IS BENEFIT FOR INDIVIDUALS: EXPANDED CONCEPTUALIZATION AND COMPREHENSIVE CONSTRUCT DEVELOPMENT

by

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ABSTRACT

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Information systems benefits for individuals (ISBI) has been a key construct for the IS success model, which has evolved over the years to strengthen the theoretical foundation for the IS field. However, relatively little research has been done to explore, develop and validate the underlying theoretical dimensions for this crucial construct. Moreover, extant research related to this construct in particular, and to the IS success model in general, has been conducted in the context of individual IS application instead of the overall IS in the organization. This study fulfills four research objectives: (1) Develop a theory-based extended conceptualization of IS Benefits for Individuals (ISBI) in the context of overall use of various types of IT/IS by individuals in an organization (2) Develop a comprehensive theory-based conceptualization for the overall IT/IS use (ISU) (3) Develop and Validate the ISBI and the ISU constructs (4) Apply the two constructs in examining IS success.

This study draws from the ERG theory (ERG stands for Existence, Relatedness, Growth; Alderfer, 1972), Job Characteristic Theory (JCT; Hackman and Oldham, 1975, 1976) and other theoretical perspectives. A theory-based WJT framework was developed which consists of three levels: **W**ork enrichment, **J**ob interaction, and **T**ask performance,

corresponding to the three levels of the ERG theory. The ISBI construct is developed as a formative construct that consists of these three sub-constructs, and each of which, in turn, consists of three sub-constructs based on JCT and other relevant theories. With a sample of 231 responses from business professionals, the validities of the ISBI construct were established. A partial test of the IS success model was conducted with the ISBI measure and a measure of the overall IS Use. The results indicate that ISBI mediates the relationship between IS Use and satisfaction. This finding attests to the robustness of the scale in its ability to explain why people are satisfied when using IS.

In addition, the study results reveal that overall IS Use has roughly equal impacts on the three types of benefits, but the job interaction benefit has the highest impact on satisfaction, while the Task Performance Benefits has no impact on satisfaction. Further, DSS (Decision Support Systems) Use is found to be the most important type of IS in increasing employees' job benefit perception, while GSS (Group Support Systems) most greatly contributes to employees' increased Corporate IS Satisfaction. These results provide a more granulated picture of the relationship among IS Use, ISBI, and Satisfaction, in the context of the emerging IS environment which has evolved far beyond the traditional IRS (Information Reporting Systems) and gravitated toward modern DSS and GSS.

In conclusion, this study has succeeded in developing and validating theory-based multidimensional measures for ISBI and ISU, and applying it to test a part of the IS success model. Further, this study expended the context of the IS success model to the overall IS and the different types of IS it includes, rather than a single system as in previous studies. The theoretical and empirical work of this study has thus contributed significantly to the cumulated research on IS success, a critical foundation for the IS field.

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CHAPTER 1

INTRODUCTION

1.1 Research Motivation

Understanding the impact or benefit of Information Systems (IS) or Information Technology (IT) on individual users has been a challenge to IS researchers and practitioners. Early studies chose empirical measures for IS benefits without sound theoretical underpinnings (Torkzadeh and Doll, 1999; Saarinen, 1996; Bonner, 1995; Gable *et al*., 2008). Moreover, many researchers have assessed IS impacts or benefits by simply using the scale of perceived usefulness developed from TAM (Technology Acceptance Model) (Davis, 1989). Perceived usefulness might be an appropriate construct to evaluate overall IS/IT impact on individual users with a high degree of content and convergent validity. However, the perceived usefulness construct is necessary, but not sufficient to appreciate the fundamental scale and scope of IS benefits. An attempt to tap and capture the full domain of IS benefits with one single facet appears to be too simplistic, or even naïve, since IS benefits or performance is intrinsically a multifaceted complex construct (DeLone and McLean, 2003; Torkzadeh and Doll, 1999).

Failure to recognize the multidimensional nature and property of IS benefits may be attributed to the lack of theoretical perspectives in understanding this complex, multifaceted construct. Such weak or absence of theoretical basis for comprehending major constructs in IS research may stem from a number of causes, such as researchers' own preferred definitions or concepts for research convenience (Markus and Robey, 1988), inadequate conceptualization, excessive dependence on existing measurements which may be problematic (Burton-Jones and Straub, 2006), inconsistent results on IS impacts (DeLone and McLean, 2003), and inability to explore objective measures (Benbasat and Barki, 2007) etc.

To overcome the criticism caused by deficient theoretical rigor in IS research (Melone, 1990; Au *et al*., 2002; Burton-Jones and Straub, 2006; Briggs *et al*., 2008), researchers have

recently attempted to apply theoretical bases in conceptualizing major constructs in IS success domain. For instance, with respect to the construct satisfaction, IS researchers (McKinney *et al*., 2002; Bhattacherjee, 2001) applied disconfirmation theory developed in the context of marketing to derive more in depth insights about that construct, while Au *et al*. (2008) employed ERG (Existence, Relatedness, Growth) theory that originated from management studies. Another major construct in IS research, IS use or usage has also recently received extensive theoretical attention in studies (e.g. Burton-Jones and Straub, 2006; Burton-Jones and Gallivan, 2007; Barki *et al*., 2007), investigating the link between IS use and individual performance.

Surprisingly, research on identifying the underlying dimensions of individual impact or net benefit through a theory-based view still remains sparse. While it is important to provide a rich theoretical portrait to the two major constructs of IS satisfaction and IS use, providing strong theoretical foundation to conceptualize and measure IS benefits is also crucial for IS research. However, there has been little research effort to conceptualize IS benefits from a theoretical perspective and to develop theory-based measures for exploring the underlying dimensions of IS benefits. The lack of a theoretical basis in conceptualizing makes it difficult to develop and choose more appropriate measures for IS benefits in examining its relationship with other major constructs.

In addition to the lack of theory in investigating ISBI, many previous studies tested the constructs and instruments to measure the constructs with one single IS application or one particular system (e.g. Rai, *et al*., 2002; Iivari, 2005; Seddon and Kiew, 1994), rather than with the overall IS used by an employee in an organization. These studies attempted to generalize the overall IS benefits based on their empirical research results from a specific IS application context. Nevertheless, the extent and dimensions of ISBI are likely to be different depending on the nature of a particular IS or IT. A user, for example, is likely to perceive an email system as beneficial in terms of speedy communication accessibility rather than knowledge creativity gained mainly through a knowledge management system. Coupling with the deficiency of theory, sparse attention to the IS differences originated from the unique nature of each distinct

IS (e.g. traditional processing system, e-mail system, CRM, Knowledge Database) results in failure to generate reliable and consistent findings on ISBI. Many previous studies, however, do not consider the various dimensions of individual benefits varying across different types of IS application or technology that an individual uses for his/her work. Moreover, it remains doubtful whether the scales and instruments developed to measure the benefits from the individual IS context based on decades old IS (e.g. mainframe, EDI) can be reliably applied to measure the benefits of more advanced IS applications context at present (Teng and Calhoun, 1996; Au *et al*., 2002). Therefore, it is necessary to examine the different dimensions of ISBI, depending on the wider types of IS/IT used today by individual users for their work.

1.2 Research Objectives

As a research attempt at applying theoretical lens to IS benefits for individuals, this study aims to propose the development of definitions, scales, and measures which are designed to understand the multidimensional nature of IS benefits for individuals. Based on the foregoing discussion, the objectives of this study are to conceptualize, develop and validate critical underlying dimensions of IS benefits for individuals (ISBI) through the theoretical lenses of JCT (Job Characteristics Theory), ERG (Existence, Relatedness, Growth) theory (Alderfer, 1972), and other theoretically relevant perspectives. First, a job-centric approach is adopted to conceptualize and delineate the various aspects of ISBI. In addition to the perspective focused on employees' job context, this study will augment ERG theory to understand ISBI. ERG-theory, which stands for Existence (material, psychological), Relatedness (social relationship with others), and Growth (self-actualization and further achievement), was originally developed to comprehend human needs embedded in a human beings' personal life context. However, this study seeks to pay extensive research attention in understanding underlying dimensions of ISBI in a job and organizational setting where employees use various types of IS for different tasks. Thus, it is important to augment ERG theory to address employees' benefits in a professional job context.

These are the major objectives of this study:

(1) Develop a theory-based extended conceptualization of IS Benefits for Individuals (ISBI) in the context of overall use of various types of IT/IS by individuals in an organization.

(2) Develop a comprehensive theory-based conceptualization for the overall IT/IS use (ISU).

(3) Develop and Validate the ISBI and the ISU constructs.

(4) Apply the two constructs in examining IS success.

With this study, the set of constructs for the IS success model will have better and more robust measurements, thus setting the stage for further progress in studying IS success.

CHAPTER 2

LITERATURE REVIEW

2.1 IS Success Models

IS success model (DeLone and McLean, 1992, 2003; see Figure 2.1 and Figure 2.2) including Seddon (1997; see Figure 2.3)'s respecified IS success model (Rai *et al*., 2002), considers IS benefits as one of the most important constructs to understand the complex aspects around IS success measures. As shown in Figure 2.2, the model has six constructs to measure IS success. Five constructs among these six measures including information quality, system quality, service quality, use, and satisfaction, eventually lead to individual impact (DeLone and McLean, 1992) or net benefits (2003).

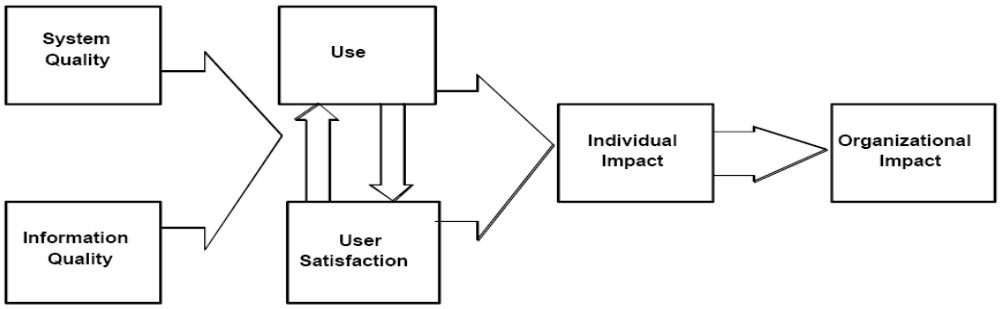


Figure 2.1 DeLone and McLean IS Success Model (1992, p. 87)

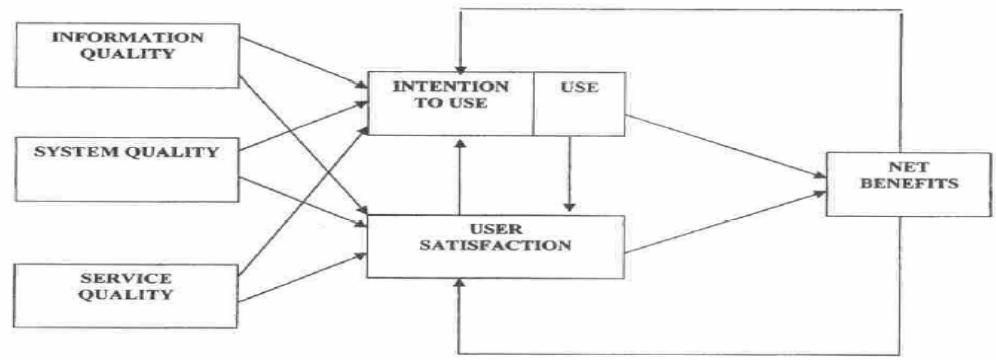


Figure 2.2 Updated IS Success Model (DeLone & McLean, 2003, p. 24)

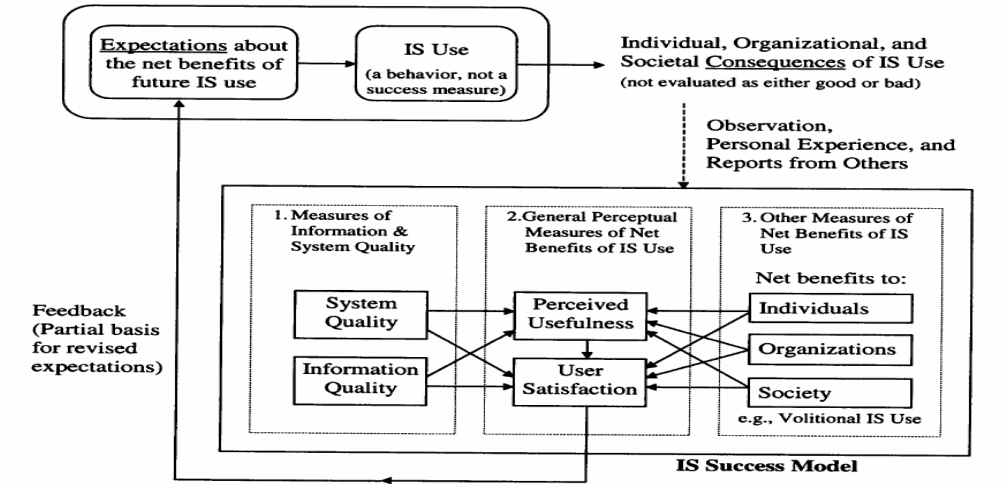


Figure 2.3 Respecified DeLone and McLean's IS Success Model (Seddon, 1997, p. 245)

With the exception of individual impact (DeLone and McLean, 1992) and net benefits (DeLone and McLean, 2003), considerable progress has been achieved in studying and understanding the other five constructs in IS success research. For example, information quality can be appropriately measured with rich dimensions such as relevance, accuracy, currency, content, exactness, format, speed, completeness, understandability (Bailey and Pearson, 1983; Ives *et al*., 1983, Doll and Torkzadeh, 1988; Lee *et al*., 2002; Gable *et al*., 2008; Nelson *et al*., 2005). System quality too, can be captured with reliability, flexibility, pertinence, ease of use, response time and confidence (Baliey and Pearson 1983; Ives *et al*., 1983; McKeen and Guimaraes, 1997; Gable *et al*., 2008; Nelson *et al*., 2005). The use construct also has been developed with multifaceted dimensions such as frequency, duration, intensity (Venkatesh *et al*., 2008), and depth, cognitive absorption or deep structure (Burton-Jones and Straub, 2006), the number of tasks used (Barki *et al*., 2007), and frequentative use and state of being (Schwarz and Chin, 2007).

In DeLone and McLean's models (1993, 2003) (Figure 2.1 and 2.2), "Individual Impact" or "Net Benefits" are dependent variable of other success variables. Of the six distinct IS success measures, five variables: system quality, information quality, service quality, use, and satisfaction are depicted as independent variables affecting the dependent variable of

"Individual Impact" through either a direct (use and satisfaction) or indirect path (system quality and information quality).

DeLone and McLean stress the importance of Individual Impact (1992) or Net Benefits (2003) and also call for further research to capture its complex nature. Recognizing that Individual Impact or Net Benefit is one of the most difficult constructs to conceptualize, they suggest developing a multi-dimensional construct for ISBI by examining it from the perspective of job related performance, such as the one proposed by Torkzadeh and Doll (1999).

In contrast, Seddon (1997), in his respecified IS success framework, defines Net Benefits as "an idealized comprehensive measure of the sum of all past and expected future benefit (p.246)." Besides, he argues that although Perceived Usefulness possesses a similar semantic meaning as Net Benefits, Individual Net Benefits should be distinguished from Perceived Usefulness, since costs are much less important in Perceived Usefulness than in Net Benefits (Seddon, 1997). He subsequently asserts that "Net Benefits" is a unique construct distinct from the others, implying that "Net Benefits" may be interpreted as a construct encompassing diverse facets. In fact, Seddon (1997) defined and conceptualized perceived usefulness and individual net benefit as distinct constructs in their re-specified IS success model (See Figure 2.3), but did not elaborate on the underlying dimensions of the two constructs.

In addition, Agarwal and Lucas (2005) emphasize the significance of studying "the impact of IT artifact" over IT artifact itself, heeding Benbasat and Zmud (2003)'s "call for returning to IT artifacts" in IS research (Galliers, 2003). According to them, IT has influenced the way employees execute tasks, provide customer service, communicate with one another, and so on. Therefore, it is imperative for IS research to focus on articulating the benefits from IT. A holistic research effort must be made to identify, analyze and elaborate on the underlying dimensions of ISBI for a more comprehensive understanding of the phenomenon.

Further, Benbasat and Barki (2007) suggest "opening the black box of usefulness" by identifying its antecedents, in order to advance IS research. In doing so, defining, articulating,

and explicating the dimensions of this construct based on a robust theoretical foundation are crucial. In response to this call, this study needs to focus on conceptualizing a comprehensive set of dimensions to improve our understanding of how perceived usefulness is formed at individual level.

2.2 ISBI as an Aggregate Construct

Researchers have attempted to measure specific areas or aspects of ISBI in the past, but a general ISBI measure is yet to be developed (DeLone and McLean, 2003). As summarized in Table 2.1, these include decision making (Teng and Calhoun, 1996; Leider and Elam, 1994; Jiang and Klein, 1999), collaboration and coordination (Majchrzak *et al*., 2005), and knowledge exploration (Barki *et al*., 2007). These efforts, however, are isolated and fragmented, lacking an integrated theoretical base to examine the overall ISBI phenomena.

Most studies on IS success appear to adopt the definition on perceived usefulness in TAM (Technology Acceptance Model; Davis, 1989) when addressing individual impacts. While defining usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance within an organizational context" (Davis, 1989; Davis *et al*., 1989), he argues that it is a construct of belief, thus measured as individuals' subjective perceptual evaluation, rather than an objective actual assessment (Davis, 1989; Davis *et al*., 1989).

Along with Davis's (1989) definition, many subsequent studies have operationalized the construct "Perceived Usefulness" as an overall job performance measure (Moore and Benbasat, 1991; Goodhue and Thompson, 1995; Venkatesh *et al*., 2003; Seddon and Kiew, 1994; Seddon, 1997; Rai *et al*., 2002; Wixom and Todd, 2005). In addition, the studies testing the validity of IS success model (DeLone and McLean, 1992) measured "Individual Impact" with the instruments developed for "Perceived Usefulness" in TAM studies (Iivari, 2005). In an attempt to reconcile DeLone and McLean's model (1992) and Seddon's model (1997), Rai *et al*. (2002) also used the Perceived Usefulness construct from TAM to measure "Individual Impact."

Table 2.1 Summary of conceptualization on ISBI in literature

ISBI measures	**Description**	**Prior Literature**	**Sample Items**
Decision Making Performance	The extent to which IS contribute to improving users' capability in various aspects of decision quality	Sirinivasan, 1985; Leider and Elam, 1994; Teng and Calhoun, 1996; Jiang and Klein, 1999; Wixom and Watson, 2001; D'Ambra and Rice, 2001;	To what extent has IS helped you to: · Increase Decision Speed · Examine more alternatives in decision making · Use more sources of information in decision making · Increase decision confidence
Job Diagnostic Dimensions (task variety, significance, autonomy),	The extent to which IS helps employees improve work quality in specific job dimensions	Ryker and Nath, 1995; Franz et al., 1986; Yoon and Guimaraes, 1995;	After IS available; · apply a number of complex or sophisticated skills · the job is quite simple and repetitive
Collaborative Performance	The extent to which IS helps individuals communicate, collaborate, and interact with coworkers for information sharing and task integration	Staples et al., 1999; Mohr et al., 1996; Majchrzak et al., 2005; Karsten, 2003; Huber, 1990;	· Uses e-mail effectively to send information updates to the work group · Supports and promotes social activities and team building activities
Knowledge innovation	The extent to which IS helps users explore or create new ideas, job skills or initiatives in their work	Torkzadeh and Doll, 1999; Gable et al., 2008; Barki et al., 2007; Shirani et al., 1999; D'Ambra and Rice, 2001; Wu and Wang, 2006;	· Do research, on my own initiative, in order to increase my knowledge regarding my job. · Generate more unique ideas · Explore several information sources, on my own initiative, in order to enhance my job related expertise
Overall Task Productivity	The extent to which IS improves users' overall productivity	Davis et al., 1989; Goodhue, 1995; Torkzadeh and Doll, 1999; Gable et al., 2008; D'Ambra and Rice, 2001; Belanger et al., 2001; Igbaria and Tan, 1997;	· Improve my overall productivity at work

Generally, studies in both TAM and IS success, conceptualize "Perceived Usefulness" or "Individual Impact" as a construct related to overall job performance, measured as an aggregated value of perceived job productivity improvement. Moreover, the operationalization of "perceived usefulness" as a simplified construct of representing individual Task Performance

is somewhat consistent with Larsen (2003)'s taxonomy research. From the variable analysis of IS success antecedents published in 15,468 articles in 11 journals, Larsen (2003) found that the concepts "Individual, Task, and Performance" are grouped into "individual and job related" category.

Although it is relatively simple to measure "Perceived Usefulness," or "Individual Impact" when treated as an aggregated summary of perceived IT-enabled job performance, it is challenging to capture the full nature and scope underlying it. Job performance includes various dimensions such as task variety, decision making quality, or communication improvement. It implies that IS may have different levels of benefits in different job performance dimensions or magnitudes. The aggregate measurement of this multifaceted construct not only hinders the articulation of its underlying dimensions, but also leads to a rough conclusion that IS contributes to improving overall job performance, without understanding how this is achieved through its various underlying dimensions.

In addition to oversimplifying, "Perceived Usefulness" or "Individual Impact" as the aggregate measure for ISBI, prior literature has an issue regarding generalizability across populations and contexts. A number of researchers used such an aggregated measure in a research context in which one single system in one organization is selected and examined (Seddon and Kiew, 1994; livari, 2005; Rai *et al*., 2002). Today, users in an organization rely on a wider range of IS for different tasks than ever. The advent of various types of advanced IS is likely to generate distinct levels and scopes of perceived usefulness or individual benefits which would be fundamentally different from those developed by using one single system for limited tasks. Thus, it is necessary to develop and validate the construct, appropriately reflecting current organizational setting where various IS are used for diverse dimensions of job performance.

From the above mentioned research models, we see a need to examine the various facets and dimensions of "Perceived Usefulness" or "Individual Impact," by recognizing the

current context and overall use of various types of advanced IS for different tasks in an organization.

2.3 ISBI as a Multi-dimensional Construct

Relatively sparse research has been done to explore various dimensions of ISBI. Torkzadeh and Doll (1999, p.329), for example, identify the following multiple dimensions of "Impact of IT" on work at the individual level:

- *Task productivity—the extent to which an application improves the user's output per unit of time;*
- *Task innovation—the extent to which an application helps users create and try out new ideas in their work;*
- *Customer satisfaction—the extent to which an application helps the user create value for the firm's internal or external customers;*
- *Management control—the extent to which the application helps to regulate work processes and performance.*

Torkzadeh and Doll's work (1999) has made significant contribution to our understanding of the underlying dimensions of individual IS impact/benefit, but there appears a lack of theoretical foundation for the four types of benefits. These four types of benefits may not comprehensively tap all underlying dimensions in the benefits. There could be other facets in benefits.

Sedera *et al*. (2004) and Gable *et al*. (2008) also attempt to conceptualize "the impact of IS" as a formative construct of multidimensional concepts: individual impact, organizational impact, system quality, and information quality. In their model (Figure 2.4), "Individual Impact" is delineated with 4 different dimensions; learning, Awareness/Recall, decision making effectiveness, and individual productivity. Curiously, they used just one single item to measure each of the 4 dimensions of Individual Impact (Gable *et al*., 2008, p. 405).

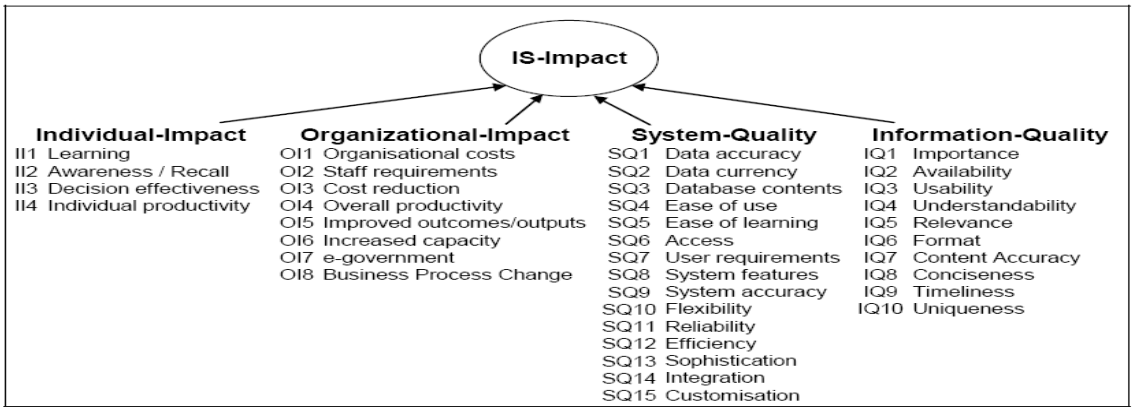


Figure 2.4 IS-Impact Measurement Model (Gable et al., 2008, p.390)

The literature review indicates that a number of previous studies have greatly expanded the multifaceted aspects of ISBI and enriched the concepts in ISBI. The theoretical underpinnings of the identified constructs, however, remain as subjects of potential research.

2.4 ERG Theory in IS research

In an attempt to provide a theoretical base for a systematic framework in conceptualizing the underlying dimensions of perceived usefulness, Glassberg (2000) was the first to have used the perspective of ERG theory (Alderfer, 1972). ERG theory classifies various types of human needs with the 3 categories of needs (existence, relatedness, growth), claiming that individuals seek to first satisfy a more concrete need (Existence) before a less concrete one (Growth). In her doctoral dissertation supervised by Dr. James Teng, Glassberg (2000) proposed and validated a richer conceptualization of "Extended Usefulness" in terms of 3 new scales; Perceived Social usefulness, Perceived Personal Usefulness, and Perceived Work Usefulness.

- *Perceived Work Usefulness; the degree to which an individual believes that using a particular technology would enhance his or her work performance*
- *Perceived Social Usefulness; "degree to which an individual believes that using a particular technology would enhance his or her social identity*
- *Perceived Personal Usefulness; "the degree to which an individual believes that using a particular technology accelerates his or her personal growth*

Au *et al*. (2008) have made significant progress in conceptualizing and developing theory-based dimensions of IS benefits to explain why people are satisfied with an IS. They develop an equitable needs fulfillment model; composed of Work performance fulfillment, Relatedness fulfillment, and Self-development fulfillment by incorporating needs theory, equity theory, and expectation theory. As a result, they investigated the effects of 3 dimensions of needs on IS satisfaction. However, their approach on three types of needs also seems to be based on human needs in a social setting, rather than an employee's needs in a work environment.

