacy of specialised instructions and practices that is provided to [the IS's] users.			
Measure		**Description**	**Adopted from**
Tra1	Amount of training	There is not enough training for me on how to find, understand, access or use [the IS].	Karimi et al. (2004); Kositanurit et al. (2006); Shin (2003); Goodhue (1998); Goodhue (1995); Bailey & Pearson (1983)
Tra2	Adequacy of training	I am getting the training I need to be able to use [the IS] effectively in my job.	Karimi et al. (2004); Kositanurit et al. (2006); Shin (2003); Goodhue (1998); Goodhue (1995); Etezadi-Amoli et al. (1996)
Documentation: The recorded description of [the IS]. This includes formal instructions for the use of [the IS].			
Measure		**Description**	**Adopted from**
Doc1	Usefulness of the manuals	The content of the user manual is useful.	Kositanurit et al. (2006); Etezadi-Amoli et al. (1996)
Doc2	Usefulness of the manuals' index	The index of the user manual is useful	Kositanurit et al. (2006); Etezadi-Amoli et al. (1996)
Doc3	Currency of the manuals	The user manual is current (up-to-date).	Kositanurit et al. (2006); Etezadi-Amoli et al. (1996)
Doc4	Completeness of the manuals	The user manual is complete	Kositanurit et al. (2006); Etezadi-Amoli et al. (1996)
Doc5	Understandability of the manuals	The user manual is easy to understand and follow.	Kositanurit et al. (2006); Etezadi-Amoli et al. (1996)
Assistance: The availability and ease of getting help on problems with the data/information.			
Measure		**Description**	**Adopted from**
Asst1	Availability of assistance	I am getting the help I need in accessing and understanding the data.	Goodhue (1995); Karimi et al. (2004); Kositanurit et al. (2006); Goodhue (1998); Goodhue (1995); Swanson (1987)
Asst2	Easy to get assistance	It is easy to get assistance when I am having trouble finding or using data.	Goodhue (1995); Karimi et al. (2004); Kositanurit et al. (2006); Goodhue (1998); Goodhue (1995); Swanson (1987)

[6] Analytic theory seeks to answer "What is" question as opposed to explaining causality or attempting predictive generalisations is the essence of the approach (Gregor, 2006).

[7] A brief discussion on the applications of multidimensional constructs is presented in Rabaa'i and Gable (2012).

Authorisation: The ease of getting approval to get access to required data/information.			
Measure		**Description**	**Adopted from**
Auth1	Right authorisation	Data that would be useful to me are unavailable because I do not have the right authorisation.	Karimi et al. (2004); Kositanurit et al. (2006); Goodhue (1998); Goodhue (1995)
Auth2	Easy to get authorisation	Getting authorisation to access data that would be useful in my job is time consuming and difficult.	Karimi et al. (2004); Kositanurit et al. (2006); Goodhue (1998); Goodhue (1995)
Auth3	Data Protection	Data are safeguarded from unauthorised changes or use.	Karimi et al. (2004).

Table 1. IS-Support Model's dimensions and indicators

3.2 Specifying the IS-Support Model

Petter Straub and Rai (2007) cast doubt on the validity of many mainstream constructs employed in IS research over the past three decades. Petter et al. (2007) criticise the almost universal conceptualisation and validation of these constructs as *reflective* when in many studies the measures appear to have been implicitly operationalised as *formative*. Other authors, like Diamantopoulos and Winklhofer (2001) and Jarvis, MacKenzie, & Podsakoff (2003), support this view[8]. Petter et al. (2007) suggest that there is a significant threat of misspecifying and validating constructs as "reflective" that, on closer scrutiny, are, in fact, "formative". Misspecification of constructs as formative or reflective results in measurement error, which impacts the structural model, thereby increasing the potential for type I and type II errors (Gable & Sedera, 2009; Gable et al., 2008).

How a multidimensional construct is operationalised may influence analytical results of research models (e.g. Gable & Sedera, 2009; Jarvis et al., 2003; Petter et al., 2007; Polites, Roberts, & Thatcher, 2011; Vlachos & Theotokis, 2009). Therefore, it is essential to carefully conceptualise the relationship from the first-order dimensions and their indicators and from lower-order dimensions to the higher-order construct (Polites et al., 2011).