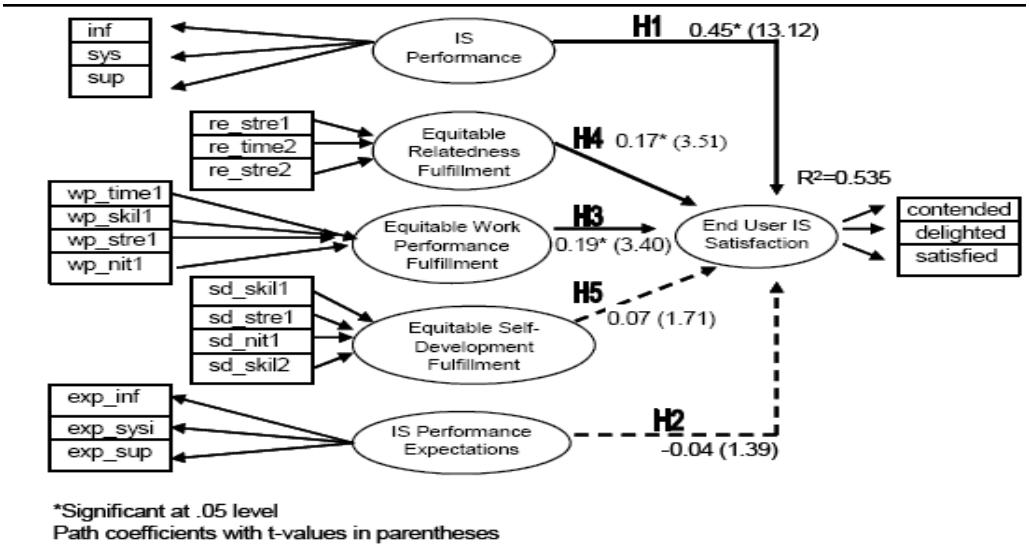


Figure 2.5 Au et al.'s Empirical Results (Au et al., 2008, p.53)

In their recent work, Yeh and Teng (forthcoming) concentrate more on job related needs of IS users. They used ERG theory to conceptualize perceived usefulness from the perspective of employees' needs at work and then test if the three types of needs (perceived extended usefulness, relatedness with coworkers, self development) significantly contribute to the need fulfillment as a formative construct. By extending and conceptualizing existing IS constructs with a theory base, the research was valuable in that they showed not only that ERG

theory helps identify various dimensions of ISBI with work-related benefits, but also that it can be effectively used in a theory-deficient domain.

2.5 Issues with the ERG Theory in IS research

Au *et al*. (2008) define relatedness as "socially oriented needs of the user that require interactions with other human beings (p. 47)." As such, these needs are broad human needs in individuals' general and personal life context as a human being, not in a more specific job and professional context as an employee. Much of the IT-enabled interactions among employees are not necessarily social in nature. Employees routinely communicate and coordinate with their colleagues on joint efforts without ever knowing each other personally.

Further, Au *et al*. (2008) developed the items for self-development fulfillment need which corresponds to Growth need in ERG theory, as the ratio of benefits to costs. For example, the concept of job security is placed as core in developing their survey items to measure self-development fulfillment need. However, the ERG theory (Mayo, 1982; Glassberg, 2000) and Hygiene factors from Herzberg *et al.* (1959)'s two factor theory suggest that security, pay, and working condition are at the basic existence level need of an employee (Plate and Stone, 1974; Greenhalgh and Rosenblatt, 1984; Furnham *et al*., 2002), and not at the more advanced growth needs. Not surprisingly, their empirical findings indicate that the work performance fulfillment and relatedness fulfillment needs have weak impacts on satisfaction, while self-development need has no significant impact at all. As they stated, the major reason of insignificant impact of self-development fulfillment need might be that they collected data mainly from IS users who use IS simply for routine operational work at a clerical job. In addition to the sampling from limited use of IS, another concern might be raised with respect to the research context in which their model is tested with information systems at operational level in airline and hotel industry representing service sector only. The operational level IS in the airline and hotel industry (e.g. TPS for food service, check-in, ticketing, reservation) transactional processing system for food service,) is mostly likely to be designed and used to improve

efficiency in data processing, rather than to generate information or to acquire knowledge. This alternative explanation is confirmed with their empirical finding that IS performance, measured with information, system and service quality, is the most significant predictor of satisfaction, whilst relatedness and work performance have relatively weak impacts.

The issue of research context related to testing with a single IS only is also found in Yeh and Teng's study (forthcoming). In their study, the strength of path coefficients of "Perceived extended Usefulness" and of "Self-development" considerably improved, compared to Au *et al*.'s study (2008), due to better conceptualization and operationalization of employee benefits.

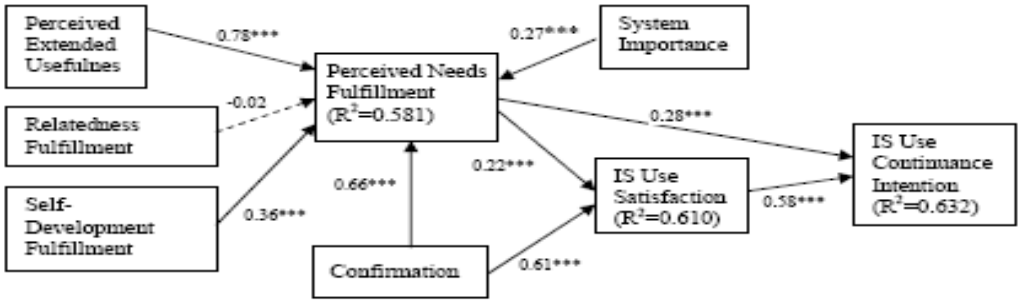


Figure 2.6 Yeh and Teng's (forthcoming) Empirical Results (p. 33)

Their empirical results also indicate that, "Perceived Extended Usefulness," operationalized as the composite of perceived efficiency and effectiveness, accounts for the bulk of the variance in Needs Fulfillment. It appears to capture the overall aggregate variance of that formative construct, even by absorbing the unique impacts of the other two needs on Perceived Needs Fulfillment. The primary reason for insignificant effect of relatedness is that the respondents were asked to identify a traditional information reporting system mainly used to generate reports or summary for decision making, rather than to facilitate communication with coworkers.

To summarize, these studies have two limitations. First, while advancing our understanding of the theoretical relevance of the ERG theory to ISBI, these studies have also

revealed the theory's limitation in that we need to focus more on employees' IS benefits in an organization from a job-centric point of view rather than their general human needs in a society. Second, these studies had weak results as their findings are based on a single IS, rather than the overall IT/IS environment which can be expected to generate more comprehensive impact or benefits along multiple dimensions.

CHAPTER 3

CONSTRUCTS CONCEPTUALIZATION AND DEVELOPMENT

To address the two limitations of previous research, in this study, we conceptualize and develop a multi-dimensional construct of ISBI with two distinct features: (1) theoretically grounding on not just the ERG theory, but also other relevant theoretical perspectives such as the JCT (Job Characteristics Theory) theory (Hackman and Oldham, 1975, 1976) and decision making (Simon, 1960; Teng and Calhoun, 1996; Todd and Benbasat, 1999), and (2) relating it to the general use of the overall IT/IS in an organization, not just a single IS, as in most of the previous studies.

3.1 Theoretical Framework for Conceptualizing ISBI

As seen in Table 3.1, many IS studies propose diverse definitions, perspectives, and constructs to best capture ISBI in terms of the impacts or benefits of IS on individuals' work performance. Moreover, while each study has interchangeably used the terms perceived usefulness, net benefits, and individual impacts, all of these definitions and conceptualization may be interpreted as ISBI for this study. For the purpose of this study, we will differentiate between individual IS impact and individual IS benefits. While IS impact include the general effects of IS on individual's work, not all of these effects may be regarded as benefits. Teng and Calhoun (1996), for example, include decision routinization as an IS impact, but this may or may not be considered a benefit by individual employees. Thus, this study defines ISBI as follows:

> *ISBI (IS Benefits for individuals) refer to the perceived contribution of overall IS/IT to the various facets of an employees' overall work achievements in the context of his/her job in an organization.*

Table 3.1 Definitions of ISBI in Previous Studies

Terms	Studies	Definitions
Individual Impact	Sedera et al. (2004, p.9)	How the system has influenced the performance of individual users, which encompass a broad range of measures.
	Gable et al. (2008, p.389)	The extent to which the IS has influenced the capabilities and effectiveness, on behalf of the organization, of key-users.
	DeLone and McLean (1993, p.69)	The extent that the system is related to individual performance on the job.
	Teng and Calhoun (1996)	The extent to which the organizational computing environment impacts on user's activities regarding decision making, communication, and job complexity.
Perceived Usefulness	Sabherwal et al. (2006, p. 1851)	The degree to which an individual believes that using the system enhances his or her productivity or job performance.
	Rai et al. (2002, p.57)	The degree to which the user believes that using a particular system has enhanced his or her job performance.
	Seddon (1997, p.246)	A perceptual indicator of the degree to which the stakeholder believes that using a particular system has enhanced his or her job performance. A system is useful if it produces benefits.
Net Benefits	Petter and McLean (2009, p.161)	The effect of an IS has on an individual which is often measured in terms of organizational performance, perceived usefulness, and affect on work practices
	Petter et al. (2008, p.239)	The extent to which IS are contributing to the success of individuals. For example, improved decision –making, improved productivity, increased sales, market efficiency, customer welfare, creations of jobs, and economic development.
	Davern and Wilkin (2010, p. 48)	Assessment of feelings regarding the totality of net benefits received from an association with the system of interest
	Wixom and Watson (2001, p.31)	The benefits of the data warehouse as perceived by a data supplier.
	Seddon (1997, p.246)	An idealized comprehensive measure of the sum of all past and expected future benefits, less all past and expected future costs, attributable to the use of an information technology application.

While the definition of Perceived Usefulness by Davis *et al*. (1989), emphasizes enhanced job performance, our definition is centered on the overall work achievement, which may include higher-order advanced benefits such as job enrichment and growth. Examples of such benefits include task innovation proposed by Torkzadeh and Doll (1999). Further, this

definition alludes to the underlying facets of the benefits, and thus calls for "opening up the black box (Benbasat and Barki, 2007)" of the perceived usefulness construct which, as we discussed earlier, is an aggregate measure. To open up the black box, it is necessary to consider the multi-levels and multi-traits nature of job benefits, rather than to focus on oversimplified overall task performance dimensions such as productivity, performance, effectiveness, and task efficiency. As a research effort to investigate the underlying multiple dimensions of ISBI, this study seeks to expand the theoretical perspective from a "task-oriented" to a job-centered focus. This expanded view in terms of user's job, rather than that of their tasks may help better understand what generic job needs they desire, what benefits they perceive and evaluate in fulfilling those needs by using IS. As a result, we can articulate in what specific job benefits users perceive usefulness from IS.

To conceptualize ISBI according to the above definition, this study will first apply the ERG theory in a more focused fashion, e.g., focusing on the job context rather than the general life context. ERG theory provides a sound theoretical perspective to understand what factors constitute human needs and how they influence individuals' value perception and behavior (Glassberg, 2000; Au *et al*., 2002; Kujala and Väänänen-Vainio-Mattila, 2009). In IS research, ERG theory along with Maslow's (1970) hierarchical needs theory, McClelland's (1955, 1961) acquired needs theory, and Hertzberg's (1959, 1968) two factor theory can be successfully used to identify and categorize an individual's value perception (e.g. perceived usefulness) or psychological affective state (e.g. satisfaction) according to different facets in motivational needs (Glassberg, 2000; Au *et al*., 2002). Marketing research also utilizes human needs theory to scrutinize the elements and processes in which customer needs and values are aroused and fulfilled (Kujala and Väänänen-Vainio-Mattila, 2009).

Drawing upon the classification and definition presented by human need theories and its application to IS research, this study proposes the WJT framework to understand employee benefits originated from employee needs. The WJT framework, as shown in Figure 3.1, consists of three levels of ISBI: **W**ork Enrichment Benefits, **J**ob Interaction Benefits, and **T**ask

Performance Benefits. These benefits are perceived by employees in a job context, rather than in a personal life context. However the three levels in the WJT framework correspond to the three levels of the ERG theory. Previous theories and studies upon which the WJT Framework is based are classified in Table 3-2.

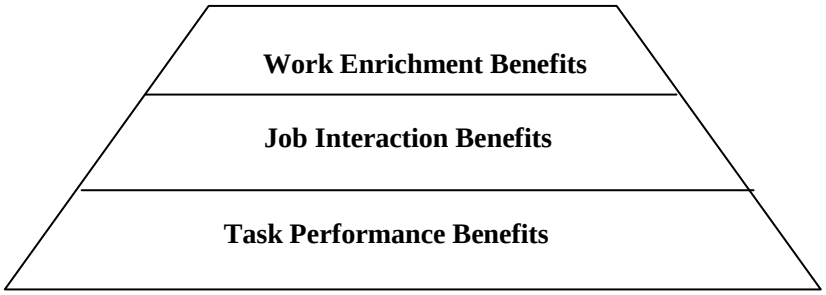


Figure 3.1 The WJT Framework for ISBI

Based on the proposition that an employee derives a set of job related benefits in using IS, ISBI is defined as a formative construct that is comprised of the three related, but different dimensions, as shown in Figure 3.2. The formative construct of ISBI suggests that a user is likely to evaluate the relative strength or importance for each dimension in perceiving ISBI.

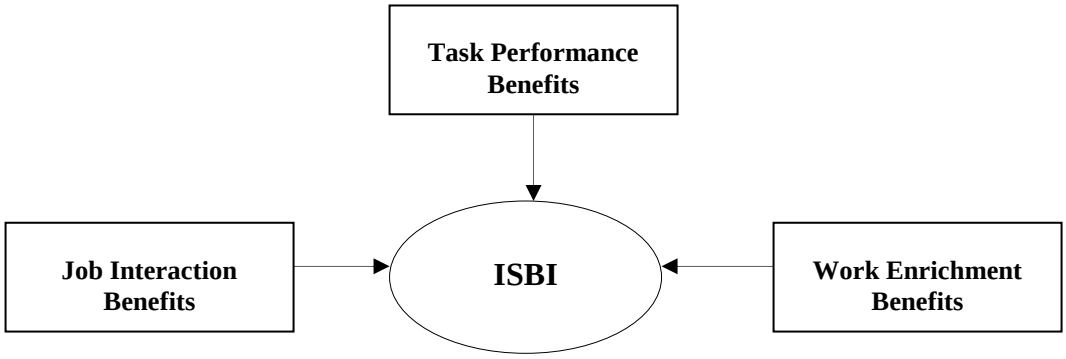


Figure 3.2 The Formative Construct, ISBI

Table 3.2 Previous Theories and Studies adopted for the WJT Framework

<table>
<tr><th>Maslow (1970)
Hierarchical needs theory</th><th colspan="2">Hertzberg (1959, 1968)
Two factor theory</th><th>ERG
(Alderfer,1972)</th><th>Glassberg
(2000)</th><th>Au et al.
(2002, 2008)</th><th>Yeh and Teng
(forthcoming)</th></tr>
<tr><td>Physiological</td><td rowspan="2">Hygiene Factors</td><td rowspan="2">Pay, Security, Supervision, Company Policies
Working Conditions</td><td rowspan="2">Existence Needs</td><td rowspan="2">Perceived Work Usefulness</td><td rowspan="2">Work Performance Fulfillment</td><td rowspan="2">Perceived Extended Usefulness</td></tr>
<tr><td>Safety</td></tr>
<tr><td>Belongingness and Love</td><td rowspan="2">Hygiene Factors</td><td>Interpersonal Relationships</td><td rowspan="2">Relatedness Needs</td><td rowspan="2">Perceived Social Usefulness</td><td rowspan="2">Relatedness Fulfillment</td><td rowspan="2">Relatedness Fulfillment</td></tr>
<tr><td>Esteem</td><td rowspan="2">Motivational Factors</td><td>Recognition</td></tr>
<tr><td>Self Actualization</td><td>Work itself, Achievement, Responsibility, Advancement to Growth</td><td>Growth Needs</td><td>Perceived Personal Usefulness</td><td>Self-Development Fulfillment</td><td>Self-Development Fulfillment</td></tr>
</table>

*Adapted from Glassberg (2000, p. 12, 14, 21) and extended from IS research (Au et al., 2002; Yeh and Teng, Forthcoming)

With reference to the WJT framework, this study identifies multiple underlying dimensions of ISBI by adopting other relevant theoretical bases. Notably, the Job Characteristics Theory (JCT: Hackman and Oldham, 1975, 1976) is used in this study to provide each ISBI construct with corresponding dimensions in job characteristics. JCT is widely studied in motivational management literature to explain the relationship between core elements (characteristics) of a job and job satisfaction. The rationale to employ JCT for this study lies in the argument that IS cannot be separated from an overall work system in an organizational setting (Alter, 1999). The benefits that are possibly generated from IS need to be examined from the perspective of job context, rather than that of an entire social environment where an employee involves with his/her personal lives. An employee, working in a job environment of using IS, is motivated with employee needs, so that he/she is likely to perceive IS values in terms of whether the IS generates job-related benefits. Thus, IS benefits on individuals should be studied with a focus on employees' job. To delineate the underlying job dimensions of ISBI, this study incorporates core job dimensions, based on JCT:

- Task Feedback
  - Extent to which IS helps an employee receive clear & timely performance feedback for better performance.
- Task Significance
  - Extent to which IS enables an employee to extend his/her job contribution to others and the company
- Dealing with others (re-labeled as "Communication & Collaboration')
  - Extent to which IS assists an employee communicate and collaborate with others in doing his/her job.
- Task Identity
  - Extent to which IS helps an employee identify a whole piece of work in the form of a business process in the company.
- Variety
  - Extent to which IS helps an employee acquire a variety of skills and competencies
- Autonomy
  - Extent to which IS provides more freedom and discretion to an employee in performing his/her job.

3.2 Conceptualization of the ISBI Construct

As discussed earlier, this study explores the underlying dimensions which are critical in understanding ISBI in a job context. Key job related benefits in each category within the WJT framework are theoretically identified by integrating ERG theory and JCT, as presented in Table 3.3. The perspective to logically explain why each dimension in WJT is formed with different job related benefits will be provided in the following section.

Table 3.3 Conceptualizing the three Dimensions of ISBI

WJT Framework Level	JCT and other Theoretical Elements
Task Performance Benefits	· Task Feedback (Adapted from JCT) · Decision Making (Adapted from Teng and Calhoun, 1996; Leidner and Elam, 1994) · Task Significance (Adapted from JCT)
Job Interaction Benefits	· Communication & Collaboration (Adapted from JCT; Staples et al., 1999; Mohr et al., 1996) · Task Identity (Adapted from JCT) · Influence (Adapted from Au et al., 2008; Yeh and Teng (forthcoming)
Work Enrichment Benefits	· Skill Variety (Adapted from JCT) · Autonomy (Adapted from JCT) · Innovation (Adapted or Adopted from Torkzadeh and Doll, 1999)

3.2.1 Task Performance Benefits

Task Performance Benefits is defined as the perceived contribution of the overall IS/IT in improving the accomplishment of specific operational and managerial tasks assigned to an employee. Task performance benefits correspond to Herzberg's Hygiene factors, Alderfer's Existence needs, Glassberg (2000)'s Perceived Work Usefulness, Au *et al*. (2002, 2008)'s Work Performance Fulfillment, and Yeh and Teng (forthcoming)'s Perceived Extended Usefulness. Individual IS users as employees are likely to expect to receive more material rewards (e.g. salary, promotion, job security) by fulfilling the basic, fundamental, and primary needs on their jobs (Glassberg, 2000; Au *et al*., 2002, 2008). It is interpreted that an employee has a basic need to do well in his/her job by enhancing tasks productivity, making decisions effectively, and

expanding his/her contributions to the success of company significantly. When employees evaluate IS in terms of whether the IS helps improve desired Task Performance, they are likely to perceive Task Performance along three dimensions; feedback, task significance, and decision making. According to McClelland (1955, 1961)'s acquired need theory, human beings look for detailed feedback about how well they do in their performance by means of pursuing higher success or performance (Glassberg, 2000). In examining feedback, employees are likely to see whether their job plays a significant part in making the organization successful. In addition, individuals are likely to achieve higher quality of his/her work by enhancing their decision performance through IS (Huber, 1990), as a critical, fundamental driver of determining Task Performance. Thus, the Task Performance dimension, as a formative construct, is formed with IT enabled benefits of more abundant information about user's job performance, efficient task execution and more effective decision making. This study develops four measurement items for each of the three constructs for Task Performance Benefits as listed below. Items for Job Interactions and Work Enrichment are also developed. These measurement items are used in the final primary test of the various research models presented later in this Chapter and the next chapter. The process for developing these items through the initial test and the pilot test stages are presented in detail in Chapter 5. All items are Likert-type scales anchored from 1 (strongly disagree) to 7 (strongly agree).

1) Feedback (reflective measure, Adapted from JCT)
   Using Corporate IS helps me to:
   - keep informed on how well I am doing my job.
   - identify strengths and weaknesses in my job performance.
   - easily tell if my job performance is good or bad.
   - gather information on the quality of my work on the job.

2) Task Significance (reflective measure, Adapted from JCT)
   Using Corporate IS enables me to:
   - see exactly how my work contributes to the company's success.
   - have more opportunities to improve company's performance.
   - clearly see positive impact of my job on the company.
   - connect my job responsibilities to the company's performance objectives.

3) Decision Making (reflective measure, Adopted from Leidner and Elam, 1994; Teng and Calhoun, 1996) is the extent to which an IS assists users to make more efficient and effective decisions.

By using Corporate IS, I am able to:

- improve the quality of decisions.
- gather better information for decisions.
- make decisions faster.
- analyze more alternatives in decision making.

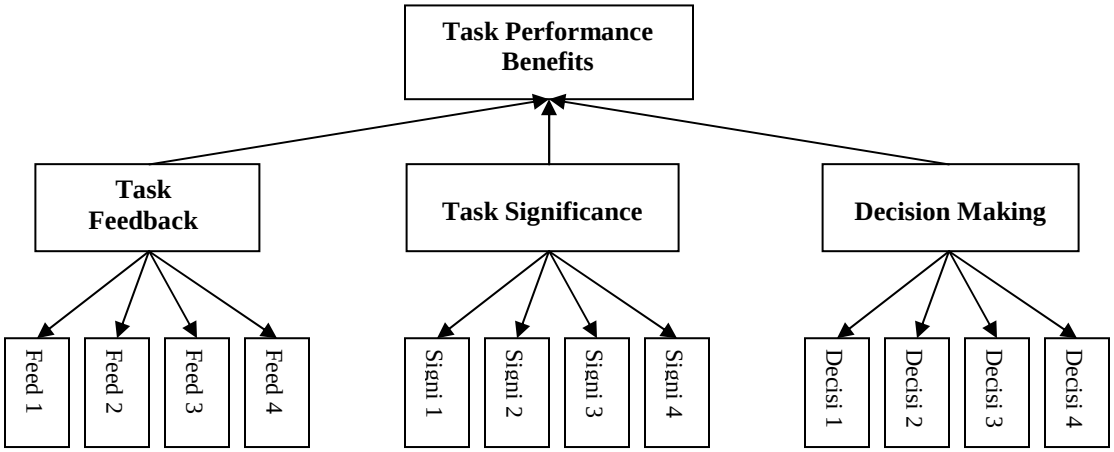


Figure 3.3 The Three Dimensions of Task Performance Benefits

3.2.2 Job Interaction Benefits

Job Interaction Benefits refer to benefits from the overall IS/IT that helps individuals closely work together and communicate with other coworkers for better interaction and integration with others. Alderfer's relatedness, Herzberg's interpersonal relationship and recognition, and Maslow's belongingness and love, and Glassberg (2000)'s perceived social usefulness, all have a shared concept with Job Interaction Benefits in that it relates to making relationships with other people. However, the concept of Job Interaction in this study limits the reach and scope of making relationship, communicating, collaborating, controlling, recognizing, and influencing other people (e.g. familiar, friends, relatives, neighbors) to those (e.g. colleagues, supervisors, customers) who interact together within a job context. In Job interaction Benefits, three related, but different concepts (communication/collaboration, task identity, and influence) are identified from JCT and relevant theories. By using IS, employees seek to communicate and collaborate to better integrate or adjust his/her works with others, while doing so, they also have an opportunity to recognize how his/her job activities are

connected with other employees within an entire business process. In addition, employees are likely to perceive benefits of IS in that IS helps them in expanding the reach (e.g. number of people) and depth (e.g. frequency of contacts) of his/her professional influence. Thus, Job Interaction as a formative construct includes communication/collaboration, task identity, and influence. This study develops four measurement items for each of the three constructs for Job Interaction Benefits as listed below. All items are Likert-type scales anchored from 1 (strongly disagree) to 7 (strongly agree).

1) Communication & Collaboration (reflective measure, Adapted from JCT; (Adapted from JCT; Staples *et al*., 1999; Mohr *et al*, 1996)
   Using Corporate IS helps me to:
   - communicate more effectively with co-workers.
   - cooperate and collaborate more closely with my colleagues.
   - do team-work better with my colleagues.
   - better integrate my job with others' work in the company.

2) Task Identity (reflective measure, Adapted from JCT)
   By using Corporate IS with my colleagues, I am able to;
   - see how an overall business process works across different units.
   - recognize where the workflow begins and where it ends in different parts of the organization.
   - understand how an entire piece of work gets accomplished in various units of the organization.
   - visualize how related activities flows through an entire business process from one unit to another.

3) Influence (reflective measure, Adapted from Au *et al*., 2008; Yeh and Teng, forthcoming) refers to IS-enabled benefits to obtain recognition about professional knowledge and reputation, and expand the depth of reach of it to others within a job relevant context.
   Using Corporate IS helps me to:
   - get recognition of my expertise from my colleagues at work.
   - make my colleagues realize the importance of my knowledge and skills.
   - apply my expertise to influence decision making in the company.
   - enhance my professional reputation among my colleagues.

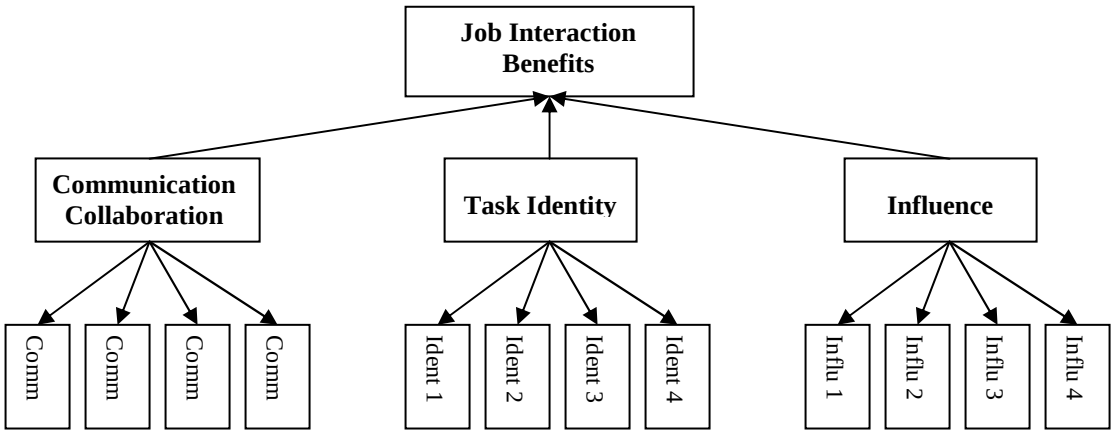


Figure 3.4 The Three Dimensions of Job Interaction Benefits

3.2.3 Work Enrichment Benefits

Work Enrichment Benefits focuses on the users' higher-order benefits or needs, in terms of expanding job responsibility, exploring new or innovative knowledge, and extending self-directed job activities. This type of benefits encompasses Maslow's Self-actualization, Herzberg's motivational factors (Work itself, Achievement, Responsibility, Advancement to Growth), as well as Au *et al*. (2002, 2008) and Yeh and Teng (forthcoming)'s Self-development fulfillment. According to this perspective, employees as human beings, possesses desire to enrich their job through learning new knowledge, innovating and improving existing job activities, or gaining more discretion by taking initiatives to improve job performance. Since, IS and IT are potent means for achieving these, this study views that Work Enrichment Benefits, as a formative construct, consists of three sub-constructs; autonomy, task variety, and innovation.

1) Autonomy (adapted from JCT)
   By using Corporate IS, I am able to:
   - take more initiatives with less instruction from supervisors.
   - gain more freedom in carrying out my job responsibilities.
   - reduce the need to always check with my supervisors on what to do.
   - have more discretion in making decisions on my own.

2) Innovation (reflective measure, adapted or adopted from Torkzadeh and Doll, 1999; Barki *et al*., 2007) refers to the extent to which IS helps to explore new ideas or methods for improving job performance.
   Using Corporate IS helps me to:
   - come up with new ideas for my job.
   - do new things that are not possible before.

- identify innovative ways of doing my job.
- find new ways to improve my job performance.

3) Task Variety (reflective measure, adapted from JCT)
   By using Corporate IS, I am able to:
   - acquire more complex and higher level skills for my job.
   - obtain skills needed to do a wider variety of things at work.
   - gain more knowledge to do better on my job.
   - develop more competencies in doing my work.

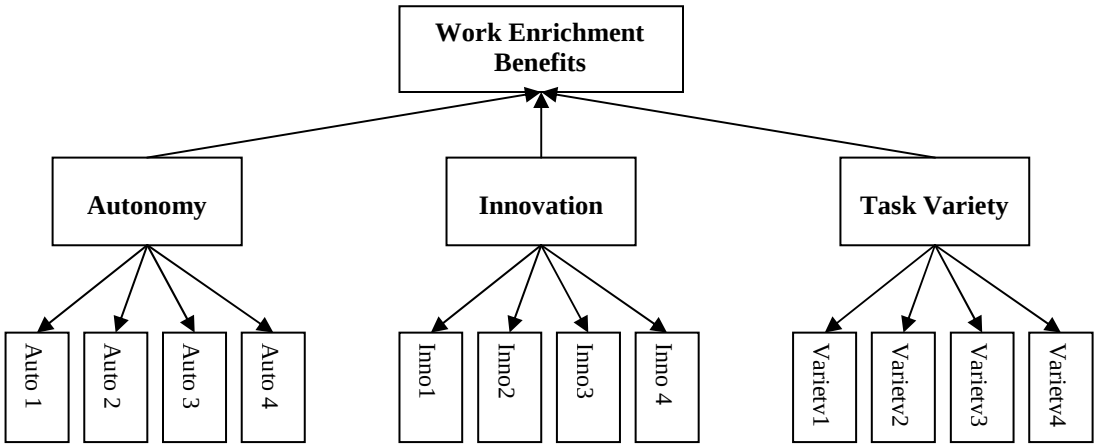


Figure 3.5 The Three Dimensions of Work Enrichment Benefits

3.3 Conceptualization of the IS Use (ISU) Construct

3.3.1 Previous Research on the IS Use Construct

While there is no consistently accepted definition of the use construct in the IS literature (Burton-Jones and Straub, 2006), researchers used a variety of terms for IS use, including IT/System usage (Taylor and Todd, 1995; Burton-Jones and Gallivan, 2007), IS continuance (Bhattacherjee, 2001; Limayem *et al*., 2007), IT utilization (Bassellier and Benbasat, 2004; Thompson and Higgins, 1991), etc. These researchers have developed different measurements for IS use (Burton-Jones and Straub, 2006), based on frequency, duration, intensity (Venkatesh *et al*., 2008], and a variety of systems features used (Barki *et al*., 2007). This may explain why there has not been a pattern of consistent findings regarding the relationship between IS use and IS benefits/performance (Burton-Jones and Straub, 2006). To overcome this difficulty, recent studies (Burton-Jones and Straub, 2006; Burton-Jones and

Gallivan, 2007) suggest developing and employing richer measurements for the IS use construct by conceptualizing its intrinsic, multidimensional aspects of IS use (Doll and Torkzadeh, 1998) and users' work related activities (Barki *et al*., 2007). According to Burton-Jones and Straub (2006), such a measure should include three major components: IS, User, and Task. Based on these theoretical underpinnings, the following definition of IS Use will be used in the current study:

> *IS Use is the extent that a user utilizes the IS to carry out tasks and activities on the job for which the information system is designed to support.*

3.3.2 Classification of Various types of IS

Another major limitation of previous conceptualizations of IS Use (hereafter referred to as ISU) in particular, and the IS success model in general, is their focus on a single IS application (e.g. Rai, *et al*., 2002; Iivari, 2005; Seddon and Kiew, 1994), rather than the overall IS in the organization which encompasses many different types of IS/IT. These different types of IS or IT can be expected to contribute to different aspects of a user's job benefits. For example, group support systems (with email, video conferencing, etc.) may greatly enhance the Job Interaction Benefits (see the WJT framework presented previously), while decision support systems can be expected to improve decision making and task performance (see Figure 3.1).

While most early studies investigated the impact of a specific type of IS, Teng and Calhoun (1996) are the first to consider the overall IT environment for users in an organization. Termed "organizational computing," the overall IT environment includes two dimensions: computing and communication. They examined the impact of organizational computing use on the various dimensions of decision making, including decision routinization, decision speed, the number of alternatives examined, and job complexity, etc. (Teng and Calhoun, 1996). Recently, McAfee (2006) classified various IT applications in organization, developed through digital revolutions in the last two decades, into three types: Function IT, Network IT, and Enterprise IT. Function IT (e.g. spreadsheet) makes the execution of standalone tasks more efficient. Network IT (e.g. weblog, groupware) facilitates interaction among the organizational members

and between organizational members, customers and suppliers. Enterprise IT (e.g. CRM, SCM) helps organizations restructure interactions among groups of employees or with business partners.

Drawing upon the work of Teng and Calhoun (1996), McAfee (2006), and McNurlin *et al*, (2009), this study classifies the overall IS/IT use in an organization into three types: Information Reporting System, Decision Support System, and Group Support System:

- Information Reporting System (IRS) *supports monitoring and control functions of management by providing timely information about internal operations and organizational performance* (Azad *et al*., 1999; p. 123). IRS typically generates pre-formatted information reports or summary delivered regularly to facilitate operation and control that involves routine, repetitive, day-to-day decisions, such as those decisions made to handle a customer complaint, keep a project on schedule, and maintain the efficiency of the work unit. A major portion of the outputs from ERP and CRM modules, for example, can be considered IRS.

- Decision Support System (DSS) includes both model-based systems, using simple spreadsheet tools (e.g., Excel what-if features), advanced modeling techniques, and data-based systems (using data warehouse and tools such as OLAP and data mining). While IRS mainly support more structured, routine decision making. DSS facilitates less structured decisions and goes beyond providing status information for "reactive" use. It enables the users to do exploratory analysis which can be interactive and creative. Current popularity of the business intelligence (BI) applications attests to the appeal of DSS, (Watson et al., 2006; Negash and Gray, 2003; Alter, 2004; Clark *et al*., 2007). BI vendors (e.g. Cognos, Microstrategy) may provide custom-built decision support systems and analytics tools.

- Group Support System (GSS) involves technologies that facilitate communication and collaboration among group members through exchange and sharing of information and knowledge (Olsen and Myers, 1999). Hence, it provides a means by which an employee in an *organization can communicate and collaborate with one another and even work together in a virtual team.* GSS includes such tools as *simple e-mail, instant messaging, wikis, web blogs, and groupware* (e.g. Lotus Notes), knowledge repository, and video conferencing (McAfee, 2006; p. 144).

3.3.3 Conceptualization of the Overall ISU Construct

Based on the conceptual development presented above, we attempt to conceptualize overall ISU as a formative construct, comprised of three sub-constructs: IRS use, DSS use, and GSS use, and each sub-construct will be developed based on our definition of ISU. We develop a total of 12 measurement items for three different types of ISU. Four items for each type of ISU are listed below. These measurement items are used in the final primary test of the various research models presented later in this and the following chapter. The process for developing these items through the initial test and the pilot test stages are presented in detail in Chapter 5. All items are Likert-type scales anchored from 1 (rarely), 4 (half of the time), to 7 (all the time).

IRS Use:

I use Information Reporting applications from Corporate IS;

- when I perform routine and repetitive works.
- when I need to monitor status of day-to-day operations (e.g., cost, sales, projects, customer relations, etc) for deviations from standards.
- when I need to take immediate corrective actions based on the monitoring of current status.
- when I plan my daily or weekly work activities

DSS Use:

I use Decision Support applications from Corporate IS;

- when I need to conduct analysis (e.g., analysis of sales trend, customer defection patterns, what-if scenarios, etc) for better decision making.
- when I try to pinpoint causes of certain problems related to my decisions.
- when I attempt to explore more alternatives in decision making.
- when I need to acquire crucial information and knowledge related to decisions.

GSS Use:

I use Group Support applications;

- when I communicate with my co-workers.
- when I engage in joint efforts or projects with co-workers.
- when I need to coordinate my activities with co-workers.
- when I need to share information and knowledge with co-workers.

3.4 Establishing Predictive Validities

3.4.1 Predictive Validity of ISBI

Establishing predictive validity is an essential step when developing scales and measurement models of a construct in IS research (Sethi and King, 1991). To establish the predictive validity of the ISBI construct, this study relates it to two dependent variables to which it is theoretically linked (see Figure 3.6).

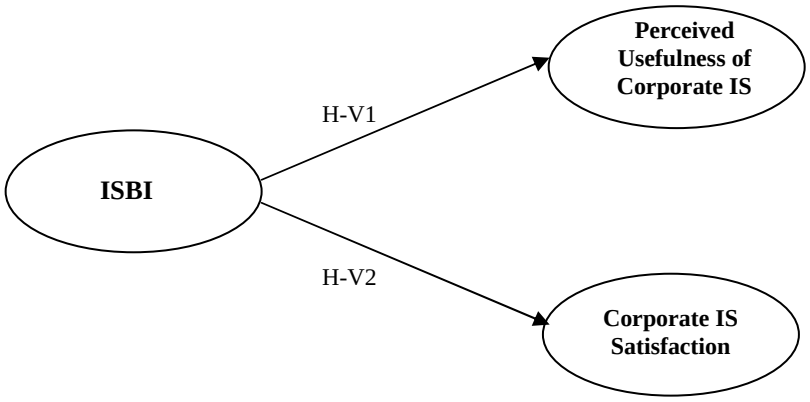


Figure 3.6 Predictive Validity of ISBI Construct

Previous studies on IS success conceptualized "Individual Impact" as "Perceived Usefulness" (e.g. Rai *et al*., 2002) and measured it as improved overall job performance due to the system in an aggregate manner following Davis *et al*. (1989). In this study, we develop a multi-dimensional ISBI construct with a view that employees would perceive various dimensions of benefits with different types of IS used in organizations. Thus, we may expect ISBI to be related to the perceived usefulness resulting from the use of the overall IS which includes a variety of IS/IT rather than a single IS application. Therefore, we posit that:

H-V1: ISBI is positively related to Perceived Usefulness of Corporate IS.

In past studies, researchers had conflicting views on the direction of the relationship between ISBI and satisfaction. The original model proposed by DeLone and McLean (1992) purports that satisfaction leads to individual impacts, while their updated model (2003) suggests a reciprocal relation between them. Seddon (1997), however, states that satisfaction

encompasses “a wider range of needs, costs, and benefits of IT application use, than perceived usefulness” (p.249) so that perceived usefulness and net benefits jointly affect satisfaction in the re-specified IS success model. Interestingly, he also suggests developing more comprehensive, reliable measures of net benefits to clarify the causal relationship. Due to this unsettled matter of directionality of the relationship, researchers have hypothesized the direction either from Satisfaction to Individual Net Benefit (Iivari, 2005; Qian and Bock, 2005) or vice-versa (Seddon and Kiew, 1994; Sabherwal *et al*., 2006; Wang, 2008). Regardless of the causal direction between the two constructs, most studies found a strong significant association in the link (Rai *et al*., 2002; Petter *et al*., 2008; Petter and McLean, 2009; Urbach *et al*., 2008). Therefore, we hypothesize:

H-V2: ISBI is positively related to Corporate IS Satisfaction.

To further examine the predictive validity of the ISBI construct, we propose an indirect impact of ISBI on Corporate IS Satisfaction through the mediating role of Perceived Usefulness of Corporate IS (See Figure 3.7). Empirical findings in prior studies revealed the presence of the direct relationship from Perceived Usefulness (Rai, *et al*., 2002; Seddon and Kiew, 1994) or perceived value (Wang, 2008) to Satisfaction. In addition, Seddon (1997) also proposed an IS success model that treats perceived usefulness as a mediator between individual benefit and satisfaction (See Figure 2.3). Thus, we hypothesize:

H-V3: Perceived Usefulness of Corporate IS mediates the impact of ISBI on Corporate IS Satisfaction.

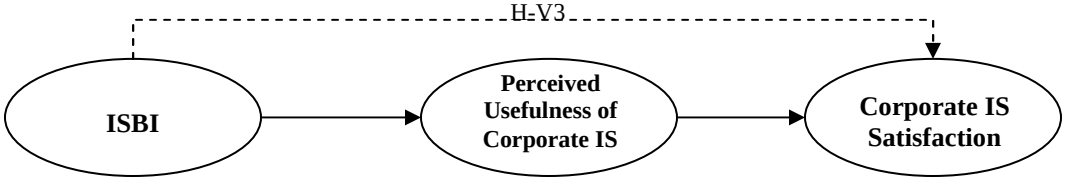


Figure 3.7 Predictive Validity: Mediation Effect of Perceived Usefulness on the Relationship between ISBI and Corporate IS Satisfaction

3.4.2 Predictive Validity of ISU

Previous studies testing the validity of the IS success model (DeLone and McLean, 1992) have reported positive relationship between ISU and Perceived Usefulness (Iivari, 2005; Rai *et al*., 2002; Seddon and Kiew, 1994). This study develops richer measurements for ISU reflecting user's job activities according to different types of ISU. Thus, it is expected that the richer ISU measurements are likely to establish high predictive validity on Perceived usefulness which is measured as a summarized construct of individual job performance. Based on the discussion provided above, we hypothesize:

H-V4: Overall ISU is positively related to Perceived Usefulness of Corporate IS.

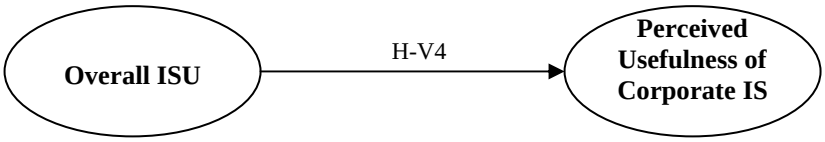


Figure 3.8 Predictive Validity of the ISU Construct

CHAPTER 4

RESEARCH AND HYPOTHESES

4.1 Research Model

The proposed ISBI and ISU constructs can be applied to test the IS success model specified by DeLone and McLean (1992; 2003) and others (Seddon and Kiew, 1994; Seddon, 1997) (see Figure 2.1, 2.2 and 2.3). However, testing the entire model entails extensive research effort which is beyond the scope of this project. We choose to test a part of the IS success model involving ISBI, Corporate IS Satisfaction, and IS Use, leaving out other success measures such as information quality, systems quality, and service quality. The research model proposed in Figure 4.1 forms a part of the IS success model. It is tested in the context of overall IS/IT use and involves a multi-dimensional construct for individual benefits, both of which have not been attempted by previous researchers.

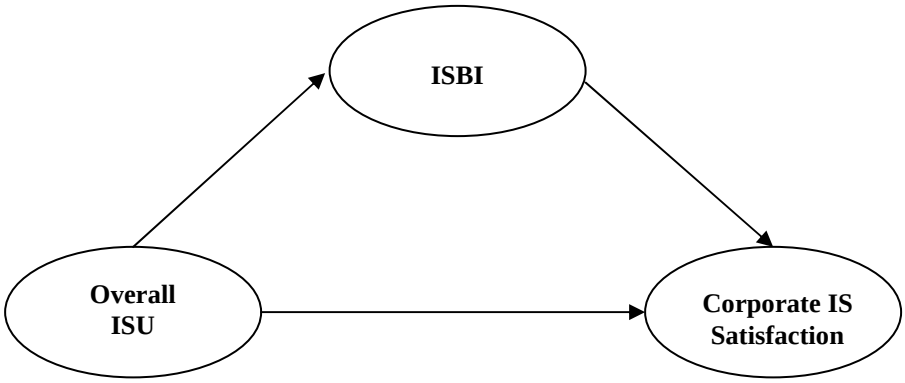


Figure 4.1 Research Model

The research model in Figure 4.1 includes IS satisfaction. Early researchers measured satisfaction in terms of user's attitude or belief about system quality and information quality (Bailey and Pearson, 1983; Ives *et al*., 1983; Doll and Torkzadeh, 1988; Seddon and Kiew, 1994). However, researchers have recently converged on their view of satisfaction as an

affective construct (McKinney *et al*., 2002; Au *et al*., 2008; Briggs *et al*., 2008; Bhattacherjee, 2001). Typically, this construct encompasses 6 aspects: the extent that the user is satisfied, pleased, contented, delighted, happy, and positive by the use of an IS. These measures will be adopted in the current study.

4.2 Hypotheses

DeLone and McLean (1992) hypothesized about the causal link from use to individual impact arguing that the more the IS is used, the greater the individual impact. However, in their updated model, they reshaped this link as a reciprocal interdependent relationship between ISU and Individual Net Benefits (DeLone and McLean, 2003). They did this by accepting a part of the arguments made against the inconclusive causal link and of the applicability of the measures (e.g. frequency, duration, extent, use versus non-use) for the use construct in IS success model (Seddon, 1997). Prior studies investigating the impact of ISU on perceived usefulness, individual impact, or net benefits, however, reported mixed empirical findings (Rai *et al*., 2002; Iivari, 2005; Wu and Wang, 2006). One reason for the mixed findings on use may be the complex, multidimensional property of the construct "Use" (Benard, 2004; Burton Jones and Straub, 2006). Because of the multidimensional nature of this construct, richer measurement approaches, going beyond the dichotomous manner (e.g. use versus non-use) in conceptualizing and operationalizing the construct use, are needed to produce reliable and consistent research results (Burton Jones and Straub, 2006; Barki *et al*., 2007). Another reason for the inconsistent results is that prior research examined the relationship between use and individual performance within a limited scope of IS application use. A number of researchers focus only on a single IS application (e.g. Rai, *et al*., 2002; Iivari, 2005; Seddon and Kiew, 1994). Nevertheless, several prior studies indicate that IT use leads to better individual performance (Torkzadeh and Doll, 1999; Burton-Jones and Straub, 2006; Almutairi and Subramanian, 2005). To provide a more reliable gauge of ISU, this study employs a richer measure of ISU that includes additional dimensions of use (Burton-Jones and Straub, 2006) that go beyond just

frequency, duration, and intensity (Venkatesh *et al*., 2008). To extend and generalize previous findings on the positive relationship between ISU and benefits in the context of overall ISU in the organization, we thus posit:

H1: Overall ISU is positively related to ISBI.

The relationship between ISBI and Corporate IS Satisfaction in Figure 4.1 has been discussed previously and stated as H-V2 (see Figure 3.6). Here, in the context of the research model, it is re-stated as H2:

H2: ISBI is positively related to Corporate IS Satisfaction.

Contending that greater ISU leads to higher satisfaction, DeLone and McLean (1992) suggest a relationship from system use to satisfaction. In their updated model (2003), they re-specified this link as a recursive interaction process in which ISU and satisfaction enhance each other. Iivari (2005) found that system use and satisfaction are strong predictors of each other, whereas Seddon and Kiew (1994) report insignificant impact of system use (measured as system importance) on satisfaction. Despite these mixed empirical findings, meta analyses by Petter *et al*. (2008) and Petter and McLean (2009) support the association between system use and satisfaction at a general level, thus we hypothesize;

H3: Overall ISU is positively related to Corporate IS Satisfaction.

In marketing sciences, researchers found that consumers often infer the likelihood that a product would be beneficial to their specific needs (Hutchinson and Eisenstein, 2008), when estimating the magnitude of its benefit. As an overall consequence of such evaluation process, individuals may first perceive whether the product is beneficial or not to them, then eventually arrive at an affective state of feeling whether the product is good or bad to them (Woodruff, 1997). In the case of IS users (consumers) and IS (the product), the users would first evaluate the benefits of IS, which can be gauged by ISBI, leading eventually to an affective feeling

regarding the product, which is to be measured by satisfaction. Based on this theoretical perspective, we hypothesize:

H3-1: The positive relationship between overall ISU and Corporate IS Satisfaction is mediated by ISBI.

4.3 Decomposed Research Model

For a more in-depth examination of the antecedents of Corporate IS Satisfaction for IS success, we propose a decomposed model focused on the path from overall ISU and Corporate IS Satisfaction. Satisfaction is one of the most widely used constructs to measure IS success (DeLone and McLean, 1992). With the decomposed model, this study seeks to explore (1) the effect of overall ISU on the three individual dimensions of ISBI, and (2) the influence of three individual dimensions of ISBI on Corporate IS Satisfaction.

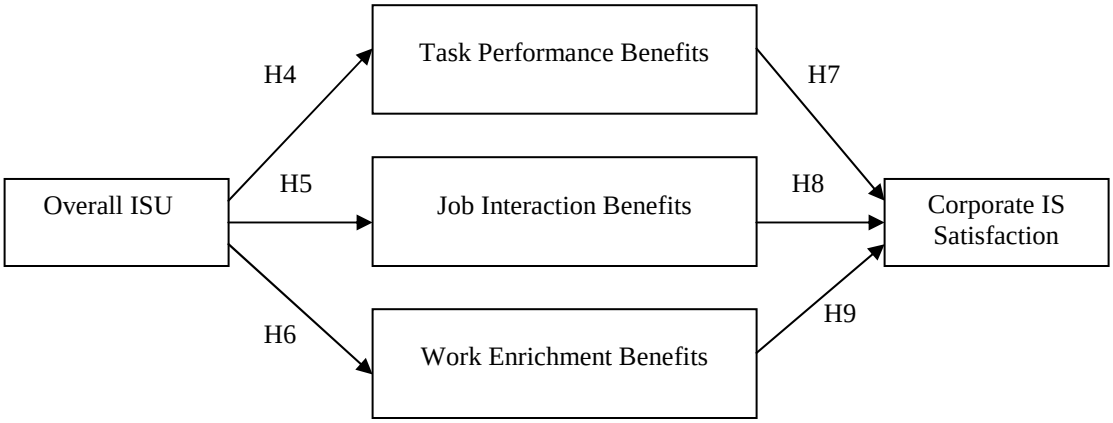


Figure 4.2 Decomposed Research Model: Relationships among Overall ISU, Dimensions in ISBI, and Corporate IS Satisfaction

4.3.1 Overall ISU and Three Dimensions of WJT

Despite the difficulty in assessment, the benefits of IS have remained a topic of interest for both IS researchers and practitioners (Brancheau and Wetherbe, 1987; DeLone and McLean, 1992, Au *et al*., 2002). Previous studies sought to examine the individual performance related to ISU at work as a causal relationship between ISU and individual performance. With respect

to the causal direction, two research streams have been described.

The first one posits that ISU leads to perceptual evaluation on individual performance (Srinivasan, 1985; Leidner and Elam, 1994; Goodhue and Thompson, 1995; Seddon and Kiew, 1994; Rai *et al*., 2002; Iivari, 2005; Almutairi and Subramanian, 2005; Barki *et al*., 2007). While conceptualizing and operationalizing perceptual evaluation, most of these studies measured the individual performance from IS with perceived usefulness related task performance or satisfaction, both of which are conceptually close to net benefits (Seddon, 1997; Wang, 2008). Regardless of whether perceived usefulness or satisfaction is used to measure perceptual evaluation as a proxy for individual performance, the empirical findings on the net benefits of IS on individual performance are mixed or contradictory to one another (Petter *et al*., 2008). As a result, previous empirical studies failed to provide not only cumulative knowledge but also theoretical justification to the impact of ISU at work. Such inconclusive and inconsistent results cast doubt on the assumption that more IS usage leads to higher individual performance.

The second research stream examines the causal direction from the perceptual evaluation constructs to ISU. The logic behind this school of thought (e.g., Straub *et al*., 1995; Adams *et al*., 1992; Lucas and Spitler, 1999; Wu and Wang, 2006; Kulkarni *et al*., 2006) is that increased individual performance is likely to result in increased use. In a broader conceptualization of net benefits, the concept of continued use is already included in net benefits (DeLone and McLean, 2003). As DeLone and McLean (2003) point out, “If the IS or service is to be continued, it is assumed that the net benefits…, thus influencing and reinforcing subsequent use…” (p. 23). Although this view contributes to expanding the dimensions of net benefit, empirical research on the relationship between individual performance and use still reports confounding results (Petter *et al*., 2008). Consequently, it is complicated, and also empirically and theoretically a challenge, to determine the direction of relationship between ISU and individual performance (Petter and McLean, 2009).

There are two possible methodological explanations for such confusing empirical results. First, perceptual measures are intrinsically vulnerable to inconsistency, biases,

prejudice of human judgment (Delaney and Huselid, 1996; Saarinen, 1996; Davern and Wilkin, 2010). Second, cross-sectional research makes it difficult to determine the direction of causality between ISU and individual performance.

Also, more importantly, previous studies, based on the naïve assumption that all types of IS/IT application can automatically generate equal level of benefits in distinct performance dimensions to all users (Jurison, 1996), have measured the construct use and individual performance in a very limited manner by examining only one or two aspects of each construct (Burton Jones and Straub, 2006; DeLone and McLean, 2003). However, within the job environment, individuals using various types of IS and IT applications for their works view multiple dimensions in performance differently across IS types.

Only a few studies (Teng and Calhoun, 1996; Adams *et al*, 1992; Jiang and Klein, 1999) have examined the different impacts of IS on individual performance, depending on different types of IS that the individuals use to accomplish their tasks (DeLone and McLean, 2003). Teng and Calhoun (1996), for example, found that different types of organizational computing technologies (computing and communication) have differentiated impact on operational and managerial decision making qualities, job routinization, and job complexity. Jiang and Klein (1999) also report that users attribute distinct performance properties based on different types of ISU (e.g. TPS, IRS, and DSS). These studies advocate the premise that the individual performance is contingent upon the type of IS being used and the performance dimensions that are evaluated.

Drawing upon the above arguments, we have reasons to believe that overall IS Use affects different dimensions of job related performance differently. Hence, the corresponding hypotheses are (also see Figure 4.2):

H4: Overall ISU is positively related to Task Performance Benefits.
H5: Overall ISU is positively related to Job Interaction Benefits.
H6: Overall ISU is positively related to Work Enrichment Benefits.

4.3.2 The Effects of Three WJT Dimensions on Satisfaction

Briggs *et al*. (2008) defines the IS satisfaction response as "*a valenced affective arousal with respect to some object that has reference to some state or outcome desired by an individual*" (p. 275), while DeLone and McLean (2003) view user satisfaction as attitude towards the information generated by the system, suggesting a positive relationship between benefits and satisfaction. Most previous studies (Rai *et al*., 2002; Iivari, 2005) on the relationship between individual impacts and satisfaction, measured the individual impacts construct with aggregate measures of job productivity, such as perceived usefulness (Davis *et al*., 1989). Au *et al*. (2008) reports that work performance and relatedness fulfillment have a significant impact on IS satisfaction. In this part of the study, we expect to uncover the three underlying dimensions of individual benefits, and this affords us an opportunity to test the following hypotheses (also see Figure 4.3):

H7: Task Performance Benefits is positively related to Corporate IS Satisfaction.
H8: Job Interaction Benefits is positively related to Corporate IS Satisfaction.
H9: Work Enrichment Benefits is positively related to Corporate IS Satisfaction.

CHAPTER 5

INSTRUMENT DEVELOPMENT

As discussed earlier, in the WJT framework, ISBI is viewed as a multidimensional formative construct related to perceived IS benefits for Work Enrichment, Job Interaction, and Task Performance. Similarly, the ISU construct is conceptualized as a formative construct comprised of the use of IRS, DSS, and GSS for fulfilling job and task activities. In order to create more reliable measures of the underlying dimensions of ISBI as well as IS Use, this study attempts to create instruments that (1) reflect the theoretical definitions employed to conceptualize each dimension, (2) are comprehensive enough to cover full dimensions, (3) are easily understood, without extensive cognitive effort, by employees in the field, and (4) can be inclusively used in various IS environments. To accomplish these goals, it is essential to ascertain content validity and construct validity. Thus, this study follows the methodological process prescribed and recommended by Churchill (1979), and Moore and Benbasat (1991). In the first section, the detailed process in developing measures for ISBI is described for content validity and construct validity (convergent and discriminant). The second section discusses the procedure for developing richer measurements for IS Use. In the last section, the additional constructs used for the primary survey are described.