The IS-Support model is conceptualised as a reflective first-order, formative second-order model (i.e. Type II in Jarvis et al. (2003) specification of multidimensional constructs). As mentioned previously and noted in Figure 1, the IS-Support construct is formed from four first-order dimensions: training, documentation, assistance and authorisation. Cumulating these four related dimensions of IS-Support entails that the dimensions collectively contribute to the second-order IS-Support construct, which can elucidate their collective effect. However, these four dimensions are likely to change over time and be affected in a different ways by other factors. For instance, IS-Support provided to users may be of different levels of effectiveness and efficiency. As such, one would be mistaken to easily trade, for example, training provided to an IS users for the documentation of the IS provided to its users. Also, a change in the assistance provided to an IS users, for example, does not imply a similar change in the authorisation granted to the IS users to access data/information; thereby making a reflective model less likely. Hence, these imply that training, documentation, assistance and authorisation affect the IS-Support in a formative way. Additionally, the four first-order dimensions of the IS-Support construct are conceptualised and measured reflectively. For example, the training dimension is manifested by such measurable reflective indicators as the amount of training and adequacy of training provided to the IS users. The other three dimensions are the same, reflected by their measurement indicators.

[8] Nevertheless, there has been an ongoing debate on the characteristics of both model types and particularly on the limitations of formative indicators (e.g. Ali, Tate, Rabaa'i, & Zhang, 2012; Bagozzi, 2007; Bollen, 2007; Edwards, 2011; Hardin, Chang, Fuller, & Torkzadeh, 2011; Howell, Breivik, & Wilcox, 2007a, 2007b; Wilcox, Howell, & Breivik, 2008). A comprehensive overview of the application of formative measurement models has been provided by Diamantopoulos, Riefler, and Roth (2008).

3.3 The Research Design

Consistent with MacKenzie and House (1979), McGrath (1979) and Burton-Jones and Straub (2006), this study employs guidelines similar to Gable et al. (2008), to conceptualise and validate a measurement model. These guidelines suggest a research cycle that involves two main phases: Conceptualisation and Validation (Figure 2)[9].