5.1 Developing ISBI Measures

5.1.1 Initial Instrument Refinements

Following Churchill (1979), this study chooses a sample of items from prior studies by examining broad psychometric aspects of the content. Although the items from previous studies (e.g. Hackman and Oldham, 1975, 1976; Torkzadeh and Doll, 1999; Leidner and Elam, 1994; Teng and Calhoun, 1996; Au *et al*., 2008), provide preliminary basis for our effort, these measures need to be modified and expanded to reflect conceptualization and classification

identified in this study. To achieve this, the instruments from JCT and other related studies are adapted or refined to reflect the nature and context of IS in a job environment of a business. These items are then presented to a pool of 11 experienced judges, including faculty members and doctoral students at the College of Business of a major southern university, as well as industry professionals who use IS in the field. The experts were asked not only to review whether the draft instrument items cover the psychometric properties of the intended underlying dimensions, but also to identify wordings which were perceived by them to be ambiguous.

The panel made several useful comments and suggestions to improve the clarity of each item. A number of items were dropped or modified. To ascertain that each survey item does indeed correspondent to its intended construct, a card sorting procedure is typically performed (Moore and Benbasat, 1991). Accordingly, we asked the panel of experts to match the items in relation to the nine constructs, and the results are excellent for most constructs. For the "task identity" construct, however, they found some difficulty and the items were modified accordingly. The items resulting from this round of initial refinements are presented in Table 5.1, which will be used in the pilot test in the next phase of instrument development.

This study seeks to develop job-focused benefits by systematically classifying various types of IS/IT applications widely used by employees in an organizations into IRS, DSS, and GSS. The term "overall IS/IT" appears unsuitable in defining the IS that an individual user is actually using to carry out his or her work in an organization. For the purpose of this study, it is essential to confine the coverage to IS that is exploited by a user within a job-centric environment. Therefore, the term "Corporate IS" is adopted to make it easier to understand, and to limit the scope of IS to job related business.

Table 5.1 ISBI Measures at Pilot Test

	Dimensions	Survey Items
Task Performance Benefits	Feedback	Using Corporate IS helps me to: · keep informed on how well I am doing my job. · identify strengths and weaknesses in my job performance. · easily tell if my job performance is good or bad. · gather feedback on the quality of my work on the job.
	Task Significance	Using Corporate IS enables me to: · see exactly how my work contributes to the company's success. · have more opportunities to improve company's performance. · clearly see positive impact of my job on the company. · connect my job responsibilities to the company's performance objectives.
	Decision Making	By using Corporate IS, I think I am able to: · improve the quality of decisions. · gather better information for decisions. · make decisions faster. · analyze more alternatives in decision making.
Job Interaction Benefits	Communication Collaboration	Using Corporate IS helps me to: · communicate more effectively with co-workers. · cooperate and collaborate more closely with my colleagues. · do successful team-work with my colleagues. · better integrate my job with others' work in the company.
	Task Identity	Through using Corporate IS with my colleagues, I am better able to; · see how an overall business process works across different units. · recognize where the workflow begins and where it ends in different parts of the organization. · understand how an entire piece of work gets accomplished in various units of the organization. · visualize how related activities flows through an entire business process from one unit to another.
	Influence	Using Corporate IS helps me to: · get more recognition of my expertise from my colleagues at work. · make my colleagues realize the importance of my knowledge and skills. · apply my expertise to influence decision making in the company. · enhance my professional reputation among my colleagues.
Work Enrichment Benefits	Task Variety	Using Corporate IS helps me to: · acquire more complex and higher level skills for my job. · obtain skills needed to do a wider variety of things at work. · gain more knowledge to do better on my job. · develop more competencies in doing my work
	Innovation	Using Corporate IS helps me to: · come up with new ideas for my job. · do new things that are not possible before. · identify innovative ways of doing my job. · find new ways to improve my job performance.
	Autonomy	Using Corporate IS helps me to: · take more initiatives with less instruction from supervisors. · gain more freedom in carrying out my job responsibilities. · reduce the need to always check with my supervisors on what to do. · feel more empowered to make decisions on my own with less instruction from supervisors.

* Anchors for all items are 1 to 7 (1 = Strongly Disagree; 7 = Strongly Agree)

5.1.2 Pilot Test

The drafted questionnaire including the 36 items of underlying dimensions of ISBI (see Table 5.1) for pilot test were distributed to a sample of 51 business professionals who were enrolled in two professional MBA classes at a university in the South. Five responses were discarded from analysis due to monotone or incomplete answers. Each item was measured with a 7-point Likert-scale response format (7-Strongly Agree to 1-Strongly Disagree). The respondents are asked to complete it and then to comment on the survey. They are also asked to indicate whether the questionnaire is easy to understand, has grammatical or vocabulary errors in wording, and consumed a moderate amount of time to answer. The comments and suggestions from this pilot test were used to develop the primary survey test.

Hair *et al*. (1998, p. 102) recommends common factor analysis when (1) the main objective of EFA (exploratory factor analysis) is to discover the latent dimensions or constructs. (2) little knowledge about specific and error variance in the variables exists in prior research. Moreover, common factor analysis is viewed as a more theoretical-based analysis with restrictive assumptions and is more appropriate in explaining correlations among measured variables than principal component analysis (PCA) (Fabrigar *et al*., 1999). By following this recommendation, common factor analysis using communalities was chosen, instead of PCA. We choose common factor analysis, as the primary objective of the research is to explore the underlying dimensions of ISBI by seeking to identify common factors that influence correlations among items. Furthermore, there is a lack of prior knowledge about specific and error variance in ISBI and its subcategories.

This study used statistical package SPSS software 16.0 to conduct common factor analysis (FA; principal axis factoring in SPSS) with varimax rotation. The eigenvalues (>1.0) and scree plot suggested to extract 8 factors accounting for 82.55% of the variance. The result of FA in pilot test is displayed in Table 5.2 which shows that the eight-factor solution is appropriate, but not as exactly hypothesized in our 9 factor solution. All items were loaded on the corresponding construct, except that the items for innovation construct and the autonomy

construct were loaded into one single factor.

Except for one item (feedback4 “gather feedback on the quality of my work on the job”) which is not loaded into any factor, the 8 factor solution is clearly extracted without no-loaded and cross-loaded items (> .5). This preliminary EFA result showed that psychometric properties of the measures for ISBI were adequate overall. However, we noted two important limitations: (1) the item (feedback4) was not loaded into a factor. (2) Innovation and Autonomy were found to be loaded into one single factor. To resolve these issues, this study decided to refine the item of feedback4 by rewording it as “gather information on the quality of my work on the job.” In addition to feedback4, an item in Communication/Collaboration (Commu3) and another item in autonomy (autonomy4) were found to be quite ambiguous or perhaps too strong. Therefore, the first (do successful team-work with my colleagues) was re-worded as: do team-work better with my colleagues, and the latter (feel more empowered to make decisions on my own) was changed to: have more discretion in making decisions on my own.

With respect to the second problem, respondents participating in the pilot study failed to differentiate innovation from autonomy. This situation may be related to our using the identical opening phrase “Using Corporate IS helps me to…..” for all items in the three constructs within the Work Enrichment dimension. To remedy this in the primary test, we created an additional beginning phrase; “By using Corporate IS, I am able to….,” and used the two different beginning phrases alternatively within Work Enrichment dimension. Moreover, the questionnaire in the primary test displays all items for the three constructs into one single box without page break between them.

Table 5.2 Results of Factor Analysis from Pilot Test

No	Survey Items	1	2	3	4	5	6	7	8
Feed1	keep informed on how well I am doing my job.								0.797
Feed2	identify strengths and weaknesses in my job performance.								0.774
Feed3	easily tell if my job performance is good or bad.								0.704
Feed4	*gather feedback on the quality of my work on the job.*								
Sig1	see exactly how my work contributes to the company's success.							0.620	
Sig2	have more opportunities to improve company's performance.							0.745	
Sig3	clearly see positive impact of my job on the company.							0.714	
Sig4	connect my job responsibilities to the company's performance objectives.							0.727	
Deci1	improve the quality of decisions.				0.855				
Deci2	gather better information for decisions.				0.894				
Deci3	make decisions faster.				0.867				
Deci4	analyze more alternatives in decision making.				0.809				
Comu1	communicate more effectively with co-workers.	0.953							
Comu2	cooperate and collaborate more closely with my colleagues.	0.871							
Comu3	*do successful team-work with my colleagues.*	0.921							
Comu4	better integrate my job with others' work in the company.	0.872							
Iden1	see how an overall business process works across different units.						0.784		
Iden2	recognize where the workflow begins and where it ends in different parts of the organization.						0.806		
Iden3	understand how an entire piece of work gets accomplished in various units of the organization.						0.835		
Iden4	visualize how related activities flows through an entire business process from one unit to another.						0.797		
Infu1	get recognition of my expertise from my colleagues at work.					0.904			
Infu2	make my colleagues realize the importance of my knowledge and skills.					0.845			
Infu3	apply my expertise to influence decision making in the company.					0.810			
Infu4	enhance my professional reputation among my colleagues.					0.711			
Vari1	acquire more complex and higher level skills for my job.		0.751						
Vari2	obtain skills needed to do a wider variety of things at work.		0.885						
Vari3	gain more knowledge to do better on my job.		0.810						
Vari4	develop more competencies in doing my work.		0.771						
Inno1	come up with new ideas for my job.			0.599					
Inno2	do new things that are not possible before.			0.551					
Inno3	identify innovative ways of doing my job.			0.593					
Inno4	find new ways to improve my job performance.			0.534					
Auto1	take more initiatives with less instruction from supervisors.			0.687					
Auto2	gain more freedom in carrying out my job responsibilities.			0.740					
Auto3	reduce the need to always check with my supervisors on what to do.			0.699					
Auto4	*feel more empowered to make decisions on my own.*			0.697					

* Items in *italic* are modified for Primary Test

** For the sake of clarity, this table does contain values that are greater than 0.50.

5.1.3 Convergent and Discriminant Validity through Confirmatory Factor Analysis in Pilot Test

For pilot study data, this study carried out Confirmatory Factor Analysis (CFA), using SmartPLS 2.0 to ascertain discriminant and convergent validity of the measurement items with the sample of respondents (*n* = 46) collected in pilot test. Following Chin (1998)'s recommendations, this study obtained the results of cross loadings and AVEs by running SmartPLS 2.0, as displayed in the Table 5.3 and Table 5.4, respectively. It should be noted that the table shows the result of CFA which also displays the relationship between the measured items and the construct (Hair *et al*., 1998). As a result, the cross loadings and AVEs were obtained on the basis of a 9 factor solution as the research hypothesized.

As demonstrated in Table 5.3, the loadings of all items on the corresponding construct (in bold font) are higher (at least >.857) than the cross loading of each item on other constructs. In addition, the squared roots of all AVEs in the principal diagonal are greater than the off-diagonal elements in their respective rows and columns (see Table 5.4). Based on both cross loadings and AVEs, significant statistical evidence for discriminant validity was found in the pilot test.

Table 5.3 Results of Validity from Pilot Test: Cross Loadings

	Autonomy	Communication	Decision	Feedback	Identity	Influence	Innovation	Significance	Variety
Auto1	**0.959**	0.293	0.575	0.596	0.715	0.493	0.682	0.554	0.486
Auto2	**0.970**	0.303	0.577	0.642	0.660	0.534	0.719	0.578	0.522
Auto3	**0.955**	0.264	0.499	0.558	0.706	0.585	0.647	0.524	0.455
Auto4	**0.956**	0.249	0.571	0.604	0.726	0.554	0.701	0.531	0.562
Comu1	0.231	**0.962**	0.150	0.252	0.128	0.181	0.495	0.352	0.283
Comu2	0.345	**0.943**	0.337	0.354	0.263	0.232	0.543	0.420	0.348
Comu3	0.282	**0.959**	0.280	0.276	0.194	0.103	0.545	0.496	0.292
Comu4	0.221	**0.932**	0.234	0.221	0.189	0.074	0.527	0.437	0.330
Deci1	0.595	0.285	**0.951**	0.566	0.523	0.422	0.422	0.566	0.546
Deci2	0.578	0.265	**0.966**	0.535	0.573	0.405	0.358	0.610	0.521
Deci3	0.517	0.238	**0.970**	0.582	0.532	0.415	0.357	0.593	0.489
Deci4	0.521	0.236	**0.929**	0.535	0.496	0.393	0.335	0.528	0.374
Feed1	0.542	0.284	0.438	**0.886**	0.512	0.549	0.380	0.420	0.372
Feed2	0.581	0.265	0.561	**0.955**	0.527	0.617	0.491	0.526	0.552
Feed3	0.565	0.201	0.539	**0.928**	0.545	0.596	0.482	0.498	0.511
Feed4	0.600	0.333	0.578	**0.893**	0.570	0.644	0.487	0.572	0.579
Iden1	0.688	0.289	0.473	0.496	**0.915**	0.567	0.527	0.591	0.538
Iden2	0.666	0.160	0.565	0.532	**0.927**	0.572	0.352	0.487	0.355
Iden3	0.678	0.174	0.466	0.605	**0.952**	0.653	0.429	0.496	0.370
Iden4	0.706	0.156	0.583	0.572	**0.953**	0.666	0.448	0.579	0.489
Infu1	0.476	0.163	0.352	0.549	0.562	**0.939**	0.245	0.380	0.370
Infu2	0.538	0.089	0.363	0.635	0.608	**0.943**	0.326	0.383	0.483
Infu3	0.569	0.160	0.441	0.618	0.720	**0.946**	0.336	0.473	0.448
Infu4	0.515	0.189	0.439	0.656	0.548	**0.899**	0.368	0.375	0.417
Inno1	0.619	0.494	0.328	0.446	0.349	0.221	**0.888**	0.442	0.586
Inno2	0.618	0.552	0.334	0.429	0.378	0.341	**0.930**	0.594	0.596
Inno3	0.674	0.533	0.360	0.478	0.437	0.374	**0.954**	0.642	0.556
Inno4	0.721	0.470	0.395	0.506	0.558	0.319	**0.908**	0.613	0.588
Sig1	0.529	0.358	0.507	0.475	0.566	0.444	0.534	**0.879**	0.509
Sig2	0.538	0.459	0.590	0.526	0.480	0.375	0.598	**0.932**	0.529
Sig3	0.478	0.421	0.568	0.520	0.476	0.351	0.573	**0.938**	0.584
Sig4	0.556	0.409	0.551	0.517	0.600	0.433	0.590	**0.932**	0.605
Vari1	0.522	0.352	0.569	0.539	0.467	0.439	0.597	0.588	**0.947**
Vari2	0.411	0.292	0.443	0.444	0.395	0.380	0.604	0.555	**0.929**
Vari3	0.414	0.240	0.362	0.485	0.316	0.359	0.497	0.510	**0.857**
Vari4	0.578	0.325	0.474	0.564	0.521	0.504	0.614	0.566	**0.937**

Table 5.4 AVE and Correlations of Constructs from Pilot Test

	CR	Autonomy	Communication	Decision	Feedback	Identity	Influence	Innovation	Significance	Variety
Autonomy	0.979	**0.960**								
Communication	0.973	0.289	**0.949**							
Decision	0.976	0.579	0.268	**0.954**						
Feedback	0.954	0.626	0.296	0.581	**0.916**					
Identity	0.966	0.731	0.208	0.557	0.589	**0.937**				
Influence	0.964	0.564	0.161	0.428	0.659	0.657	**0.932**			
Innovation	0.957	0.716	0.556	0.386	0.505	0.469	0.342	**0.920**		
Significance	0.957	0.570	0.449	0.603	0.554	0.575	0.434	0.624	**0.920**	
Variety	0.955	0.528	0.332	0.507	0.555	0.468	0.461	0.632	0.605	**0.918**

* Diagonal Elements (in bold) are Squared root of the AVE

In PLS analysis, the statistical evidence for convergent validity can be obtained by examining whether each of the measured items significantly (with a significant *t*-value) loads on its construct (Gefen and Straub, 2005). As shown in Table 5.5, all of the *t* values of item loadings on their own constructs are greater than the significant t value threshold (t=1.65, p< 0.05). Based on this empirical finding, we conclude that convergent validity is satisfied.

Based on the results of the pilot test and the adjustments made to the measurement items, we developed the finalized ISBI instrument for the primary test and present it in Table 5.6.

Table 5.5 T-Statistics in Measurement Model from Pilot Test

	Autonomy	Communication	Decision	Feedback	Identity	Influence	Innovation	Significance	Variety
Auto1	60.07								
Auto2	79.69								
Auto3	70.30								
Auto4	59.55								
Comu1		25.21							
Comu2		34.74							
Comu3		21.17							
Comu4		17.09							
Deci1			52.58						
Deci2			63.77						
Deci3			79.73						
Deci4			30.29						
Feed1				22.86					
Feed2				61.78					
Feed3				43.91					
Feed4				25.82					
Iden1					27.72				
Iden2					24.91				
Iden3					61.79				
Iden4					50.25				
Infu1						24.21			
Infu2						49.38			
Infu3						48.06			
Infu4						18.04			
Inno1							25.12		
Inno2							46.37		
Inno3							53.26		
Inno4							31.31		
Sig1								17.59	
Sig2								30.93	
Sig3								45.62	
Sig4								35.97	
Vari1									53.81
Vari2									31.27
Vari3									12.75
Vari4									39.06

*Significant *t* value = *1.66 (n= 46, df = 99, p< 0.05)*

Table 5.6 ISBI Measures for the Primary Test

	Dimensions	Survey Items
Task Performance Benefits	Task Feedback	Using Corporate IS helps me to: · keep informed on how well I am doing my job. · identify strengths and weaknesses in my job performance. · easily tell if my job performance is good or bad. · gather information on the quality of my work on the job.
	Task Significance	Using Corporate IS enables me to: · see exactly how my work contributes to the company's success. · have more opportunities to improve company's performance. · clearly see positive impact of my job on the company. · connect my job responsibilities to the company's performance objectives.
	Decision Making	By using Corporate IS, I am able to: · improve the quality of decisions. · gather better information for decisions. · make decisions faster. · analyze more alternatives in decision making.
Job Interaction Benefits	Communication /Collaboration	Using Corporate IS helps me to: · communicate more effectively with co-workers. · cooperate and collaborate more closely with my colleagues. · do team-work better with my colleagues. · better integrate my job with others' work in the company.
	Task Identity	By using Corporate IS with my colleagues, I am able to; · see how an overall business process works across different units. · recognize where the workflow begins and where it ends in different parts of the organization. · understand how an entire piece of work gets accomplished in various units of the organization. · visualize how related activities flows through an entire business process from one unit to another.
	Influence	Using Corporate IS helps me to: · get recognition of my expertise from my colleagues at work. · make my colleagues realize the importance of my knowledge and skills. · apply my expertise to influence decision making in the company. · enhance my professional reputation among my colleagues.
Work Enrichment Benefits	Autonomy	By using Corporate IS, I am able to: · take more initiatives with less instruction from supervisors. · gain more freedom in carrying out my job responsibilities. · reduce the need to always check with my supervisors on what to do. · have more discretion in making decisions on my own.
	Innovation	Using Corporate IS helps me to: · come up with new ideas for my job. · do new things that are not possible before. · identify innovative ways of doing my job. · find new ways to improve my job performance.
	Task Variety	By using Corporate IS, I am able to: · acquire more complex and higher level skills for my job. · obtain skills needed to do a wider variety of things at work. · gain more knowledge to do better on my job. · develop more competencies in doing my work

* Anchors for all items are 1 to 7 (1 = Strongly Disagree; 7 = Strongly Agree).

5.2 Developing the ISU Measures

5.2.1 Initial Measurements for ISU

As discussed earlier, in this study, we classify the overall corporate IS into three different types: IRS (Information Reporting Systems), DSS (Decision Support Systems), and GSS (Group Support Systems) (Teng and Calhoun, 1996; McAfee, 2006; and McNurlin, *et al*, 2009). We developed definitions for these three types of IS and presented them in a table for the initial test. For each type, the respondents were to indicate the frequency and duration of use. The feedback from the panel of experts in the initial test indicates that these definitions are not clear and somewhat difficult to understand. Based on their suggestions, we made some modifications, and the revised ISU instrument for the next phase (the pilot test) is presented in Table 5.7.

As shown in the table, IRS (Information Reporting System) is defined as a system that delivers pre-formatted information reports regularly to facilitate operation and control. We illustrate the typical reports provided by IRS with purchase order reports, production scheduling reports, promotion tracking reports, and customer accounts reports. DSS is defined as a system that facilitates analysis and identification of problems for non-routine, long-term consequential decision making. Typical examples of DSS are provided as what-if scenario analysis, sales forecasting, sales trend analysis, production quality deviation analysis, and customer defection analysis. GSS is described as a technology that facilitates communication and collaboration among group members through exchange and sharing of information and knowledge. To help respondents easily understand the term GSS, the typical examples such as Lotus notes, Groupwise, Wikis, Microsoft SharePoint, E-mail systems, and Knowledge repository were included in the table survey.

Table 5.7 ISU Instrument for the Pilot Test

- We will use the term "**Information Reporting System (IRS)**" to refer to a type of IS and IT which regularly delivers pre-formatted information reports to facilitate operation and control for routine, repetitive, day-to-day decisions.
- ***IRS*** usually includes accounting/finance IS, logistics IS, human resources IS, etc. or modules of integrated enterprise-wide systems such as ERP and CRM systems.
- Typically ***IRS*** reports include purchase order reports, production scheduling reports, promotion tracking reports, and customer accounts reports, etc.
- In the following table, please identify three major routine activities on your job, and the information from ***IRS*** that support these activities:

Major routine activity on your job (e.g. Record current status of sales, inventory, customers, Check quantities of goods on display and in stock, Process orders and customer inquiries etc.	**Information provided by IRS supporting this routine activity** (e.g. Purchasing orders, Scheduled Inventory Report)
_____	_____
_____	_____
_____	_____

On average, I use IRS _____ **hours** per day (please estimate).
On average, I use IRS _____ **times** per day (please estimate).

- We will use the term "***Decision Support System (DSS)***" to refer to a type of IS and IT which supports non-routine, long-term consequential decision making for the achievement of work unit or organizational objectives. **DSS** typically facilitates analysis that helps you to identify causes of problems in decision making.
- ***DSS*** typically include(e.g. What-if scenario analysis, Sales forecasting, Production quality deviation analysis) and
- These may be provided by spreadsheet tools (e.g., Excel what-if features), ERP-based business intelligence functionalities and data mining, and OLAP (On-line analytical processing) etc.
- In the following table, please identify three major routine activities on your job, and the information from ***DSS*** that support these activities or decisions:

Major decision on your job (e.g. Procure new goods, products, or services. Forecast sales trend. Decide the terms of an agreement. Advise on forthcoming product developments and discuss special promotions.	**Information provided by DSS supporting this decision** (e.g. sales, material forecasting numbers and statistics, personnel performance rating statistics, cost/benefit analysis matrix, supplier rating spreadsheet, problem/solution matrix, etc.
_____	_____
_____	_____
_____	_____

On average, I use DSS _____ **hours** per week (please estimate).
On average, I use DSS _____ **times** per week (please estimate).

- We will use the term "***Group Support System (GSS)***" to refer to a type of IS and IT which facilitate communication and collaboration among group members through exchange and sharing of information and knowledge.
- ***GSS*** typically includes E-mail systems, Lotus notes, Groupwise, Wikis, Microsoft SharePoint, Knowledge repository etc.

On average, I use GSS _____ **hours** per day (please estimate)
On average, I use GSS _____ **times** per day (please estimate)

5.2.2 Development of Measurements for ISU at Pilot Test Stage

As described earlier for the pilot testing of ISBI, the drafted questionnaires for ISU (see Table 5.7) were distributed to a sample of 51 business professionals enrolled in two professional MBA classes at a university in the southern United States. Five responses were discarded from analysis due to unreliable or incomplete answers. Many respondents found it difficult to estimate number of hours and number of times they use a certain type of system per day or per week.

Based on such feedback, we adopted a new approach to the ISU instrument development. We attempted to develop a richer ISU measure by capturing users' interactions with the various types of IS for their job activities that require these systems, following the recommendations made by Burton-Jones and Straub (2006). Thus, the survey measurements for IRS use were developed by focusing on the nature of IRS that typically supports users' job that involves routine and repetitive works, monitors current status of day-to-day operations with reports. The following items were developed for the final primary test, anchored on the basis of usage frequency from 1 (rarely), 5 (half of the time), and 7 (all the time):

I use Information Reporting applications from Corporate IS;
when I perform routine and repetitive works.
when I need to monitor status of day-to-day operations (e.g., cost, sales, projects, customer relations, etc) for deviations from standards.
when I need to take immediate corrective actions based on the monitoring of current status.
when I plan my daily or weekly work activities.

Following the same approach for IRS, the measures for DSS use were developed by focusing on the nature of DSS that typically supports users' job involving analysis for better decision making, pinpointing causes of problems, and exploring more decision alternatives. The following items are developed for the final primary test, anchored on the basis of usage frequency from 1 (rarely), 5 (half of the time), and 7 (all the time):

I use Decision Support applications from Corporate IS;
when I need to conduct analysis (e.g., analysis of sales trend, customer defection patterns, what-if scenarios, etc) for better decision making.

when I try to pinpoint causes of certain problems related to my decisions.
when I attempt to explore more alternatives in decision making.
when I need to acquire crucial information and knowledge related to decisions.

Similarly, the measures for GSS use were developed by focusing on the nature of GSS that typically supports users' job that involves communication, collaboration, coordination, and sharing knowledge. The following items are developed for the final primary test, anchored on the basis of usage frequency from 1 (rarely), 5 (half of the time), and 7 (all the time):

I use Group Support applications;
when I communicate with my co-workers.
when I engage in joint efforts or projects with co-workers.
when I need to coordinate my activities with co-workers.
when I need to share information and knowledge with co-workers.

5.3 Additional Constructs for the Primary Survey

In addition to ISBI and ISU, two additional constructs are included in our research models: Corporate IS Satisfaction and Perceived Usefulness. Previous researchers measured satisfaction in terms of user's attitude or belief about system quality and information quality (Bailey and Pearson, 1983; Ives *et al*., 1983; Doll and Torkzadeh, 1988; Seddon and Kiew, 1994). However, researchers have recently converged on their view on satisfaction as an affective construct (McKinney *et al*., 2002; Au *et al*., 2008; Briggs *et al*., 2008; Bhattacherjee, 2001). Typically, this encompasses six aspects: the extent that the user is satisfied, pleased, contented, delighted, happy, and positive by the use of an IS. McKinney *et al*. (2002) reported cronbach's alpha of 0.98 and composite factor reliability of 0.96. In addition, Au *et al*. (2008) and Limayem and Cheung (2008) also provide empirical evidence of high composite reliability of 0.93 and 0.94, respectively. The items included in this construct, which we will adopt in the current study are listed below, are all anchored from 1 (strongly disagree) to 7 (strongly agree):

- I am contented with Corporate IS.
- I am pleased with Corporate IS.
- I have a positive feeling toward Corporate IS.
- I feel happy with Corporate IS.
- I feel delighted with Corporate IS.
- Overall, I am satisfied with Corporate IS.

Research on the Technology Acceptance Model (Davis *et al*., 1989) along with other IS research (Rai *et al*., 2002) measured "perceived usefulness" in terms of the overall productivity or effectiveness attributable to ISU. Previous studies have consistently reported high levels of reliability, at least above 0.91, on these items (e.g. Davis, 1989; Cronbach's alpha reliability of .97; Venkatesh *et al*., 2008; Bhattacherjee and Premkumar, 2004; Rai *et al*., 2002, composite reliability of 0.96). Thus, we measure perceived usefulness with six items developed by Davis (1989), all anchored from 1 (strongly disagree) to 7 (strongly agree):

Using Corporate IS on my job;

- enables me to accomplish tasks more quickly.
- improves my job performance.
- increases my productivity.
- enhances my effectiveness on the job.
- makes it easier to do my job.
- Overall, I find Corporate IS useful in my job.

As discussed in this chapter, we have developed new constructs for ISBI and ISU or adopted the measurements for Perceived Usefulness and Satisfaction from previous studies for the primary survey. The entire questionnaire for the primary survey can be found in APPENDIX A.

CHAPTER 6

DATA ANALYSIS AND RESULTS

The data analysis and results of this study are presented in this chapter with seven sections: (1) sample profile, (2) data analysis, (3) descriptive statistics, (4) testing predictive validities for research constructs, (5) testing hypotheses for research models, (6) summary of hypothesis testing results, and (7) evaluating common method bias. The first section illustrates the summary of the demographic characteristics of the respondents. The second section presents the results of evaluating various types of validities such as reliability and construct validity as well as the appropriateness of formative construct specifications. In the third section, descriptive statistics of the measured constructs are discussed. The fourth and fifth section presents the empirical results on the predictive validities and hypotheses testing, respectively. The sixth section summarizes the hypotheses testing. The last section presents the analysis of common method bias.

6.1 Demographic Characteristics of the Sample Dataset

This study utilized a field sample from a population of managers and professionals. Data was collected from students enrolled in the MBA programs at a state university located in a large city in the South. These students are mostly managers and professionals employed by local business firms, and can be regarded as ideal samples from the population demanded by the study.

A total of 270 survey responses were collected. Out of these, 39 samples were dropped for varied reasons, including inadequate responses (e.g. monotone or patterned responses, too many missing answers, etc.), respondents being not managers or professionals (security guards, package handlers, full time students, etc.), not currently employed, not permitted to use corporate IS (as an intern, for example), or otherwise not using IRS or DSS at

all on their job. The remaining dataset of 231 responses were used for final analysis in developing constructs and testing hypotheses.

Table 6.1 Sample Demographic Characteristics

Demographic Variable	Category	Count	Percentage
Gender	Male	140	60.6
	Female	91	39.4
	Total	231	100.0%
Age	20 and below	3	1.3
	21-30	146	63.2
	31-40	57	24.7
	41-50	15	6.5
	51-60	10	4.3
	Total	231	100.0
Education	High School Degree	2	.9
	Associate Degree	2	.9
	Bachelor Degree	155	67.1
	Master Degree	70	30.3
	Doctorate Degree	1	.4
	Others	1	.4
	Total	231	100.0%
Job Title	Engineer (software, quality, Maintenance, Environmental, Optimization, Sales)	24	10.4
	Analyst/Specialist (Financial, Sourcing, HR, Real estate, Price/Cost, System)	38	16.5
	Manager (HR, IS, Operation, Project, Accounting, Communication)	41	17.7
	Director/Executive (Marketing, Operation, Accounting, Project,	13	5.6
	Supervisor (First-Line, Accounting, Contract, Procurement)	10	4.3
	Representative (Sales, Financial, Leasing, Purchasing)	12	5.2
	Administrator (IT, Contract)	3	1.3
	Coordinator (Marketing, Logistic, HR, School)	5	2.2
	Consultant	5	2.2
	Accountant	13	5.6
	Auditor	3	1.3
	Architect	1	.4
	Staff, Assistant (Sales, Marketing, HR)	30	13.0
	Chairman, President, VP (Operation, Marketing, Finance), Owner	10	4.3
	No Response	23	10.0
	Total	231	100.0%
Years in Current Organization (Mean: 4.28; S.D.: 4.34	Less than 2 years	93	40.3
	Between 2-4 years	53	22.9
	Between 4-7 years	42	18.2
	Greater than 7 years	35	15.2
	No Response	8	3.5
	Total	231	100.0%

Table 6.1 Continued

Demographic Variable	Category	Count	Percentage
Number of Employees	Less than 50	46	19.9
	51-300	48	20.8
	301-1,000	28	12.1
	1,001-10,000	57	24.7
	10,001-50,000	31	13.4
	Greater than 5000	9	3.9
	No Response	12	5.2
	Total	231	100.0%
Organization Industry	Manufacturing	40	17.3
	IT/Telecommunications	15	6.5
	Banking/Insurance/Financial Service	39	16.9
	Consulting/Business Service	14	6.1
	Hotel/Entertainment/Service Industry	17	7.4
	Health Care	13	5.6
	Construction/Architecture/Engineering	14	6.1
	Government/Military	14	7.1
	Education	15	6.5
	Retail	9	3.9
	Transportation	8	3.5
	Non-profit	4	1.7
	Oil/Gas/Energy	4	2.0
	Others	21	9.1
	No Response	2	0.9
	Total	231	100.0%

Table 6.1 summarizes the demographic information. The sample characteristics demonstrate that the sample appears to be a reasonable sample from of the desired population of managers and professionals. The sample shows a wide range of characteristics in terms of industry type, organizational size (as the number of employees), job title, the number of years on the job, age, and gender. Further, the average number of years on the job is over 4, and thus we can be quite sure that the respondents are familiar with their company's business and information systems. As a result, it is believed that the results of this study may be generalized to the population, for external validity.

6.2 Data Analysis

6.2.1 PLS Technique

This study employed PLS (Partial Least Square) technique (Fornell and Bookstein, 1982; Barclay *et al*., 1995; Chin, 1998) to analyze data by using software SmartPLS 2.0 (M3)

beta (Ringle *et al*., 2005) for validating measurements and testing the hypotheses. PLS, a component-based approach, is chosen due to several advantages over structural equation modeling (SEM), a covariance-based approach. Not only can PLS handle both reflective and formative structures, but also demands minimal statistical restrictions on measurement scales, sample size, and distribution of residuals (Chin and Newsted, 1999, Chin *et al*., 2003).

Unlike SEM, which is based on maximum likelihood (ML) function, which is often used to analyze causal relationships and test a theory as well as hypotheses, PLS is based on Principal Component Regression (PCR), and is more suitable for prediction modeling (Chin and Newsted, 1999). Moreover, a large sample size is needed for SEM analysis (Kline, 2005), while PLS technique requires a relatively small sample size (Barclay *et al.*, 1995; Gefen *et al*., 2000).

6.2.2 Measurement Validation

6.2.2.1 Reliability

The assessment of the measurement reliability and validity are essential in developing measurements and validating them. First, reliability is the extent to which responses on measured multiple items for a construct are consistent at any point in time (Hair *et al*., 1998). In assessing reliability, Cronbach's alpha, measuring the inter-correlations among the measured items and reporting a result within the range from 0 to 1, has no threshold value to determine reliability (Hair *et al*., 1998). Yet, generally acceptable lower limit is 0.70 which is decreased to 0.6 for exploratory research (Nunnally, 1970; Hair *et al*., 1998).

Although Cronbach's alpha is the most popular estimator to assess reliability (internal consistency), it typically underestimates reliability, even producing negative estimates (Novick and Lewis, 1967; Raykov, 1997; Tarkkonen and Vehkalahti, 2005), mainly due to its restrictive assumptions on the equal distribution of measurement errors (Christmann and Van Aelst, 2006). Composite Reliability (CR) can be used as an alternative estimator to measure reliability by lessening the classical assumption postulated in Cronbach'a alpha method (Fornell and Larcker, 1981). In general, the accepted cut-off value for CR is 0.7 or greater (Barclay *et al*., 1995; Fornell and Larcker, 1981), suggesting that if the value of CR is greater than 0.70, the

responses are consistent or repeated over the measured multiple items. However, when the CR value of the item is less than 0.70, it indicates inconsistency in responses. It can also be interpreted that items may be unrelated to the construct or that the items may measure more than one construct.

The SmartPLS 2.0 software provides statistics for both Cronbach's alpha and composite reliability. As shown in Table 6.2, all Cronbach's alpha values greatly exceed the cut-off of 0.7 recommended by Nunnally (1970), while all loadings of the items for composite reliability are also substantially greater than the criterion value of 0.7, advocated by Fornell and Larcker (1981) and Barclay *et al*. (1995). With the given statistical evidence, we conclude that the measured items are statistically reliable, so that all of these items are used for further analyses.

Table 6.2 Item Correlations, t-vaules, Cronbach's Alpha, and Composite Reliability of Measured Items

Latent Construct	Items	Corrected Item-Total Correlation	t- value	Cronbach's Alpha	Composite Relaibility
Feedback	Feedback1	.782	41.81	0.923	0.945
	Feedback2	.846	67.23		
	Feedback3	.857	80.11		
	Feedback4	.799	54.91		
Task Significance	Sinificance1	.838	57.00	0.931	0.951
	Sinificance2	.795	38.52		
	Sinificance3	.886	107.70		
	Sinificance4	.839	68.04		
Decision	Decision1	.818	43.75	0.922	0.945
	Decision2	.851	63.26		
	Decision3	.786	30.31		
	Decision4	.819	44.19		
Communication/Collaboration	Commucation1	.852	52.15	0.940	0.957
	Commucation1	.909	108.6		
	Commucation1	.875	63.43		
	Commucation1	.794	35.33		
Task Identity	Identity1	.742	31.88	0.931	0.951
	Identity2	.868	83.34		
	Identity3	.892	114.50		
	Identity4	.862	84.57		
Influence	Influence1	.776	42.17	0.916	0.941
	Influence2	.845	64.31		
	Influence3	.779	45.99		
	Influence4	.831	50.52		
Autonomy	Autonomy1	.826	58.11	0.939	0.956
	Autonomy2	.863	58.65		
	Autonomy3	.856	69.63		
	Autonomy4	.873	79.41		
Innovation	Innovation1	.781	46.84	0.921	0.944
	Innovation2	.835	53.07		
	Innovation3	.864	64.78		
	Innovation4	.789	33.48		
Variety	Variety1	.857	65.32	0.944	0.959
	Variety2	.893	93.50		
	Variety3	.848	45.73		
	Variety4	.861	60.74		
IRS Use	IRS Use1	.681	21.47	0.879	0.917
	IRS Use2	.805	57.15		
	IRS Use3	.794	55.21		
	IRS Use4	.670	29.77		
DSS Use	DSS Use1	.863	85.88	0.943	0.959
	DSS Use2	.882	92.69		
	DSS Use3	.866	64.13		
	DSS Use4	.845	50.65		
GSS Use	GSS Use1	.816	48.17	0.936	0.955
	GSS Use2	.866	50.42		
	GSS Use3	.888	63.16		
	GSS Use4	.828	31.82		
Usefulness	Usefulenss1	.840	35.22	0.963	0.970
	Usefulenss2	.894	74.21		
	Usefulenss3	.920	105.9		
	Usefulenss4	.886	47.03		
	Usefulenss5	.890	70.99		
	Usefulenss6	.856	50.15		
Satisfaction	Satisfaction1	.848	42.68	0.963	0.970
	Satisfaction2	.923	88.96		
	Satisfaction3	.873	37.76		
	Satisfaction4	.906	68.17		
	Satisfaction5	.848	51.96		
	Satisfaction6	.893	72.09		

6.2.2.2 Exploratory Factor Analysis

Reliability itself does not entail validities (Straub, 1989), despite that convergent validity can be assessed with tests from reliability of items and composite reliability of constructs. Hence, not only to examine the measured items' convergent validity, but also to ascertain whether the 36 items of measurement items for ISBI developed in this research conform to their conceptual definitions, this study conducts an exploratory factor analysis (EFA; Common Factor Analysis using Squared Multiple Correlations on the Diagonal). Through EFA, this study seeks to explore what underlying dimensions constitute ISBI, and to validate the multifaceted aspects of it. A total of 231 responses collected from the primary survey are used for EFA.

With the same method applied in the pilot test, this study uses a statistical package, SPSS software 16.0 to conduct common factor analysis (FA; principal axis factoring in SPSS) with varimax rotation on a total dataset of 231 responses. In validating the underlying dimensions of ISBI, FA method is chosen due to its strict statistical property that extracts the smallest number of factors accounting for the common variance of the measured items.

As hypothesized in defining and conceptualizing the underlying dimensions of ISBI, the eigenvalues (>1.0) and scree plot suggested to extract 7 factors accounting for 74.7% of the variance (see Figure 6.1 and Table 6.3). Despite that there is no absolute threshold to decide on the number of factors extracted, as a rule of thumb in social science, it is acceptable to consider a factor solution accounting for 60 percent of total variance (Hair *et al*., 1998). Table 6.3 reports the results of eigenvalues (latent root; the amount of variance accounted for by a factor). Meanwhile, the scree test suggests extracting greater number of factors than latent root criterion.

Table 6.3 Results of Eigenvalues and Total Variance Explained with 7 Factors

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.884	46.901	46.901	16.629	46.191	46.191	5.596	15.544	15.544
2	3.233	8.98	55.881	2.973	8.258	54.449	5.218	14.494	30.038
3	2.216	6.155	62.036	2.007	5.574	60.023	3.419	9.498	39.535
4	1.759	4.887	66.923	1.562	4.339	64.363	3.328	9.246	48.781
5	1.637	4.546	71.47	1.4	3.888	68.251	3.246	9.017	57.797
6	1.473	4.091	75.561	1.233	3.424	71.674	3.115	8.652	66.45
7	1.343	3.73	79.291	1.102	3.062	74.736	2.983	8.287	74.736
8	0.918	2.549	81.84						
9	0.798	2.218	84.058						
10	0.448	1.245	85.303						

*Extraction Method: Principal Axis Factoring

As depicted in Figure 6.1, the scree test shows that the curve drops steeply and first becomes flattened out after 9th factor, indicating that extracting nine factors is optimal and qualified. In general, scree test criterion, however, recommends more factors to extract than eigenvalue criterion does (Hair *et al*., 1998). In addition, the result of FA in primary test is displayed in Table 6.4. All items loaded highly on their own respective construct, .5 or above.

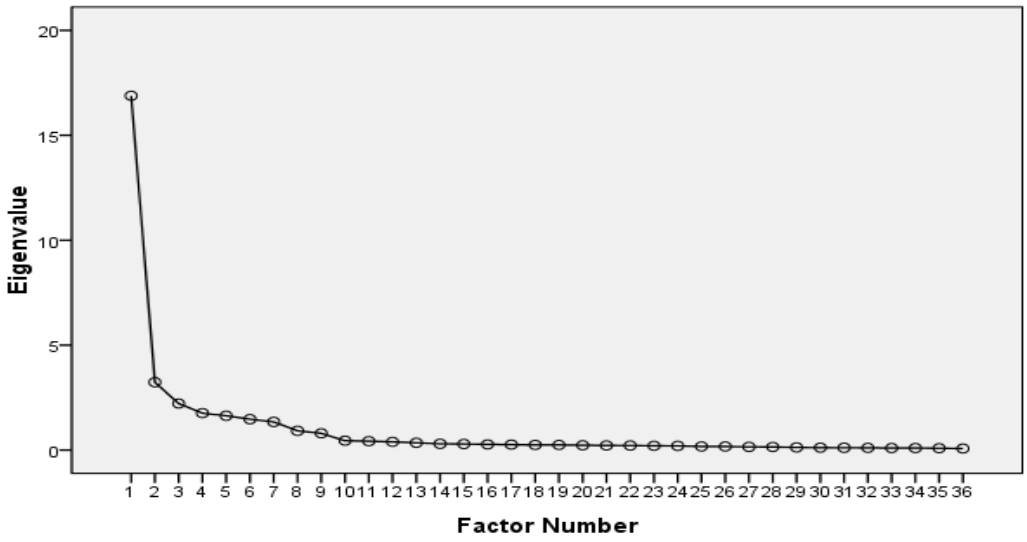


Figure 6.1 Eigenvalue Plot for Scree Test

Table 6.4 Results of FA (Common Factor Analysis) in Primary Test

Items	Mean	S.D.	Survey Items	1	2	3	4	5	6	7
Feed1	4.26	1.52	keep informed on how well I am doing my job.		.752					
Feed2	4.01	1.50	identify strengths and weaknesses in my job performance.		.822					
Feed3	3.89	1.51	easily tell if my job performance is good or bad.		.841					
Feed4	4.04	1.57	gather information on the quality of my work on the job.		.766					
Significance1	4.13	1.61	see exactly how my work contributes to the company's success.		.669					
Significance2	4.52	1.55	have more opportunities to improve company's performance.		.537					
Significance3	4.19	1.63	clearly see positive impact of my job on the company.		.652					
Significance4	4.25	1.64	connect my job responsibilities to the company's performance objectives.		.631					
Decision1	4.81	1.51	improve the quality of decisions.							.720
Decision2	5.15	1.42	gather better information for decisions.							.772
Decision3	5.02	1.56	make decisions faster.							.676
Decision4	5.04	1.62	analyze more alternatives in decision making.							.660
Commu1	5.48	1.49	communicate more effectively with co-workers.			.850				
Commu2	5.36	1.44	cooperate and collaborate more closely with my colleagues.			.877				
Commu3	5.28	1.47	do team-work better with my colleagues.			.819				
Commu4	5.34	1.45	better integrate my job with others' work in the company.			.667				
Identity1	4.61	1.45	see how an overall business process works across different units.				.618			
Identity2	4.51	1.51	recognize where the workflow begins and where it ends in different parts of the organization.				.803			
Identity3	4.43	1.59	understand how an entire piece of work gets accomplished in various units of the organization.				.828			
Identity4	4.56	1.56	visualize how related activities flows through an entire business process from one unit to another.				.789			
Infulence1	4.03	1.54	get recognition of my expertise from my colleagues at work.						.696	
Infulence2	4.20	1.56	make my colleagues realize the importance of my knowledge and skills.						.780	
Infulence3	4.33	1.59	apply my expertise to influence in decision making in the company.						.638	
Infulence4	4.38	1.62	enhance my professional reputation among my colleagues.						.717	
Autonomy1	4.79	1.54	take more initiatives with less instruction from supervisors.					.705		
Autonomy2	4.91	1.51	gain more freedom in carrying out my job responsibilities.					.765		
Autonomy3	4.82	1.62	reduce the need to always check with my supervisors on what to do.					.813		
Autonomy4	4.77	1.58	have more discretion in making decisions on my own.					.799		
Innovation1	4.52	1.50	come up with new ideas for my job.	.629						
Innovation 2	4.73	1.55	do new things that are not possible before.	.732						
Innovation 3	4.71	1.55	identify innovative ways of doing my job.	.770						
Innovation 4	4.78	1.50	find new ways to improve my job performance.	.661						
Variety1	4.77	1.52	acquire more complex and higher level skills for my job.	.760						
Variety2	4.88	1.50	obtain skills needed to do a wider variety of things at work.	.720						
Variety3	5.03	1.48	gain more knowledge to do better on my job.	.672						
Variety4	4.85	1.53	develop more competencies in doing my work.	.673						

* SPSS was used for factor analysis. Extraction Method: Principal Axis Factoring Analysis. Rotation Method: Varimax with Kaiser Normalization.

** For the sake of clarity, this table does contain values that are greater than 0.50.

This study defines and conceptualizes a 9-factor model of ISBI from the theoretical perspective of JCT and ERG. The JCT theoretically discriminates task feedback from task significance, both of which have also been empirically proved as distinct constructs by prior studies (Hackman and Oldham, 1975, 1976). Despite that feedback and task significance emerging as one single factor through EFA, the factor emerged through EFA must be "*logically interpretable and theoretically meaningful*" (Fabrigar *et al*., 1999). Based only on the findings from statistical factor solution, it cannot be argued that they are theoretically one factor. Rather, it is problematic to collapse 2 theoretically distinct constructs into one single factor purely on statistical grounds. Based on our theoretical definition, task feedback refers to benefits that IS can inform the individual users about his or her job performance. On the other hand, task significance refers to contributions to a company made by an individual user through using IS. Task significance is to assess the importance of what an employee is doing to a company, regardless of whether the employee is doing good or bad. Similarly, innovation/learning and task variety are also theoretically distinct concepts (e.g. Sein and Boostrom, 1991).

We choose 9 factor structure, rather than 7-factor solution, for further analyses for two reasons. First, the scree test results, as discussed above, show that a 9-factor solution is acceptable. To clarify the number of factors, another factor analysis was conducted. At this time the number of factors extracted from the dataset is specified as "9" by the researcher. As a result of this additional factor analysis which might be regarded neither as an EFA nor a CFA in a strict methodological standard (Gefen and Straub 2005 p, 92), the 9-factor solution (see Table 6.5) explaining 78.96% of the variance in the dataset is generated. In the nine-factor solution, without no-loaded or cross-loaded items (>0.5), all 9 factors are clearly differentiated from each other, and in complete agreement with the underlying dimensions of ISBI as we conceptualized based on JCT, ERG, and other relevant theories. This 9-factor solution from the method discussed above suggests that the 7-factor structure may be attributed to the inherent difficulty in explicating a large number of dimensions with factor analysis. In fact, prior studies (e.g.

Pierce and Dunham, 1978) which explored various job dimensions with JCT report similar difficulty in generating a stable number of factors in job characteristics through factor analysis.

Table 6.5 Results of FA by Pre-specifying Nine Extracted Factors

	Factor								
	1	2	3	4	5	6	7	8	9
Feed1	0.785								
Feed2	0.837								
Feed3	0.811								
Feed4	0.711								
Significance1									0.57
Significance2									0.553
Significance3									0.713
Significance4									0.633
Decision1						0.72			
Decision2						0.779			
Decision3						0.697			
Decision4						0.691			
Commu1		0.849							
Commu2		0.88							
Commu3		0.825							
Commu4		0.687							
Identity1				0.621					
Identity2				0.815					
Identity3				0.835					
Identity4				0.805					
Influence1					0.707				
Influence2					0.809				
Influence3					0.652				
Influence4					0.752				
Autonomy1			0.721						
Autonomy2			0.774						
Autonomy3			0.827						
Autonomy4			0.822						
Innovation1							0.632		
Innovation2							0.752		
Innovation3							0.725		
Innovation4							0.616		
Variety1								0.622	
Variety2								0.741	
Variety3								0.647	
Variety4								0.715	

* Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization
** .5 of factor loading or above is displayed for clarity.

The result of 9 factor structure showed that the psychometric properties of the measured items developed in this study were reliable and valid in capturing the full domain and nature of ISBI, since all items were loaded on the respective constructs as this study theoretically hypothesizes. Based on the results of 9 factor structure, all of the 36 items for ISBI were retained for testing hypotheses.

6.2.2.3 Convergent Validity

Using the result of factor loadings and AVE computed by PLS model (Fornell and Larcker, 1981; Chin, 1998), this study confirms the convergent validity of the 9 constructs in ISBI. First, the factor loading of a measured item (indicator) on the corresponding factor (latent construct) can be used to determine construct validity. The results of Confirmatory Factor Analysis in the primary test of this study (see Table 6.6) shows that all factor loadings of the measured items on their respective constructs, ranging from .853 to .949, are larger than the cut-off value of 0.70 (Fornell and Larcker, 1981). These high loadings provide a statistical evidence to claim convergent validity of each measured items on the corresponding latent construct.

Another method of confirming the convergent validity in CFA using PLS analysis is to examine whether each measured item loads on its latent construct at the significance level of 0.05 (Gefen and Straub, 2005). As demonstrated in Table 6.2, the t-values of measured items on the corresponding latent construct are significant at the significance level of 0.005, indicating convergent validity. In Table 6.2, Composite Reliability for all ISBI constructs are greater than .7, indicating a high level of convergent validity.

This study also computed AVE from SmartPLS, as a method of examining convergent validity on the measured items. AVE measures the amount of variance in measured items explained by their latent construct as a proportion of captured variance plus measurement error variance (Fornell and Larcker, 1981). Table 6.7 shows that AVE values of the first-order construct in ISBI, ranging from 0.799 to 0.855, are larger than the cut-off value of 0.5.

Table 6.6 Results of Confirmatory Factor Analysis for ISBI

	Feed	Signif	Deci	Commu	Identity	Influen	Autono	Innovat	Variety
Feedback1	0.874	0.578	0.441	0.315	0.319	0.447	0.278	0.356	0.398
Feedback2	0.914	0.621	0.426	0.277	0.392	0.412	0.316	0.369	0.381
Feedback3	0.924	0.685	0.443	0.218	0.406	0.481	0.362	0.363	0.405
Feedback4	0.892	0.689	0.471	0.306	0.434	0.494	0.410	0.464	0.415
Significance1	0.688	0.910	0.514	0.296	0.517	0.563	0.344	0.397	0.436
Significance2	0.602	0.884	0.613	0.425	0.540	0.556	0.385	0.468	0.485
Significance3	0.669	0.938	0.532	0.355	0.490	0.586	0.404	0.416	0.467
Significance4	0.647	0.910	0.507	0.331	0.450	0.571	0.384	0.383	0.443
Decision1	0.473	0.584	0.904	0.385	0.458	0.469	0.512	0.506	0.517
Decision2	0.437	0.568	0.921	0.465	0.526	0.470	0.432	0.502	0.499
Decision3	0.410	0.465	0.875	0.445	0.430	0.368	0.465	0.467	0.481
Decision4	0.456	0.515	0.900	0.484	0.529	0.452	0.496	0.593	0.561
Commu1	0.279	0.318	0.421	0.914	0.367	0.411	0.372	0.454	0.401
Commu2	0.289	0.342	0.427	0.949	0.446	0.402	0.420	0.493	0.446
Commu3	0.271	0.334	0.426	0.931	0.476	0.366	0.388	0.475	0.442
Commu4	0.297	0.421	0.535	0.889	0.575	0.432	0.484	0.496	0.534
Identity1	0.370	0.484	0.489	0.542	0.853	0.429	0.375	0.514	0.443
Identity2	0.378	0.477	0.508	0.453	0.926	0.385	0.394	0.498	0.483
Identity3	0.406	0.518	0.475	0.456	0.941	0.444	0.405	0.489	0.479
Identity4	0.418	0.518	0.497	0.405	0.922	0.473	0.436	0.499	0.499
Influence1	0.480	0.557	0.360	0.380	0.375	0.870	0.391	0.418	0.476
Influence2	0.452	0.561	0.431	0.381	0.371	0.913	0.416	0.478	0.477
Influence3	0.447	0.572	0.517	0.430	0.502	0.883	0.491	0.537	0.563
Influence4	0.445	0.544	0.436	0.372	0.444	0.909	0.461	0.513	0.537
Autonomy1	0.342	0.367	0.521	0.444	0.428	0.496	0.905	0.561	0.600
Autonomy2	0.379	0.388	0.509	0.443	0.397	0.468	0.926	0.537	0.611
Autonomy3	0.301	0.359	0.439	0.390	0.392	0.401	0.917	0.498	0.527
Autonomy4	0.375	0.416	0.475	0.389	0.407	0.446	0.929	0.539	0.553
Innovation1	0.387	0.403	0.503	0.497	0.510	0.496	0.506	0.874	0.623
Innovation2	0.361	0.349	0.477	0.456	0.454	0.442	0.517	0.909	0.661
Innovation3	0.347	0.400	0.539	0.486	0.528	0.500	0.531	0.928	0.725
Innovation4	0.458	0.490	0.546	0.439	0.481	0.526	0.535	0.883	0.681
Variety1	0.447	0.501	0.513	0.447	0.503	0.555	0.581	0.754	0.922
Variety2	0.425	0.467	0.531	0.460	0.479	0.528	0.555	0.685	0.941
Variety3	0.406	0.451	0.563	0.464	0.496	0.535	0.591	0.673	0.914
Variety4	0.362	0.439	0.508	0.469	0.454	0.513	0.581	0.658	0.922

* Feed (Feedback), Signif (Significance), Deci (Decision Making), Commu (Communication /Collaboration), Influen (Influence), Autono (Autonomy), Innovat (Innovation).