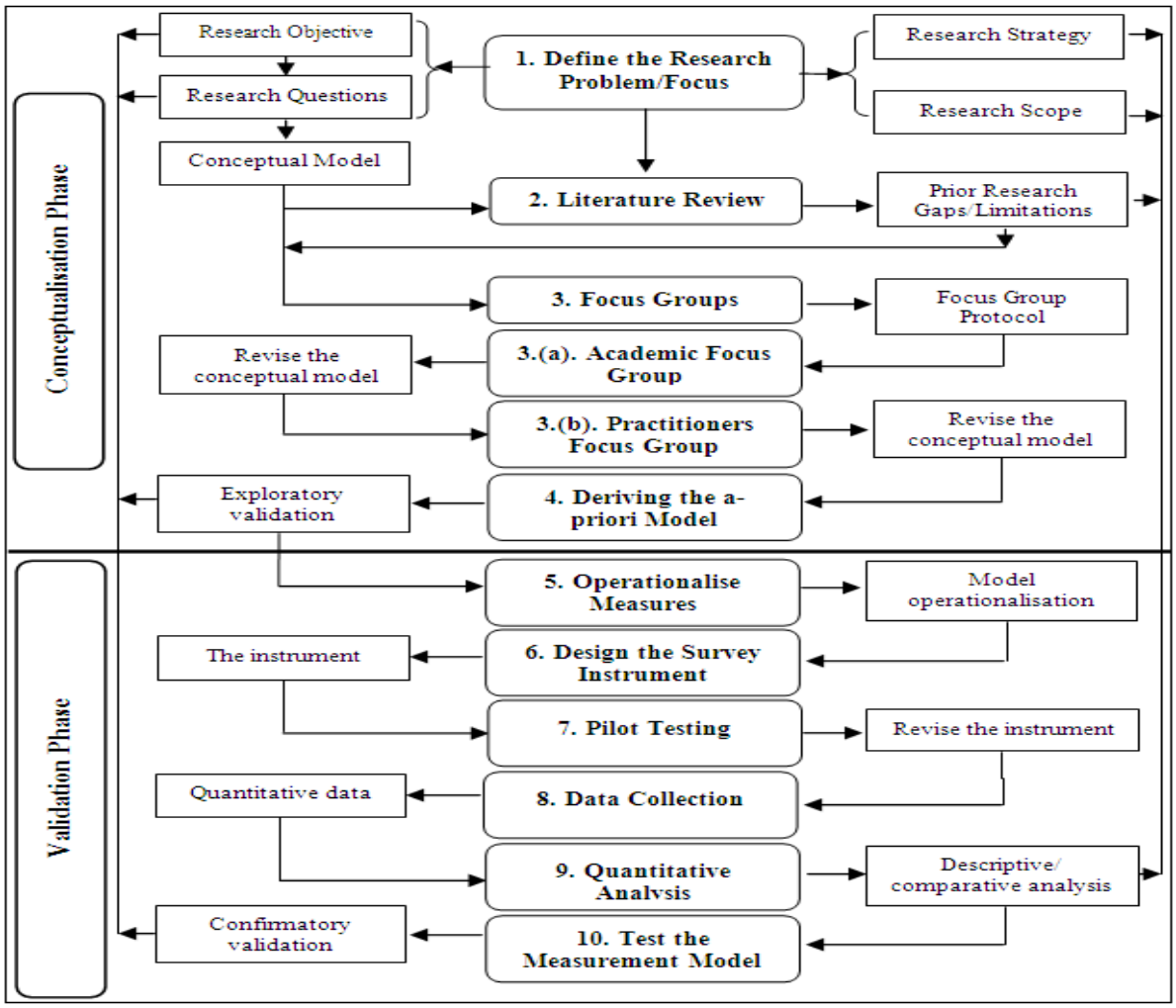

Figure 2. The Overall Research Design.

3.3.1 Conceptualisation phase

The first purpose of this phase is to achieve a grounded understanding of the area of study, commencing with the stages: (i) define the research problem/focus and (ii) review relevant literature. A comprehensive literature review was conducted on IS-Support. The literature review assessed and critically examined different studies related to the research problem (i.e. IS-Support provided to key-user groups) that have been published in academic literature and identified several limitations and gaps in prior IS evaluation studies to motivate and position this work.

[9] The different stages of the research are presented by rounded rectangles, information flows and their directions are illustrated by arrows and the outputs derived from the different stages are presented by rectangles.

Stages 3 through 7 correspond to the 'function method' of the two-step approach of Burton-Jones and Straub (2006) for identifying/selecting measures and operationalising constructs that are appropriate to the context of the study, and entailed the conduct of separate academic and practitioner focus groups. The focus groups aimed to test the completeness and applicability of the IS-Support conceptual model dimensions and measures. Following any required revision, the conceptual model would be operationalised in the Validation phase.

3.3.2 Validation Phase

The validation phase aims to empirically validate the model employing survey data and mainly 7-point Likert scales; the instrument to be piloted and revised as necessary. Descriptive and comparative analyses will be conducted and reported. The model will be tested using the partial least squares (PLS) approach of structural equation modeling (SEM). Reasons for using PLS in this study include: (1) the theory development nature of this study (e.g. Chwelos, Benbasat, & Dexter, 2001; Kanawattanachai & Yoo, 2007; Komiak & Benbasat, 2006), (2) the ability of PLS to model both formative as well as reflective constructs makes it suitable for our purpose[10] (e.g. Choudhury & Karahanna, 2008; Liang, Saraf, Hu, & Xue, 2007; Limayem, Hirt, & Cheung, 2007), and (3) the ability of PLS to easily model multidimensional constructs (Wetzels, Odekerken-Schröder, & van Oppen, 2009).

4 SUMMARY AND RESEARCH OUTLOOK

This paper reports on the conceptual model of a larger research effort proceeding from a central interest in the importance of assessing the IS-Support provided to key-user groups. The overall study is novel in aiming to contribute to the goal of developing a robust model and instrument for measuring IS-Support.

The proposed IS-Support construct is defined as the support the IS key-user groups receive to increase their capabilities in utilising the information systems within the organisation. This study conceptualised IS-Support model as a reflective first-order, formative second-order model, wherein the four dimensions: training, documentation, assistance and authorisation, form the overarching construct – IS-Support.

With two interrelated phases, conceptualisation phase and validation phase, to hypothesise and test the measurement model, the IS-Support model proposed in this study is subsequently further evaluated against the qualities of strong analytic theory through focus groups and a survey. The focus groups qualitatively investigate (i) model completeness, (ii) model parsimony, and (3) mutual exclusivity of the conceptual model dimensions and measures, while the survey further addresses these qualities quantitatively.

[10] It should be noted that CBSEM such as LISREL can handle formative models (Jarvis et al., 2003); however, such models are often easier to handle in PLS compared to LISREL (Andreev, Heart, Maoz, & Pliskin, 2009; Gefen, Rigdon, & Straub, 2011; Hair, Ringle, & Sarstedt, 2011).

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