6.2.2.4 Discriminant Validity

A method of assessing discriminant validity through a factor structure is to examine if the factor loading of a measured item on the corresponding latent construct is significantly larger than any of the other factor loadings (correlations) on other constructs in the same row and column of the extracted factor model (Hair *et al*., 1998; Bagozzi *et al*., 1991). As shown earlier in Table 6.6, the factor loadings of the measured items on the nine latent construct satisfies this criterion.

In CFA using PLS analysis, discriminant validity can be assessed by examining whether the square root of AVE to be greater than the correlation between a construct and any other construct (Fornell and Larcker, 1981; Gefen and Straub, 2005), despite that there is no absolute threshold value exists to determine statistical significance. As demonstrated in Table 6.7, each element (square root of AVE) in the principal diagonal is all substantially higher than off-diagonal elements in their corresponding row and column, supporting the claim of discriminant validity.

Table 6.7 AVE and Correlations among Latent Constructs in ISBI

	AVE	Feed	Signi	Deci	Com	Iden	Infl	Auto	Inno	Varie	T-Perf	J-Inter	W-Enri	IRS	DSS	GSS	Usef	Satis
Feedback	0.812	**0.901**																
Significance	0.830	0.716	**0.911**															
Decision Making	0.810	0.494	0.594	**0.900**														
Communication	0.848	0.309	0.386	0.493	**0.921**													
Identity	0.830	0.432	0.549	0.540	0.510	**0.911**												
Influence	0.799	0.510	0.625	0.490	0.438	0.476	**0.894**											
Autonomy	0.845	0.381	0.416	0.529	0.454	0.442	0.494	**0.919**										
Innovation	0.808	0.431	0.457	0.575	0.522	0.549	0.546	0.581	**0.899**									
Variety	0.855	0.444	0.503	0.572	0.497	0.523	0.576	0.624	0.749	**0.925**								
T-Performance	0.601	0.859	0.906	0.805	0.460	0.592	0.634	0.514	0.567	0.589	**0.776**							
J-Interaction	0.536	0.515	0.643	0.631	0.808	0.827	0.782	0.574	0.668	0.659	0.696	**0.732**						
W-Enrichment	0.642	0.479	0.525	0.638	0.560	0.576	0.616	0.831	0.887	0.910	0.636	0.724	**0.801**					
IRS Use	0.735	0.288	0.264	0.328	0.246	0.258	0.163	0.251	0.235	0.238	0.340	0.277	0.275	**0.857**				
DSS Use	0.855	0.308	0.341	0.454	0.280	0.334	0.354	0.357	0.362	0.374	0.427	0.399	0.415	0.339	**0.925**			
GSS Use	0.840	0.175	0.269	0.231	0.655	0.318	0.314	0.256	0.324	0.244	0.264	0.533	0.312	0.195	0.224	**0.917**		
Usefulness	0.843	0.427	0.455	0.619	0.670	0.503	0.499	0.645	0.719	0.701	0.580	0.692	0.786	0.250	0.300	0.327	**0.918**	
Satisfaction	0.845	0.423	0.462	0.435	0.563	0.451	0.448	0.498	0.545	0.567	0.513	0.605	0.613	0.124	0.232	0.275	0.722	**0.919**

* Diagonal Elements (in bold) are Square root of the AVE

** First Order Construct: Feed (Feedback), Signi (Significance), Deci (Decision Making), Comm (Communication/Collaboration), Iden (Identity), infl (Influence), Auto (Autonomy), Inno (Innovation), Varie (Variety), IRS(IRS use), DSS (DSS use), GSS (GSS use), Usef (Usefulness), Satis (Satisfaction)

Second Order Construct: T-Perf (Task-Performance), J-Inter (Job Interaction), W-Enri (Work Enrichment)

This study conceptualizes that each of the nine job benefits corresponds to one of the three WJT dimensions: Task Performance, Job Interactions, and Work Enrichment. Task Performance is to be a formative constructs consisting of benefits for feedback, significance, and decision making; Job Interaction is comprised of communication, influence, and identity; and Work Enrichment consists of variety, autonomy, and innovation. Results of correlations among the nine job benefits, as seen in, reveal that the correlations between the three components of Task Performance (0.716, 0.494, and 0.594). The correlation between task significance and feedback is higher than .7 cut-off value suggested by Jarvis *et al*. (2003). It is interesting to observe, however, that decision making is highly correlated with innovation (.575) and variety (.572), and that task significance is also highly correlated with influence (.625) and decision making (.594). This is understandable since decision making is the most challenging aspect of Task Performance, and a good grasp on decision making enables an employee to become more innovative and employs a more variety of skills on the job. On the other hand, if an employee feels IS helps him/her to make more contribution, e.g., making the task more significant, this would certainly pave the way for more influence. It is inconceivable that someone would think he/she has more influence while regarding the job he/she does is not event significant. These patterns of relationships, while interpretable, are consistent with the ERG theory. While Maslow's hierarchy does not permit overlap between the five levels, Alderfer's (1972) ERG theory accommodates shared domains between the three needs.

We next examine the correlation related to the three constructs within Job Interaction. Table 6.7 indicates that the correlations among the three sub-constructs are all quite moderate (0.510, 0.438, and 0.476), supporting our conceptualization of Job Interaction as a formative construct. Table 6.7 also reveals that task identity is correlated highly with task significance (0.549) in Task Performance and innovation (0.549) in Work Enrichment, and that influence is highly correlated with significance (0.625) in Task Performance and variety (0.576) in Work Enrichment. This pattern of results suggests that Job Interaction Benefits potentially facilitate benefits by sharing some aspects with both Task Performance and Work Enrichment. It is

reasonable to expect that active and meaningful interactions with fellow workers on the job, through collaboration and knowledge sharing, provide a mean for exerting influence and foster innovation, while increasing his/her contribution to the organization.

With respect to benefits within Work Enrichment dimension, all of them are most highly correlated only within the dimension (0.581, 0.624, and 0.749). Although innovation and variety is highly correlated (0.749), it would be problematic to collapse 2 theoretically distinct constructs into one single factor purely only on statistical ground. It should be noted that innovation through learning opportunity and task variety can be related, but they are theoretically different concepts (e.g. Sein and Boostrom, 1991).

Overall, from the results of correlations discussed above, we can understand that the nine constructs which are likely to be perceived at the same time, have shared and overlapped facets among them in terms of WJT framework. The empirical result is also consistent with Alderfer's ERG theory, and that the ERG components are not exclusive from each other, rather there are shared dimensionalities in constituting a composite of needs.

6.2.2.5 Convergent and Discriminant Validity for ISU and other Constructs

In validating the underlying dimensions of ISU, along with and Perceived Usefulness and IS Satisfaction, we performed EFA using FA method with Varimax rotation. As a result, it is suggested five-factor structure, explaining 78.93% of the variance in the dataset. In the five-factor solution, all 5 factors are clearly differentiated from each other without no-loaded or cross-loaded items (>0.5) (see Table 6.8), as this study conceptualized and hypothesized. The result of EFA showed that the measured items for ISU developed in this study were reliable and valid.

Convergent validity was also examined through CFA using PLS analysis. As shown in Table 6.9, all factor loadings of the measured items on their respective constructs are larger than the cut-off value of 0.70 (Fornell and Larcker, 1981). These high loadings provide a statistical evidence to claim convergent validity of each measured items on the corresponding latent construct.

Table 6.8 Results of Common Factor Analysis for Other Constructs

No	Mean	S.D.	Survey Items	1	2	3	4	5
IRS1	4.46	1.94	when I perform routine and repetitive works.					.709
IRS2	4.61	1.83	when I need to monitor status of day-to-day operations (e.g., cost, sales, projects, customer relations, etc) for deviations from standards.					.877
IRS3	4.45	1.82	when I need to take immediate corrective actions based on the monitoring of current status.					.858
IRS4	3.93	1.88	when I plan my daily or weekly work activities.					.689
DSS1	4.06	2.07	when I need to conduct analysis (e.g., analysis of sales trend, customer defection patterns, what-if scenarios, etc) for better decision making.			.863		
DSS2	3.91	1.93	when I try to pinpoint causes of certain problems related to my decisions.			.890		
DSS3	3.99	1.96	when I attempt to explore more alternatives in decision making.			.877		
DSS4	4.33	1.97	when I need to acquire crucial information and knowledge related to decisions.			.842		
GSS1	5.54	1.66	when I communicate with my co-workers.				.811	
GSS2	5.45	1.68	when I engage in joint efforts or projects with co-workers.				.895	
GSS3	5.52	1.64	when I need to coordinate my activities with co-workers.				.909	
GSS4	5.66	1.62	when I need to share information and knowledge with co-workers.				.842	
Uful1	5.41	1.48	enables me to accomplish tasks more quickly.		.726			
Uful2	5.20	1.44	improves my job performance.		.793			
Uful3	5.39	1.44	increases my productivity.		.843			
Uful4	5.33	1.39	enhances my effectiveness on the job.		.797			
Uful5	5.47	1.40	makes it easier to do my job.		.810			
Uful6	5.55	1.37	Overall, I find Corporate IS useful in my job.		.704			
Satis1	4.76	1.37	I am contented with corporate IS/IT.	.794				
Satis2	4.75	1.34	I am pleased with corporate IS/IT	.885				
Satis3	4.95	1.32	I have a positive feeling toward corporate IS/IT.	.819				
Satis4	4.76	1.39	I feel happy with corporate IS/IT.	.857				
Satis5	4.49	1.54	I feel delighted with corporate IS/IT.	.809				
Satis6	4.94	1.39	Overall, I am satisfied with corporate IS/IT.	.839				

* Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization
** .5 of factor loading or above is displayed for clarity.

In addition to the high loadings on their own respective construct, the AVE values of three types of ISU, Perceived Usefulness, and IS Satisfaction, ranging from 0.735 to 0.855 (see Table 6.7), are larger than the cut-off value of 0.5, supporting convergent validity of the instruments.

To assess discriminant validity, we examined if the factor loading of a measured item on the corresponding latent construct is significantly larger than any of the other factor loadings on other constructs in the same row and column of the extracted factor model (Hair *et al*., 1998; Bagozzi *et al*., 1991). As shown in Table 6.9, the factor loadings of the measured items on the five construct satisfies this criterion. Further, as demonstrated in Table 6.7, each element (square root of AVE) in the principal diagonal is all substantially higher than off-diagonal

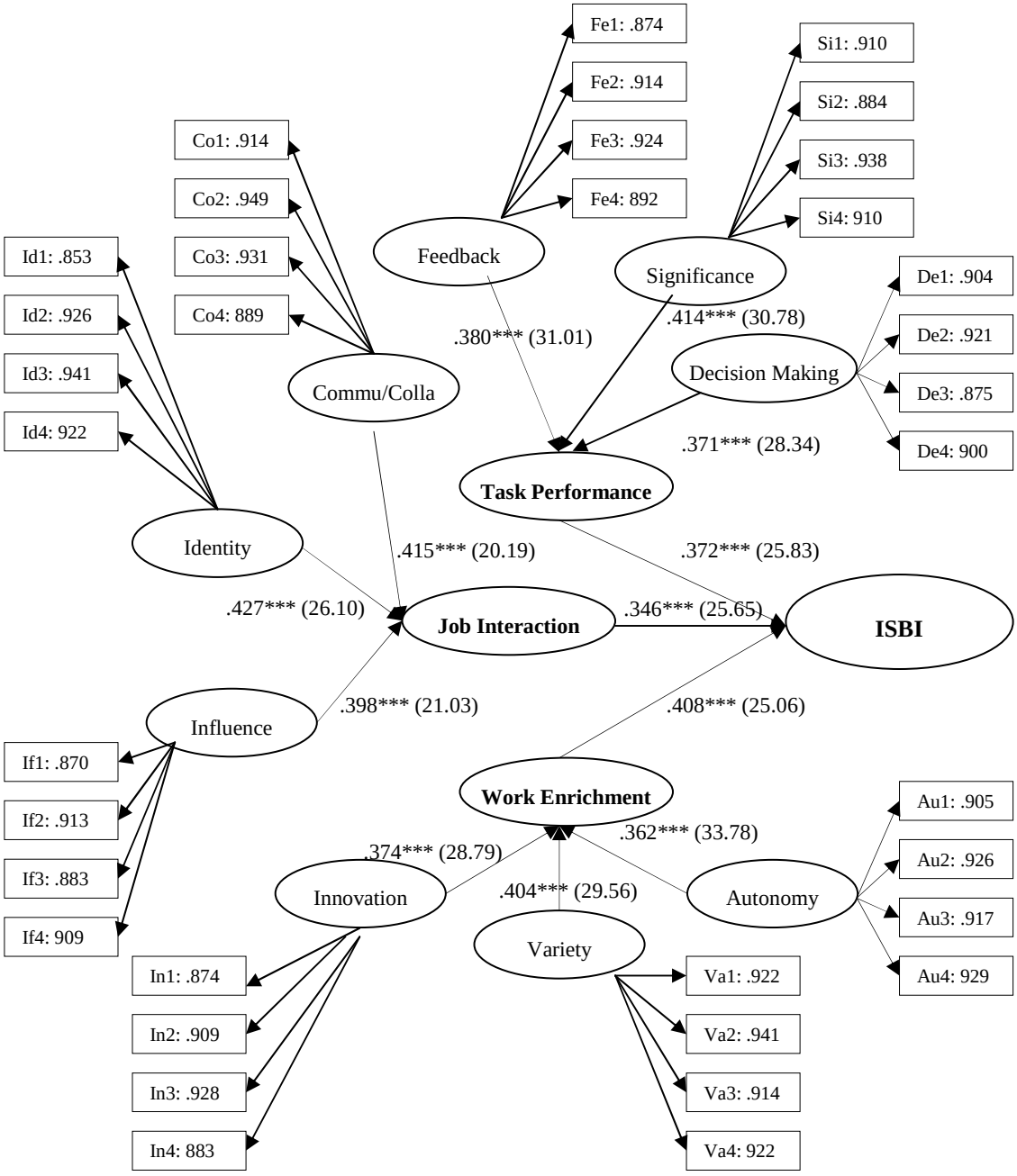
elements in their corresponding row and column, supporting the claim of discriminant validity. Overall, convergent and discriminant validity for the constructs (IRS use, DSS use, GSS use), usefulness, and satisfaction) measured in this study were obtained from these analyses.

Table 6.9 Results of Confirmatory Factor Analysis for ISU and Other Constructs

	IRS	DSS	GSS	Usefulness	Satisfaction
IRS1	0.808	0.251	0.106	0.258	0.124
IRS2	0.905	0.326	0.180	0.193	0.058
IRS3	0.900	0.311	0.200	0.199	0.108
IRS4	0.810	0.267	0.176	0.220	0.144
DSS1	0.314	0.924	0.223	0.286	0.224
DSS2	0.313	0.935	0.189	0.287	0.216
DSS3	0.308	0.925	0.195	0.268	0.179
DSS4	0.318	0.914	0.221	0.270	0.237
GSS1	0.186	0.227	0.898	0.345	0.275
GSS2	0.153	0.225	0.927	0.271	0.197
GSS3	0.181	0.199	0.939	0.312	0.269
GSS4	0.197	0.168	0.902	0.269	0.269
Useful1	0.214	0.255	0.365	0.889	0.639
Useful2	0.237	0.287	0.268	0.927	0.670
Useful3	0.221	0.285	0.300	0.945	0.658
Useful4	0.215	0.275	0.243	0.922	0.670
Useful5	0.231	0.282	0.292	0.923	0.632
Useful6	0.259	0.271	0.332	0.903	0.705
Satisfaction1	0.104	0.213	0.274	0.652	0.896
Satisfaction2	0.109	0.202	0.269	0.674	0.949
Satisfaction3	0.112	0.190	0.262	0.662	0.913
Satisfaction4	0.124	0.214	0.255	0.677	0.934
Satisfaction5	0.100	0.229	0.193	0.630	0.892
Satisfaction6	0.133	0.229	0.263	0.685	0.929

6.2.2.6 The Appropriateness of Formative Construct Specifications

To assess the second-order and third-order formative construct validity, we examined it through CFA using PLS. As shown in Figure 6.2, all nine first-order constructs have similar levels of significant importance in forming the corresponding second-order constructs, supporting our conceptualization of Task Performance, Job Interaction, and Work Enrichment Benefits as a formative construct.



* $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$, path coefficients with t-values in parentheses

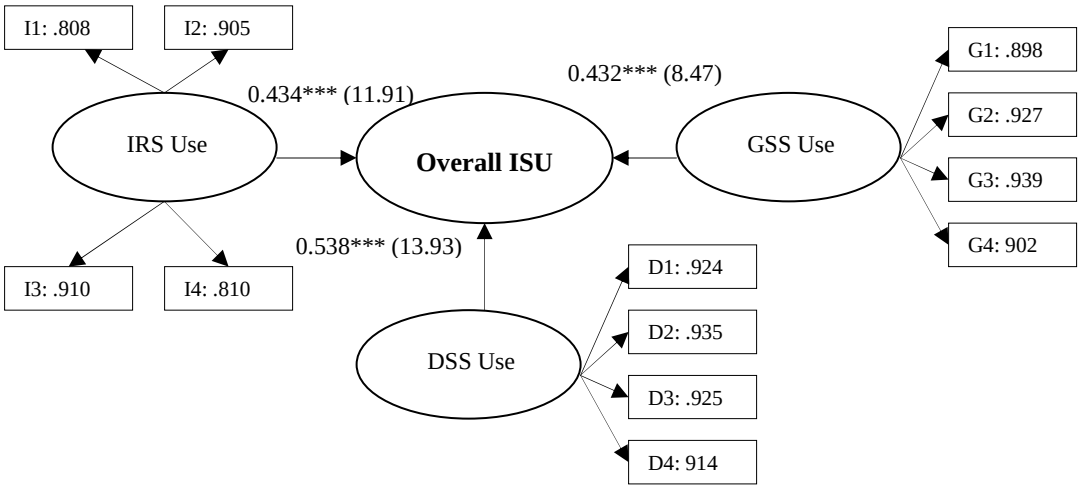
Figure 6.2 Measurement Model of ISBI

Further, all three second-order dimensions forming ISBI (third-order construct) have significant paths (Task Performance, b=.372, $p < 0.005$; Job Interaction, b=.346, $p < 0.005$; Work Enrichment b=.408 $p <$ .005), indicating that these three formative sub-constructs all have significant and sizable role in forming the ISBI construct. It also shows that the three WJT

dimensions have equivalent importance in forming ISBI, while Work Enrichment Benefits is the most important one.

The second-order ISU construct is also specified as formative with three components: IRS use, DSS use, and GSS use. The correlations among these three components, as shown in Table 6.7, are all less than 0.340, substantially less than the cut-off point at 0.7. Thus, we are confident that this is not a reflective construct.

Further, according to CFA using PLS, all three first-order ISU constructs (IRS use, DSS use, and GSS use) have significant paths (IRS use, b=.434, p< 0.005; DSS use, b=.538, p< 0.005; GSS use, b=.432, p <.005) on overall ISU, indicating that these three formative sub-constructs have significant and sizable role in forming the overall ISU construct (see Figure 6.3). Interestingly, IRS use and GSS use appears to have almost similar importance, while DSS use has the most importance.



* p< 0.05, ** p< 0.01, *** p< 0.005; path coefficients with t-values in parentheses

Figure 6.3 Measurement Model of ISU

In addition to high correlations among the constructs, the high levels of multicollinearity cause a serious concern over the validity of formative constructs (Diamantopoulos and Winklhofer, 2001; Petter *et al*., 2007; Diamantopoulos and Siguaw, 2006). To ascertain that our first-order constructs and second constructs are not highly redundant in forming second order or

third-order constructs, we performed variance inflation factor (VIF) test by using latent scores computed from Smart PLS. Diamantopoulos and Winklhofer (2001) suggest a common cut-off threshold of 10.0 to establish the validity for formative construct specification. As shown in Table 6.10, all of VIF values in our formative constructs are less than 2.7, ranging from 1.07 (GSS Use on Overall ISU) to 2.61 (Job Interaction on ISBI). These low multicollinearity results support our formative construct conceptualizations.

6.3 Descriptive Statistics

The descriptive statistics are summarized in Table 6.10, which includes the latent variable index values and standard errors (S.E.) for all constructs. Here, some interesting results are observed. We found that communication/collaboration and decision making have the highest latent variables Index Values among all 9 constructs.

Table 6.10 Results of Index Values and VIF for Latent Constructs

Constructs	LV Index Values	Standard Error	VIF	WJT Dimensions	LV Index Values	Standard Error	VIF (ISBI)
Feedback	4.05	0.013	2.080	Task Performance	4.43	0.014	2.087
Significance	4.27	0.013	2.431				
Decision Making	5.01	0.013	1.570				
Communication	5.37	0.021	1.448	Job Interaction	4.73	0.014	2.611
Identity	4.53	0.018	1.513				
Influence	4.23	0.018	1.385				
Autonomy	4.82	0.010	1.721	Work Enrichment	4.80	0.018	2.261
Innovation	4.69	0.013	2.397				
Variety	4.88	0.013	2.599				
IRS Use	4.38	0.039	1.149	Overall IS Use	4.68		
DSS Use	4.07	0.042	1.164				
GSS Use	5.54	0.044	1.071				

The high value for the communication/collaboration construct appears to be associated with a greater value in GSS use which reports the greatest Index value among ISU use measures. While DSS use is measured for the basis of decision making benefits, we found a relative low mean value for DSS use. However, the high index value of decision making

benefits means that this benefit is very critical for employees' Task Performance, and any help they can get from DSS would be valued highly, regardless of the level of DSS usage. In examining the mean values for the three dimensions within WJT, we found that index values of Work Enrichment and Job Interaction are greater than that of Task Performance, suggesting that the respondents derive more benefits from higher order categories in the WJT framework.

6.4 Testing Predictive Validities for Research Constructs

6.4.1 Statistical Techniques for Analysis

Using Smart PLS software based on a Partial Least Square (PLS) regression technique, all proposed hypotheses are tested. PLS structural model generates path coefficients and t-values on the respective relationship among variables. A path coefficient (as a value, ranging from -1 to 1) which is interpreted as a standardized beta coefficient in a regression analysis reflects the magnitude or strength of the relationship (Kline, 2005). The *t*-value determines the statistical significance at pre-defined level of p-value for a path from one variable to another. In this study, t-values for testing the significances of hypotheses were calculated via running bootstrapping of cases as a sample size with 1,000 re-sampling repetitions. Hence, one tail t-test distribution with *df* = 999 was applied to determine the statistical significance of hypotheses which requires *t*-value >2.58 at 99.5% significance level ($p< 0.005$), *t*-value > 2.33 at 99.0% significance level ($p< 0.01$), and *t*-value >1.65 at 95% significance level ($p< 0.05$).

6.4.2 Control Variables

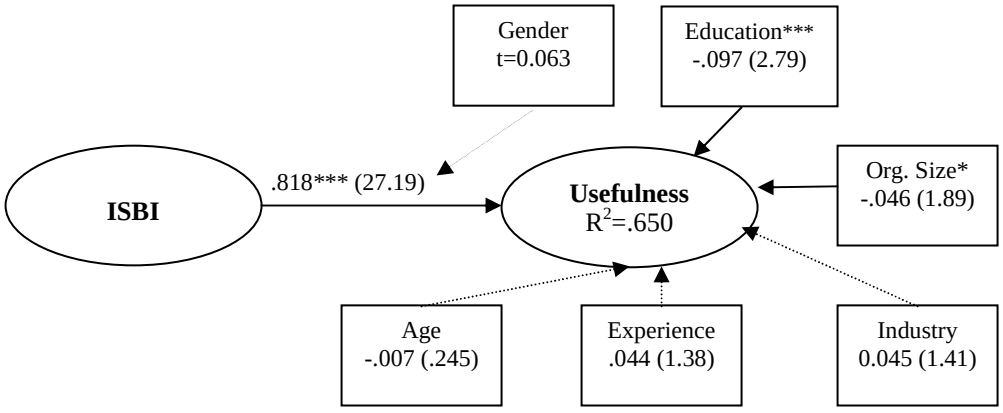
A set of variables, including Gender, Age, Education, Organization size (total number of employees), experience (the respondent's spent years with the current organization), and Industry are selected as control variables in the PLS models. Industry is coded as 1, 2, or 3 depending on the degree of information intensity of the industry (Porter and Millar, 1985), as follows:

- Industry = 3 for those handling pure information, including banking, insurance and financial services, and business consulting/service.
- Industry = 2 for those providing services, including hotel, entertainment, education.

- Industry = for those producing or handling physical products, including manufacturing, retails, oil/gas/energy etc.).

6.4.3 Results of Testing Predictive Validity of ISBI

The PLS structural model results for testing predictive validity of ISBI on Usefulness and Satisfaction (see Figure 3.6), provide path coefficients and t-values on the corresponding links (see Figure 6.4). The relationship from ISBI (as a third order construct) to perceived usefulness is highly significant (b= .818, t=27.19; p< .005) and the R^2 is 65%. This high R-square and high path coefficient provide very strong support for the predictive validity for ISBI, since perceived usefulness is an aggregate measure for individual benefits.



*p< 0.05, ** p< 0.01, *** p< 0.005; path coefficients with t-values in parentheses

Figure 6.4 PLS Results of Predictive Validity of ISBI on Perceived Usefulness of Corporate IS

No significant relationships between Perceived usefulness and any control variables were found. To examine if there is a gender effect in perceiving usefulness of Corporate IS, we split the dataset in two (one for each gender group; 140 and 91 respondents for male and female respectively) and generated t-values with bootstrap for each group. By adapting Maruyama (1999)'s statistical procedure, we compared t-values by using original sample means (0.827 for male; 0.823 for female) and standard errors (0.318 for male; 0.052 for female) obtained from PLS model. As a result of the t test, we found that the difference in perceiving usefulness between male and female group is not statistically significant (t=0.063). However,

education (*b*= -.097, *t*=2.79, *p*< .005) was found to have a negative significant relationship, indicating employees who have relatively more education perceive less usefulness on Corporate IS. As an explanation for this finding, perhaps more educated users are more demanding. A negatively significant relationship was also found between usefulness and organizational size in terms of the number of employees (*b*= -.046, *t*=1.89, *p*< .05). This can be anticipated since some employees who work in large companies perceive less usefulness in their current Corporate IS, considering their relatively high level of job complexity due to more co-workers and customers.

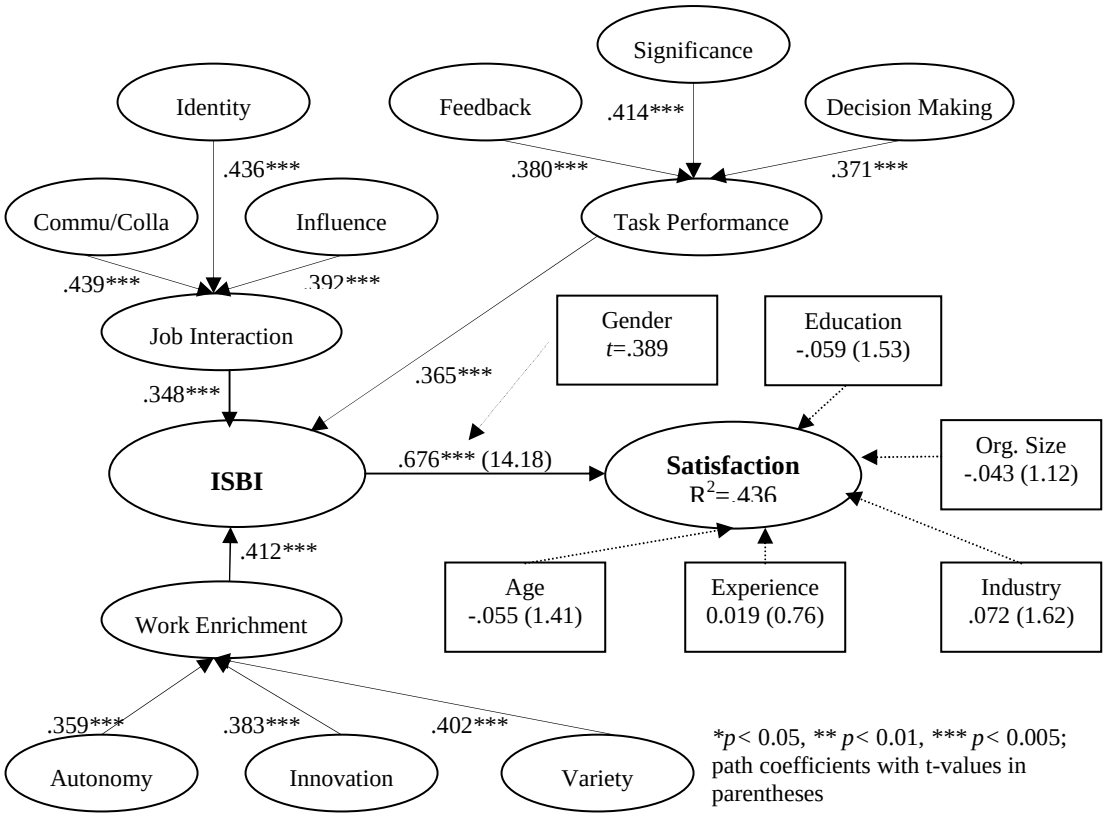


Figure 6.5 PLS Results of Predictive Validity of ISBI on Corporate IS Satisfaction

In addition, the relationship between ISBI and satisfaction shows a highly significant (*b*= .676, *t*=14.18; *p*< .005) link and the R^2 is relatively high, 43.6% (see Figure 6.5). No control variables, including gender (*t* value = .389; the original sample means of 0.69 and 0.65;

standard errors of 0.06 and 0.10 for male and female respectively), were found to be significant, providing further support for the predictive validity for ISBI

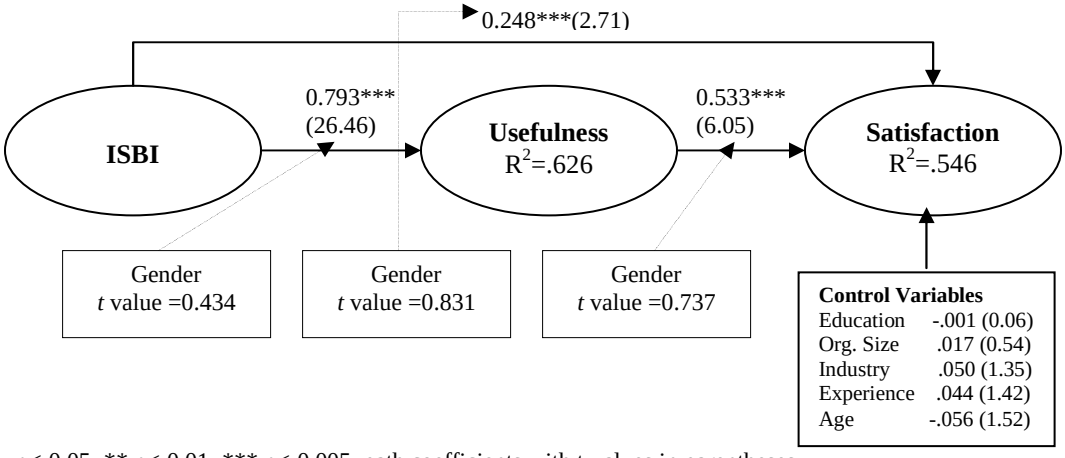
As discussed earlier, the original model proposed by DeLone and McLean (1992) purports that satisfaction leads to individual impact, while their updated model (2003) suggests a reciprocal relation between them. Seddon (1997), however, states that satisfaction encompasses "a wider range of needs, costs, and benefits of IT application use, than perceived usefulness" (p.249) so that perceived usefulness and net benefits jointly affect satisfaction in his re-specified IS success model. However, he also suggests developing more comprehensive, reliable measures of net benefits to clarify the causal relationship. Regardless of the causal direction between the two constructs, most studies found a strong significant association in the link (Rai *et al*., 2002; Petter *et al*., 2008; Petter and DeLone, 2009; Urbach *et al*., 2008). With our results from the current study, the evidence shows that our measure for ISBI is an excellent one, since it adequately predicts satisfaction.

Form these results, both hypotheses H-V1 (*ISBI is positively related to Perceived Usefulness of Corporate IS*) and H-V2 (*ISBI is positively related to Corporate IS Satisfaction*) are accepted. With these statistical results, predictive validity for ISBI is firmly established.

6.4.4 Result of Testing Predictive Validity for Mediation Effect of Perceived Usefulness on the Relationship Between ISBI and Corporate IS Satisfaction

This study also includes the H-V3 hypothesis (Perceived Usefulness of Corporate IS mediates the impact of ISBI on Corporate IS Satisfaction) for establishing additional predictive validity in that perceived usefulness reflects an aggregate construct comprised of multiple dimensions (Task Performance, Job Interaction, and Work Enrichment) in ISBI. This study statistically investigates the mediation effect of perceived usefulness by following Holmbeck (1997)'s suggestion; First we used the PLS model, to examine the direct effect of ISBI on Corporate IS Satisfaction (b = 0.676, t=14.18, p< 0.005; R^2 = 0.436) (see Figure 6.5). Next, another graphic PLS model is drawn in which perceived usefulness is placed between ISBI and satisfaction. We will then compare the parameter estimates of path coefficients from both

models (see Figure 6.6). The results suggest that the direct effect is still significant, but greatly decreased (b=0.248; t=2.71, p< 0.005) by the inclusion of the indirect effect through perceived usefulness, suggesting a partial mediation effect. In examining the indirect effect of perceived usefulness on satisfaction, no control variables were found to be significant. The t test results show that there are no significant gender differences in the relationships; ISBI-Satisfaction (t= .831, original sample mean of .302 and .175; S.E. of .100 and .116 for male and female respectively), ISBI-Usefulness (t= .434, original sample mean of .809 and .787; S.E. of .029 and .041 for male and female respectively), and Usefulness-Satisfaction (t= .737, original sample mean of .482 and .594; S.E. of .099, and .116 for male and female respectively).



p< 0.05, ** p< 0.01, *** p< 0.005, path coefficients with t-values in parentheses

Figure 6.6 Mediation Effect of Perceived Usefulness on the Relationship Between ISBI and Corporate IS Satisfaction

To further confirm the mediating effect of usefulness, we tested it again by using the regression approach with latent scores obtained from the PLS model. As suggested by Baron and Kenny (1986), the significance of each regression (beta) coefficient on the link was examined; (1) the independent variable (ISBI) and the dependent variable (satisfaction), (2) the independent variable (ISBI) and the presumed mediator (usefulness), and (3) usefulness and satisfaction.

As demonstrated in Table 6.11, the direct relationship between ISBI and satisfaction is significant (b= .651, p< 0.005), and another direct relationship between ISBI and usefulness (mediator) is also significant (b= .781, p< 0.005). In a multiple regression model which satisfaction is regressed on the two constructs (ISBI and usefulness), the impact of ISBI on Satisfaction is still significant, but decreased (b= .225, p< 0.005), while usefulness (mediator) is still significant (b= .546, p< 0.005). Results from regression models indicate the presence of partial mediation effect of usefulness on the relationship between ISBI and satisfaction. Therefore H-V3 is partially supported.

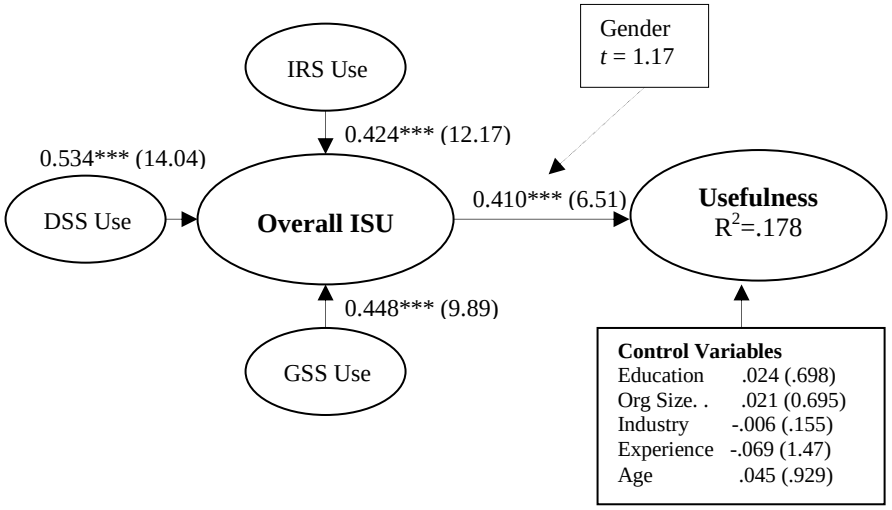
Table 6.11 Regression Results of Mediation Effect of Perceived Usefulness

Step 1 ISBI→ Satisfaction			**Step 2** ISBI→ Usefulness			**Step 3** (a) ISBI (b) Usefulness)→ Satisfaction			Result of Mediation Effect
β	Sig.	R^2	β	Sig.	R^2	β	Sig.	R^2	
.651***	.000	.424	.781***	.000	.610	(a) .225*** (b) .546***	.002 .000	.541	Partial Mediation

*p< 0.05, ** p< 0.01, *** p< 0.005

6.4.5 Results of Testing Predictive Validity of Overall ISU on Perceived Usefulness

H-V4 is proposed to test the predictive validity of overall ISU on Perceived Usefulness. To test H-V4, this study draws a graphic PLS model (see Figure 6.7). As shown in the figure, the relationship between overall ISU and perceived usefulness is highly significant (b= .410, t=6.51; p< .005) with a relatively moderate R^2 of 17.8%. Therefore, H-V4 is supported, indicating also that the ISU measure has sound predictive validity. None of the control variables were found to be significant. The t test results for the gender difference show that the relationship is not significantly different due to gender (t= 1.17, original sample mean of .469 and .296; S.E. of .072 and .129 for male and female respectively).

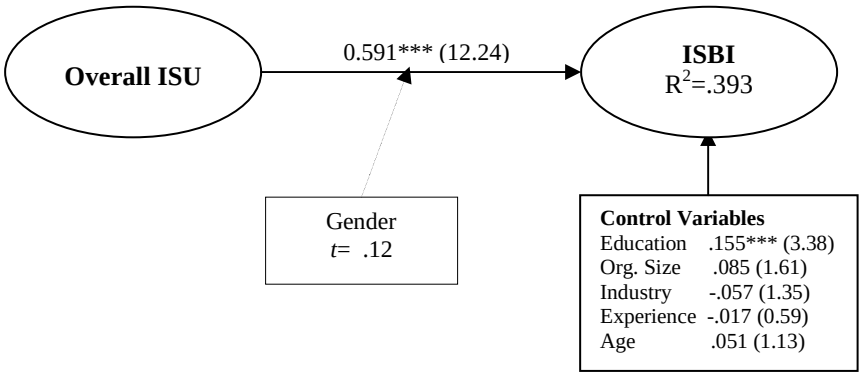


* $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$, path coefficients with t-values in parentheses

Figure 6.7 PLS Results of Predictive Validity of Overall ISU on Perceived Usefulness

6.5 Testing Hypotheses for Research Models

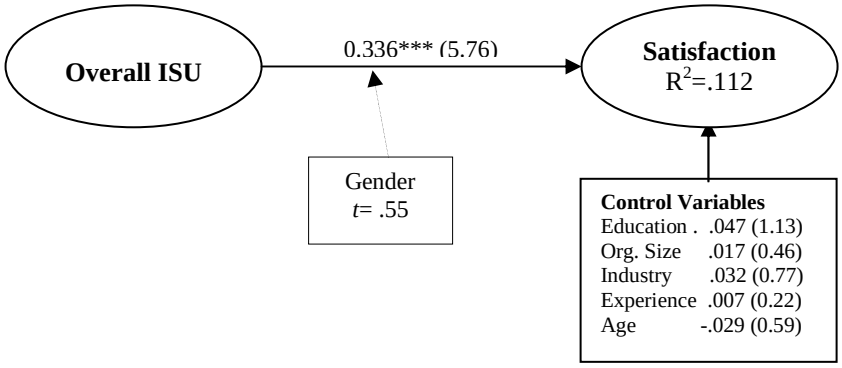
Hypothesis H1 posits that overall ISU is positively related to ISBI. Results of PLS structural model for testing H1 are shown in Figure 6.8. To determine the significance of hypotheses, each *t*-value and path coefficient resulting from bootstrapping output is depicted in corresponding paths. The results suggest that the overall ISU is significantly related with ISBI (b=.591, $p < 0.005$). Based on the t test results (t= 0.12, original sample mean of .590 and .602; S.E. of .057 and .085 for male and female respectively), we concluded that there is no significant gender difference for this relationship. Further, none of the other control variables, except education (b= .155, $p < 0.005$) were found to be significant. It appears that those with higher education stands to benefit more from the information systems they use, perhaps since they have more knowledge and expertise to exploit the information provided.



* $p < 0.05$, ** $p < 0.01$, *** $p < 0.005$, path coefficients with t-values in parentheses

Figure 6.8 Direct Relationship Between Overall ISU and ISBI

H2 is hypothesized and tested earlier as H-V2. The result supports that ISBI and satisfaction are positively and significantly related (b=.676; p< .005) with R^2 at .436.



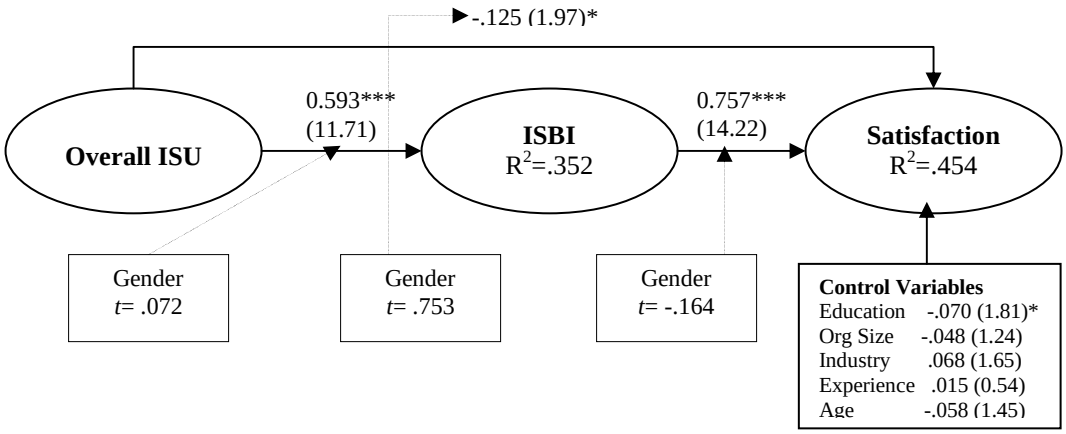
*$p < 0.05$, ** $p < 0.01$, *** $p < 0.005$, path coefficients with t-values in parentheses

Figure 6.9 Direct Relationship Between Overall ISU and Corporate IS Satisfaction

Hypothesis 3, hypothesizing that Overall ISU is positively related to IS satisfaction, is tested with a PLS model examining the direct impact of overall ISU on Corporate IS Satisfaction. The result suggests that Overall ISU is significantly related with satisfaction (b=0.336, p< 0.005; see Figure 6.9). None of the control variables were found to be significant. The gender difference is also not significant in the relationship (t= 0.55, original sample mean of .336 and .274; S.E. of .070 and .087 for male and female respectively).

Prior researchers (e.g. DeLone and McLean, 1992; Iivari, 2005; Petter and McLean, 2009) have suggested and empirically validated a positive relationship between these two constructs. With the results from this study, however, we validate this relationship with a much more comprehensive and robust measure (ISU), further advancing the rigor and relevance of this area of research.

H3-1, hypothesizing the mediation effect of ISBI on the relationship between overall ISU and Corporate IS Satisfaction, is tested through a PLS model examining overall ISU, ISBI, and Corporate IS Satisfaction (see Figure 6.9 and Figure 6.10). PLS analysis reveals that the relationship from ISU to Satisfaction is much reduced from the direct relationship (b = 0.336). In fact, the relationship becomes negative and significant (b= -.125, p< 0.05) with the inclusion of ISBI as the mediator.



*p< 0.05, ** p< 0.01, *** p< 0.005, path coefficients with t-values in parentheses

Figure 6.10 Mediation Effect of ISBI on the Relationship Between Overall ISU and Corporate IS Satisfaction

To further ascertain the mediating effect of ISBI, we tested it again by using the regression approach with latent scores obtained from the PLS model. As demonstrated in Table 6.12, the direct relationship between ISU and satisfaction is significant (b= .304, p< 0.005), and another direct relationship between ISU and ISBI (mediator) is also significant (b= .415, p< 0.005). In a multiple regression model which satisfaction is regressed on the two

constructs (ISU and ISBI), the impact of ISU on Satisfaction is found insignificant (b= -.111, p> 0.05), while ISBI is still significant (b= .716, p< 0.005). Results from regression models indicate the presence of full mediation effect of ISBI on the relationship between ISU and satisfaction.

Table 6.12 Regression Results of Mediation Effect of ISBI

Step 1 ISU→Satisfaction			**Step 2** ISU→ ISBI			**Step 3** (a) ISU (b) ISBI→ Satisfaction			Result of Mediation Effect
β	Sig.	R^2	β	Sig.	R^2	β	Sig.	R^2	
.304***	.000	.092	.415***	.000	.173	(a)-.111 (b) .716***	.071 .000	.433	Full Mediation

*p< 0.05, ** p< 0.01, *** p< 0.005

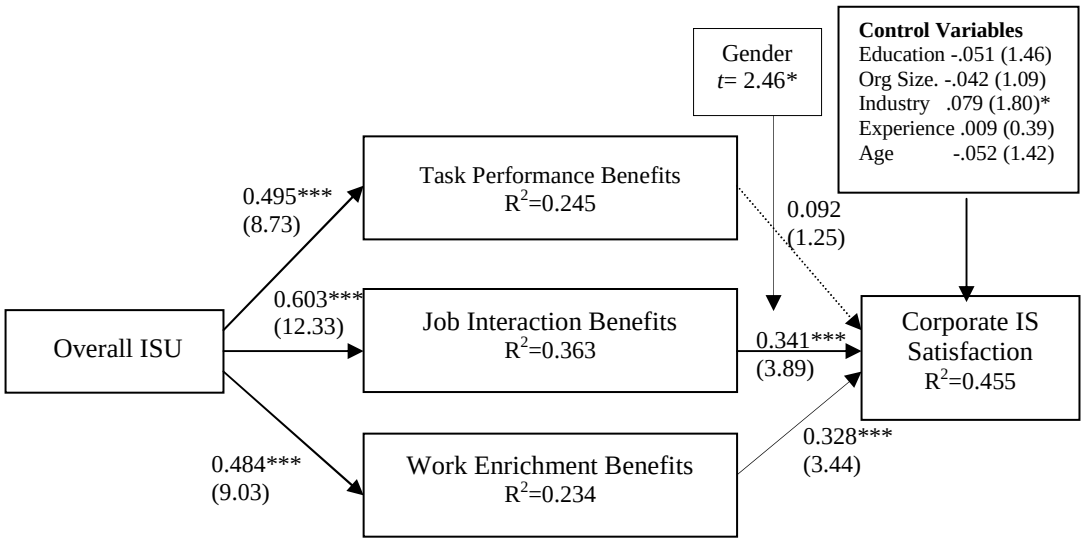
Combing the two analyses, it is concluded that the direct significant relationship between overall ISU and satisfaction is mediated by ISBI. Consumers, according to marketing sciences researchers, often infer the likelihood that a product would be beneficial to their specific needs when estimating the magnitude of its benefit. With this evaluation process, individuals would first perceive whether the product is beneficial to them, leading eventually to an affective state, feeling whether the product is good or bad for them (Woodruff, 1997). These research findings on the mediating effect of ISBI for H3-1 reveals a similar and consistent pattern, as the users would first evaluate the benefits of IS, which can be gauged by ISBI, leading eventually to an affective feeling regarding IS, which is to be measured by satisfaction.

The negative relationship between ISU and Satisfaction with the presence of ISBI in the PLS model means that ISBI more than completely explains the effect of ISU on Satisfaction. This finding suggests the possibility that factors in addition to ISU, such as information quality and systems quality, may have contributed to ISBI, which enables ISBI to magnify satisfaction. Future studies that incorporate these additional IS success factors may examine these possibilities. In this mediation model, none of the control variables were found to be significant except education. In the t tests by gender groups, there were no significant gender differences in the ISU→ISBI relationship (t= .072, original sample mean of .600 and .593; S.E. of .056 and .082 for male and female respectively), the ISBI→Satisfaction relationship (t= -.164, original

sample mean of .760 and .768; S.E. of .069 and .085 for male and female respectively), and the ISU→Satisfaction relationship (*t*= .753, original sample mean of -.099 and -.204; S.E. of .069, and .122 for male and female respectively). However, education was found to have a negative significant relationship (*b*= -.070, *t*=1.81, *p*< .05), indicating employees who have relatively more education feel less satisfied when using Corporate IS.

We proposed hypotheses H4 through H9, in order to further explore how the overall ISU affect different dimensions of ISBI and how these dimensions are related with Corporate IS Satisfaction. This decomposed model explains 45.5% of variance in Corporate IS Satisfaction (see Figure 6.11). With respect to the hypotheses H4, H5, and H6, each of which hypothesizes that overall ISU is related with Task Performance benefit (H4), Job Interaction Benefits (H5), and Work Enrichment Benefits (H6), respectively. The results demonstrate that H4 (*b*= .495, R^2=.245), H5 (*b*= .603, R^2=.363), and H6 (*b*= .484, R^2=.234) are all strongly supported.

We further attempted to investigate the impact of three dimensions of ISBI on Corporate IS Satisfaction with H7, H8, and H9. The results of testing H7 (*Task Performance Benefits is positively related to Corporate IS Satisfaction*), H8 (*Job interaction Benefits is positively related to Corporate IS Satisfaction*), and H9 (*Work Enrichment Benefits is positively related to Corporate IS Satisfaction*) through a structural model of PLS are included in Figure 6.11. Results of hypotheses testing show that Job Interaction (H8) is positively related with satisfaction (*b*= .341, *p*< 0.005). Additionally, Work Enrichment (H9) is significantly associated with satisfaction (*b*= .358, *p* <0.005). However, the relationship between Task Performance and IS Satisfaction is found to be insignificant (*b*=.093, *p*> 0.05), rejecting H7.



*p< 0.05, ** p< 0.01, *** p< 0.005, path coefficients with t-values in parentheses

Figure 6.11 Testing Hypotheses for the Decomposed Model

In general, the above pattern of findings is not surprising given the results we obtained from testing H3-1, which strongly support the mediating role of ISBI between overall ISU and satisfaction. However, the decomposed model results provide further details that provide rich insights. First, it reveals the very prominent role of Job Interaction, which received the strongest impact from overall ISU, and also exerts the strongest influence on satisfaction. With the prevailing and emerging IT environment that is increasingly dominated by a variety of potent communication technologies, our results provide a much needed and relevant update to the IS success model which was proposed many decades earlier. Incidentally, the insignificance of Task Performance to IS satisfaction means that the role of IS as a tool to support routine and operational business activities is less likely to contribute to satisfaction, since today's IS users enjoy a wide variety of different types of IS or IT in their work. As a result, IRS that is implemented to reinforce Task Performance is increasing fulfilling a "hygiene" role. In other words, its absence will lead to dissatisfaction, but its presence does not necessarily improve satisfaction. No control variables, except for industry, were found to be significant with the decomposed model in Figure 6.11. Types of industry, in terms of the information intensity for

the business, were found to be significant (b= .079, t = 1.80, p< 0.05). This can be anticipated since employees who work in more information intensive industries such as banking and financial services are likely to perform much of their business activities by using information acquired from IS, thus they are more satisfied with their Corporate IS with a given level of ISBI.

The t test results show that there are no significant gender differences in the ISU-to-Task Performance relationship (t= 0.60, original sample mean of .479 and .544; S.E. of .068 and .086 for male and female respectively), the ISU-to-Job Interaction relationship (t= 0.29, original sample mean of .620 and .591; S.E. of .056 and .086 for male and female respectively), the ISU-to-Work Enrichment relationship (t= 0.55, original sample mean of .510 and .443; S.E. of .061, and .106 for male and female respectively), the Task Performance-to-Satisfaction relationship (t= 0.46, original sample mean of .067 and .129; S.E. of .079, and .109 for male and female respectively), and the Work Enrichment-to-Satisfaction relationship (t= 1.50, original sample mean of .223 and .471; S.E. of .104, and .129 for male and female respectively). However, it is found that the relationship between Job Interaction and satisfaction is significantly different by gender (t= 2.29, p< 0.05, original sample mean of .489 and .139; S.E. of .105, and .112 for male and female respectively. For male employees, the relationship between Job Interaction and Corporate IS Satisfaction is significant (t= 4.67, p< 0.005), while it is insignificant for female employees (t= 1.24). This suggests that Job Interaction plays a more important role in IS usage on the job for male than female employees.

6.6 Summary of Hypothesis Testing Results

Results for hypothesis testing through PLS analysis are summarized in Table 6.13. Out of 13 hypotheses, twelve are significantly supported.

Table 6.13 Summary of Hypothesis Testing

Model	Hypothesis	Relationship	Result
Predictive Validity 1	H-V1	ISBI – Perceived Usefulness of Corporate IS	Supported***
Predictive Validity 1	H-V2	ISBI –Corporate IS Satisfaction	Supported***
Predictive Validity 2	H-V3	Mediation Effect of Perceived Usefulness on Relationship Link between ISBI and Satisfaction	Partially Supported
Predictive Validity 3	H-V4	Overall ISU - Perceived Usefulness of Corporate IS	Supported***
Research Model	H1	Overall ISU –ISBI	Supported***
Research Model	H2	ISBI - Corporate IS Satisfaction	Supported***
Research Model	H3	Overall ISU - Corporate IS Satisfaction	Supported***
Research Model	H3-1	Mediation Effect of ISBI on the Relationship between Overall ISU and Corporate IS Satisfaction	Supported
Decomposed Model	H4	Overall ISU - Task Performance	Supported***
Decomposed Model	H5	Overall ISU - Job Interaction	Supported***
Decomposed Model	H6	Overall ISU - Work Enrichment	Supported***
Decomposed Model	H7	Task Performance - Corporate IS Satisfaction	Rejected
Decomposed Model	H8	Job Interaction - Corporate IS Satisfaction	Supported***
Decomposed Model	H9	Work Enrichment - Corporate IS Satisfaction	Supported***

* $p<.05$, ** $p<0.01$, *** $p<0.005$

6.7 Evaluating Common Method Bias

Common method bias (CMB) refers to variance resulting from the use of a common method rather than from the construct itself (Podsakoff *et al*., 2003). It may potentially cause an inflation problem in interpreting true relationships among constructs. While CMB may not be a serious concern in IS research (Malhotra *et al*., 2006), we conduct three different statistical analyses recommended by Podsakoff *et al*. (2003) to assess the presence of common method bias.

First, Harmon's one-factor test is performed to examine the presence of common method bias. By using SPSS 16.0, all 60 indicators measuring ISBI, ISU, Perceived Usefulness, and Satisfaction were entered into an un-rotated principal component factor analysis to determine the number of factors necessary to account for the variance in the variables. The results reveal 10 distinct factors having eigenvalues greater than the threshold value of 1.0.

The 10-factor model accounted for 78.9% of the total variance (see Table 6.14) where the first (largest) factor accounts for 41.1% of the variance, thus providing statistical evidence that a common method bias is unlikely to cause a serious concern, since the largest factor did not account for a majority of the variance.

Table 6.14 Result of EFA for CMB

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	24.223	41.055	41.055	24.223	41.055	41.055
2	4.429	7.506	48.562	4.429	7.506	48.562
3	3.875	6.567	55.129	3.875	6.567	55.129
4	3.182	5.393	60.522	3.182	5.393	60.522
5	2.425	4.111	64.633	2.425	4.111	64.633
6	2.116	3.586	68.219	2.116	3.586	68.219
7	1.933	3.277	71.496	1.933	3.277	71.496
8	1.536	2.603	74.099	1.536	2.603	74.099
9	1.526	2.586	76.685	1.526	2.586	76.685
10	1.315	2.228	78.913	1.315	2.228	78.913
11	0.985	1.67	80.583			

However, Harman's one-factor analysis with non rotation is a preliminary diagnostic technique in assessing the presence of common method bias in a dataset (Podsakoff *et al*., 2003; p. 889). To further ascertain the absence of common method bias, CFA is also conducted for Harman's one single factor test. For CFA method using Lisrel 8.32, this study loads all 60 items into one latent variable "Method" to examine the fit of the confirmatory factor analysis model (see Figure 6.12). This test result shows that a single factor did not fit the data well (Chi-Square =15152.5, p = 0.00; GFI =0.31; RMSEA=0.19; NFI =0.86; AGFI =0.26; PGFI =0.20). This provides ample evidence (e.g., GFI is far less than the recommended threshold of .90) that CMB is not a serious concern.

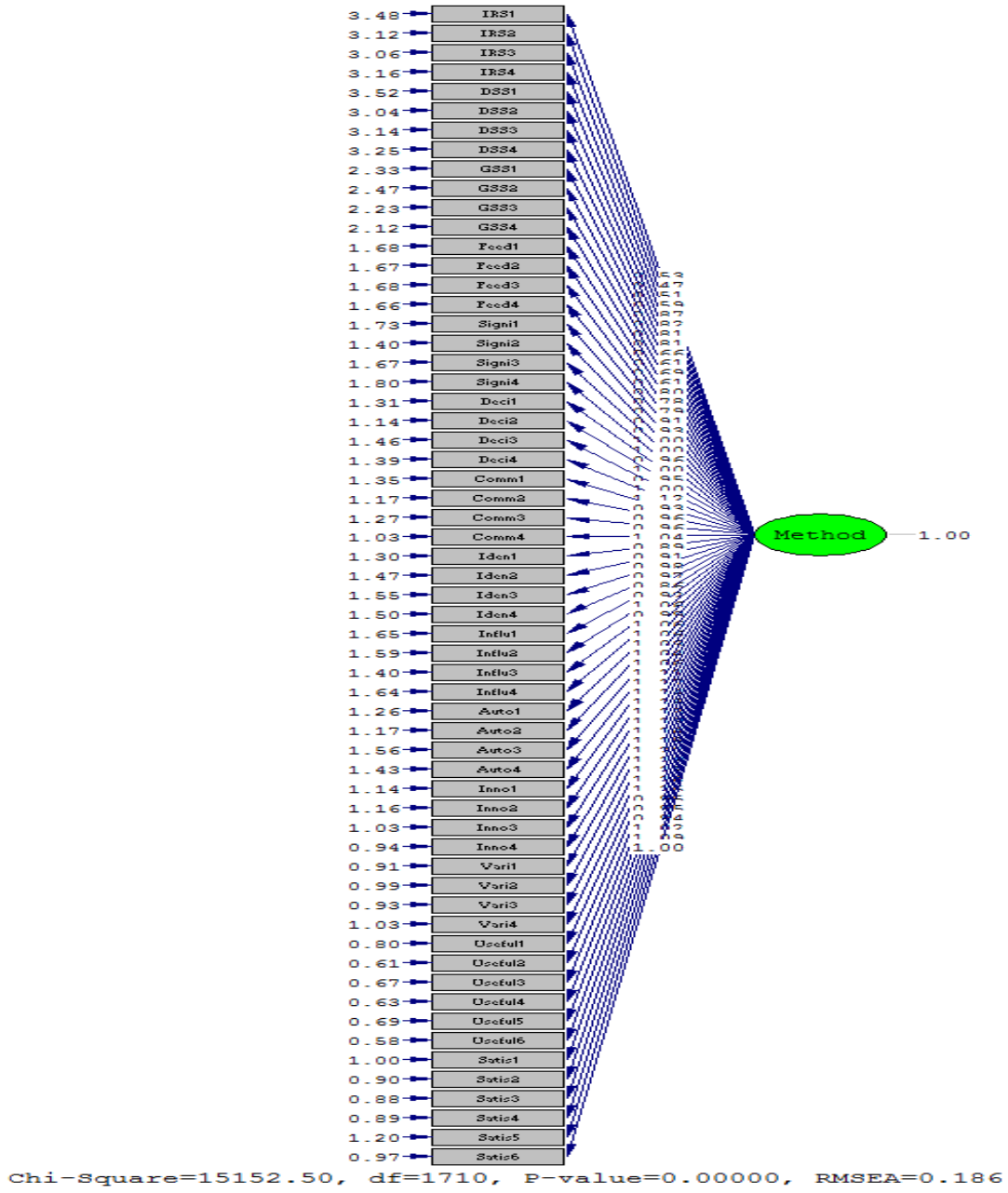


Figure 6.12 LISREL Diagram for Testing CMV

For more elaborate analysis for checking the possibility of common method bias, we also employed the approach suggested by Liang *et al*. (2007). They tested common method bias with PLS analysis by adopting the approach of "controlling for the effects of an unmeasured latent methods factor" with SEM analysis suggested by Podsakoff *et al*. (2003, p. 891).

Liang *et al*. (2007) created the method variable by loading all measured items (indicators) in one construct termed the method variable, and then transformed all indicators into single-indicator constructs. Based on this measurement model in which the method variable is linked to all single-indicator construct, indicators' substantive variances and method variance are computed. Williams *et al*. (2003) and Liang *et al*. (2007) suggest comparing the squared values of indicator's factor loading with those of the method factor loadings, examining if the squared values of indicator's factor loading is substantially larger than those of the method factor loadings. Table 6.15 presents the result of comparison of substantive factor loadings and method factor loadings. The statistical result reveals that the indicators' substantive loadings (average = 0.829) are much greater than their method loadings (average = 0.0036). The ratio of substantive to method factor loadings is about 232:1, indicating that common method bias is unlikely to be a serious concern in this study.

While the results of these analyses do not preclude the possibility of common method bias, analyses using three different approaches, as presented above, all indicate that common method bias is unlikely to be a serious concern in this study.

Table 6.15 Substantive and Method Factor Loadings for Common Bias Analysis

		Substantive Factor Loadings (R1)	$R1^2$	Method Factor Loadings (R2)	$R2^2$
Feedback	Feed1	0.8766	0.7685	-0.0009	0.0000
	Feed2	0.9441	0.8913	-0.0435	0.0019
	Feed3	0.9470	0.8968	-0.0375	0.0014
	Feed4	0.8348	0.6969	0.0839	0.0070
Significance	Significance1	0.9423	0.8880	-0.0450	0.0020
	Significance2	0.7987	0.6379	0.1180	0.0139
	Significance3	0.9568	0.9154	-0.0253	0.0006
	Significance4	0.9422	0.8878	-0.0441	0.0019
Decision	Decision1	0.9014	0.8125	-0.0003	0.0000
	Decision2	0.9374	0.8787	-0.0229	0.0005
	Decision3	0.9117	0.8312	-0.0443	0.0020
	Decision4	0.8499	0.7224	0.0667	0.0044
Communication	Commu/Colla1	0.9708	0.9425	-0.0724	0.0052
	Commu/Colla2	0.9816	0.9636	-0.0415	0.0017
	Commu/Colla3	0.9725	0.9457	-0.0557	0.0031
	Commu/Colla4	0.7537	0.5681	0.1752	0.0307
Identity	Identity1	0.7734	0.5981	0.1043	0.0109
	Identity2	0.9633	0.9279	-0.0501	0.0025
	Identity3	0.9679	0.9368	-0.0360	0.0013
	Identity4	0.9323	0.8692	-0.0103	0.0001
Influence	Influence1	0.9199	0.8461	-0.0647	0.0042
	Influence2	0.9648	0.9308	-0.0681	0.0046
	Influence3	0.7700	0.5929	0.1497	0.0224
	Influence4	0.9199	0.8462	-0.0162	0.0003
Autonomy	Autonomy1	0.8577	0.7356	0.0615	0.0038
	Autonomy2	0.8866	0.7860	0.0525	0.0028
	Autonomy3	0.9767	0.9540	-0.0781	0.0061
	Autonomy4	0.9562	0.9143	-0.0358	0.0013
Innovation	Innovation1	0.8758	0.7670	-0.0010	0.0000
	Innovation2	0.9792	0.9588	-0.0861	0.0074
	Innovation3	0.9442	0.8914	-0.0201	0.0004
	Innovation4	0.7928	0.6285	0.1103	0.0122
Variety	Variety1	0.8618	0.7426	0.0725	0.0053
	Variety2	0.9855	0.9712	-0.0542	0.0029
	Variety3	0.8951	0.8011	0.0238	0.0006
	Variety4	0.9563	0.9146	-0.0414	0.0017
IRS	IRS1	0.8204	0.6730	-0.0137	0.0002
	IRS2	0.9191	0.8447	-0.0433	0.0019
	IRS3	0.8985	0.8074	-0.0045	0.0000
	IRS4	0.7841	0.6149	0.0670	0.0045
DSS	DSS1	0.9219	0.8498	0.0044	0.0000
	DSS2	0.9331	0.8706	0.0048	0.0000
	DSS3	0.9278	0.8609	-0.0049	0.0000
	DSS4	0.9154	0.8379	-0.0045	0.0000
GSS	GSS1	0.8920	0.7956	0.0078	0.0001
	GSS2	0.9442	0.8916	-0.0374	0.0014
	GSS3	0.9270	0.8593	0.0275	0.0008
	GSS4	0.9022	0.8140	0.0021	0.0000
Usefulness	Usefulness1	0.8694	0.7559	0.0211	0.0004
	Usefulness2	0.8921	0.7959	0.0419	0.0018
	Usefulness3	1.0200	1.0403	-0.0860	0.0074
	Usefulness4	0.9401	0.8839	-0.0202	0.0004
	Usefulness5	0.9945	0.9890	-0.0818	0.0067
	Usefulness6	0.7904	0.6247	0.1279	0.0164
Satisfaction	Satisfaction1	0.8971	0.8048	-0.0019	0.0000
	Satisfaction2	0.9901	0.9802	-0.0549	0.0030
	Satisfaction3	0.9023	0.8141	0.0147	0.0002
	Satisfaction4	0.9153	0.8377	0.0256	0.0007
	Satisfaction5	0.8683	0.7539	0.0339	0.0012
	Satisfaction6	0.9399	0.8835	-0.0153	0.0002
Average			0.8291		0.0036
Ratio			231.98		1

CHAPTER 7

CONTRIBUTION AND CONCLUSION

The role of IS/IT in contributing to an employee's job benefits has long been of interest to both researchers and practitioners. Earlier studies attempted to investigate the various effects of IS on users' job benefits with an aggregate one-dimensional construct (e.g. perceived usefulness, individual performance). Although such one-dimensional constructs are reliable and valid measurements in examining IS effects on user's perceived benefits, they do not provide a view rich enough to uncover the various dimensions underlying the complex and multidimensional nature of job benefits. The aggregate variable summarizing various scales and scopes of individual benefits into a uni-dimensional construct does not provide sufficient information about all aspects of job benefits from using IS to perform a job. Furthermore, previous researchers studied IS benefits and success in reference to a single IS application. With the vastly expanded coverage of IS and IT now encompassing at least three types of IS (IRS, DSS, and GSS), different types of IS are likely to contribute differently to different types of IS job benefits.

To address these gaps in IS research, we have successfully fulfilled these objectives through a rigorously conducted empirical study: (1) Develop a theory-based extended conceptualization of IS Benefits for Individuals (ISBI) in the context of overall use of various types of IT/IS by individuals in an organization; (2) Develop a comprehensive theory-based conceptualization for the overall IS/IT use (ISU); (3) Develop and Validate the ISBI and the ISU constructs; and (4) Apply the two constructs in examining IS success.

In this Chapter, we will first discuss contribution of research findings in light of previous theories and findings, as well as directions for further studies. Next, we discuss possible implications for practice. This is followed by pointing to several potential limitation of the study. The overall conclusion is presented in the last section.

7.1 Discussion of Research Contributions

7.1.1 Instrument Developments

The ultimate purpose of information systems in organizations is to benefit individual employees in improving their job performance. The foundation of the IS field would suffer if we lack a proper conceptualization of this construct based on sound theories. Researchers have made progress over the years by first developing an aggregate measure on perceived usefulness (Davis, 1989), and then exploring other facets of benefits, such as innovation (Torkzadeh and Doll, 1999) and communication/collaboration (Karsten, 2003; Majchrzak *et al*., 2005), as well as tapping into ERG theories (Au, *et al*., 2008; Yeh and Teng, forthcoming). However, a comprehensive, theory-based conceptualization of the construct is still lacking. In this study, we have finally filled this vital gap and successfully developed this critical construct with vigorous theoretical underpinning and empirical rigor.

Drawing from ERG, JCT and other theoretical perspectives, the ISBI construct can be conceptualized to be comprised of three dimensions: Task Performance, Job Interaction, and Work Enrichment. Each dimension is theoretically conceptualized to entail three different, but related sub-constructs, each of which is measured by 4 items. The developed measures were refined through an initial and a pilot test. The finalized measures were rigorously tested and validated for reliability, convergent validity, and discriminant validity.

The results of these rigorous analyses show that the ISBI is a third-order multi-dimensional formative construct with 9 first-order reflective constructs. Also, the overall ISU construct is a second-order formative construct with three first-order reflective constructs. We have gathered very strong evidence to support the predictive validity for both constructs, and thus feel assured that they do indeed faithfully measure what they are supposed to measure.

The power and soundness of the ISBI instrument can best be illustrated by comparing it to a version of ISBI developed previously by Au et al. (2008), who actually failed to find a significant relationship between self-development fulfillment and IS satisfaction, while only very moderate relationships were found for the relationships from the work performance fulfillment

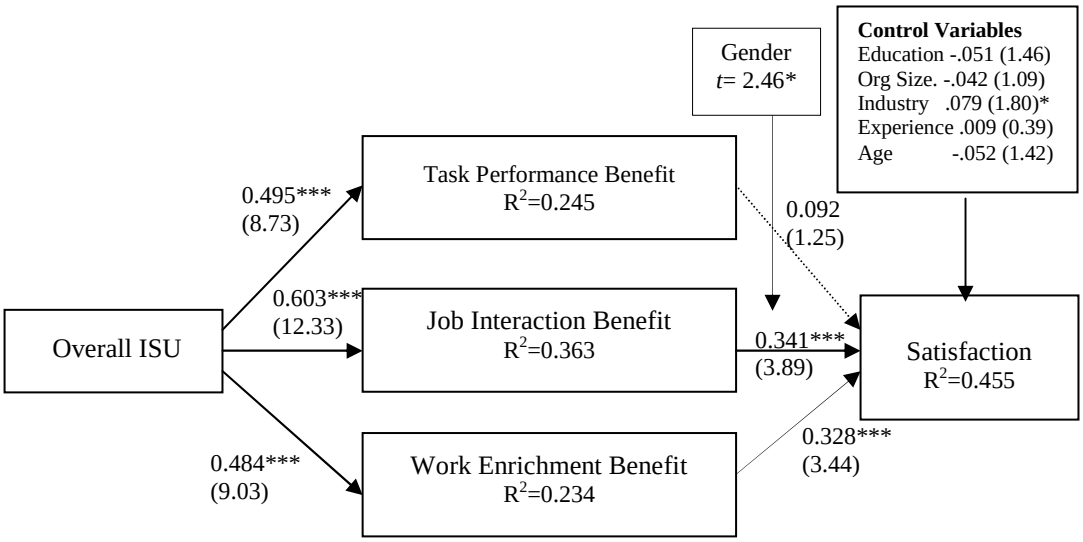
and relatedness fulfillment to IS satisfaction. Our results, however, revealed that Task Performance benefits are now regarded as basic and "hygiene" in nature, and no longer provide an active basis for user satisfaction. In contrast, the Job Interaction Benefits and Work Enrichment Benefits, both significantly and substantially contribute to increased Corporate IS satisfaction. This is reflective of the current and emerging IT environment in today's organizations, and attests to the more penetrating impacts of IS/IT and the role of these higher-order benefits as "motivators" that go beyond mere hygiene factors. The IT environments are reaching a more matured stage, and the ISBI instrument provides a timely measuring tool for researchers and practitioners.

In addition to ISBI, the ISU instrument we developed has also made a significant contribution in closing at least two serious gaps in previous research. First, previous studies examined IS success and other related phenomenon by measuring the use of just a single system (Seddon and Kiew, 1994; Iivari, 2005; Rai et al., 2002). Second, these IS measurements mostly are superficial (e.g. based on raw frequencies and intensity of use [Venkatesh et al., 2008]), and lack attention to the job context of the users, as advocated by recent researchers (Burton-Jones and Straub, 2006). The measure, with three formative components corresponding to IRS, DSS, and GSS, were shown to have good measurement properties. By closing these two gaps, our ISU measure successfully predicted perceived usefulness, a well established aggregated measure of IS benefit.

7.1.2 Contribution to Research on IS Success

The power and sound theoretical properties of these two measures are amply demonstrated as they are applied to test a critical part of the IS success model. The most exciting results emerging from this analysis concerns the mediating role of ISBI, which fully explains the influence of overall ISU on satisfaction. It is interesting to observe that this finding is consistent with TRA (Theory of Reasoned Action; Fishbein and Ajzen, 1975) with a model formulation positioning cognitive belief, which may be interpreted as ISBI in this study, as an antecedent to affective attitude, which corresponds to satisfaction in our model.

The research model we verified is the core portion of the IS success model which has evolved over two decades (DeLone and McLean, 1992, 2003, Seddon, 1997, Rai et al., 2002; Iivari, 2005), and our results have re-invigorated the model with expanded theoretical conceptualization of its critical constructs (ISBI and ISU). Therefore, the "IS success" phenomenon that researchers can now study is finally "updated" to the current realities, in that (1) we no longer have to restrict the success model to just one single system, and (2) the benefit is no longer measured by a simple aggregated usefulness measure. This breakthrough in studying IS success should lay a firm foundation for much needed advancement in this IS foundation area.



*p< 0.05, ** p< 0.01, *** p< 0.005, path coefficients with t-values in parentheses

Figure 7.1 Testing Hypotheses for the Decomposed Model

In addition to the main research model, results related to the decomposed model (see Figure 7.1 which is the same as Figure 6.11) also provides rich insights and furthers the frontier in research on IS success. It reveals the very prominent role of Job Interaction, which received the strongest impact from overall ISU, and also exerts the strongest influence on satisfaction. This result may be interpreted by the accelerating adoption of GSS and enterprise systems that tremendously enhance coordination between different business functions. In general, the Work

Enrichment Benefit appears to rank second in terms of the impact received and influence exerted. The rapid adoption of DSS application for business intelligence appears to be a major driver for this phenomenon. IRS received the least amount of impact, and actually does not have any significant influence on satisfaction. This seems to mean the increasingly "hygiene" role of this traditional type of IS in organizations.

7.1.3 Exploring the Granulated Relationships Between ISU and ISBI

In addition to the decomposed research model, we attempt to further explore the differentiated effects of the three types of IS (IRS, DSS, and GSS) on the three dimensions of ISBI. The PLS bootstrap analysis results are shown Figure 7.2. The test results show that IRS use has a significant effect on Task Performance Benefits (b=.210, t= 3.38; p< 0.005), Job Interaction Benefits (b=.104, t= 1.91; p< 0.05), and Work Enrichment Benefits (b=.126, t= 2.00; p< 0.05). On the other hand, DSS is also found to have positive impacts on all three dimensions at the significance level of 0.005, demonstrating strong and significant effects on Task Performance Benefit (b= .335, t= 5.30), Work Enrichment (b=.325, t= 5.22), as well as Job Interaction Benefit (b=.246, t= 4.33).

Not surprisingly, the effect on Task Performance is the highest, since improvement to decision making is a critical component of this dimension. Its effect on Work Enrichment is almost equally high, and this is apparently so because advanced DSS features can help users to try new and innovative things. The popularity of modern BI (Business Intelligence) systems attests to this phenomenon. Interestingly, DSS has a sizable effect on Job Interaction benefit, and this may be attributed to the cross-functional nature of most managerial decisions that carry significant consequences.

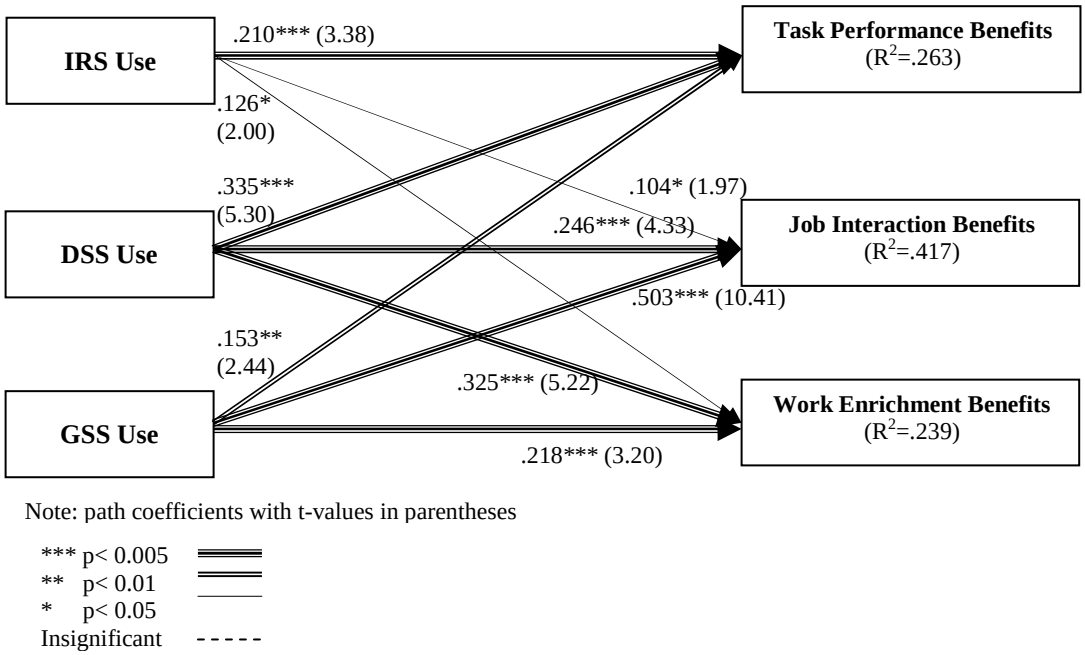


Figure 7.2 Relationships Between Different Types of ISU and Various Dimensions of ISBI

As shown in Figure 7.2, GSS use shows a strong effect on Job Interaction Benefit (*b*=.503, *t*= 10.41, *p*< 0.005) as expected since the system is primarily intended to enhance interactions among employees. GSS is also found to be significant with Work Enrichment Benefits (*b*=.218, *t*= 3.20, *p*< 0.005) and Task Performance Benefits (*b*=.153, *t*= 2.44, *p*< 0.01).

The three types of IS use explains 26.3% variance in Task Performance Benefits, 41.7% in Job Interaction Benefits, and 23.9% in Work Enrichment Benefits. Next, using an incremental *F* test we examined whether each type of ISU significantly increases the variance explained for the three different job benefits dimensions. We compared the amount variance explained between full (including all three types of ISU) and the reduced models (excluding one type of ISU among the three types ISU).

With respect to the effect size of IRS, the results suggest a significant impact of the IRS effect on the variance explained in Task Performance with a small effect size (f^2 = 0.047, F = 3.99, p < 0.05), following Cohen (1988)'s definition on the effect size of 0.02 (small) , 0.15

(Medium), and 0.35 (large) for R^2. However, the effect size of IRS on Job Interaction and Work Enrichment is not significant (F=1.95, p> 0.05; F=3.88, p> 0.05, respectively). As discussed earlier, the traditional IRS, which has existed ever since the dawn of the computer age, was the corner stone of yesteryears' information systems. Our findings indicate that IRS may help an employee get informed about how well he/she is doing on the job, or see more clearly how his/her job contribute to company's objectives, whereas this type of IS is less likely to generate high-order benefits in the areas of Job Interaction and Work Enrichment. As the IS environment has advanced and matured, its importance remains, but the perceived benefits tend to be restricted to the basic Task Performance area. This leaves out the other two higher-order benefits: Job Interaction and Work Enrichment, to more advanced DSS and GSS.

Table 7.1 Comparison of Full and Reduced Model

Dimension	Reduced Model *	R^2	f^2	F
Task Performance	DSS GSS (IRS)	0.228	0.047	10.78***
	GSS IRS (DSS)	0.167	0.130	29.57***
	IRS DSS (GSS)	0.243	0.027	6.160*
Job Interaction	DSS GSS (IRS)	0.412	0.009	1.95
	GSS IRS (DSS)	0.385	0.055	12.46***
	IRS DSS (GSS)	0.189	0.391	88.78***
Work Enrichment	DSS GSS (IRS)	0.226	0.017	3.878
	GSS IRS (DSS)	0.150	0.117	26.55***
	IRS DSS (GSS)	0.195	0.058	13.13***

* The construct in parentheses is excluded from the full model
*$p< 0.05$, ** $p< 0.01$, *** $p< 0.005$*

Regarding the effect size of GSS, the results show a significant impact of GSS on the variance explained in Job Interaction Benefits with a fairly large effect size (f^2= 0.391). GSS is also found to have a significant but small effect on the variance explained for Task Performance and Work Enrichment (f^2= 0.027, f^2= 0.058, respectively). This is understandable, since GSS does not seem to provide direct help in these two areas. It appears that GSS features (e.g. Groupware, email system, Instant messengers, Wikis, etc) are highly regarded as a tool to directly enhance Job Interaction Benefits as it is designed and implemented. The results also

show that the significant impact of DSS on the three benefits significantly increase the variance explained for all job benefits with a moderately small effect size on Task Performance (f^2= 0.130), Job Interaction (f^2= 0.055), and Work Enrichment (f^2= 0.117) Benefits.

The pattern of findings, as described and interpreted above, offered a more granulated picture of the relationships between overall ISU and ISBI. The fact that these relationships are consistent with current organizational realities, gives us more confidence that our measurements of these constructs are sound, and the results for our research models are valid.

7.1.4 Directions for Further Research

We have made great strides in this study by developing and validating two new scales for the IS success model that are based on sound theories. Future studies can attempt to further improve our scales and replicate our study with different samples, under different cultural settings. Secondly, we have applied the scales to test only part of the IS success model. Researchers can apply the new instruments to examine the entire IS success model (Delone and McLean, 1992, 2003, Seddon, 1997, Rai *et al*., 2002; Iivari, 2005) with additional constructs such as information quality, systems quality, and service quality. This would greatly advance the state of knowledge in this crucial area of IS research foundation. In addition, the two new instruments may also be applied to study areas other than IS success models. For example, the stream of research in IS implementation can benefit greatly from using our scales. One possibility is to administer the scales repeatedly over multiple stages of the implementation process to examine how the IT or IS is being assimilated by users.

7.2 Implications for Practice

For IS managers, the multifaceted ISBI instrument can be used as a powerful diagnostic tool in evaluating how IS or IT are being utilized to benefit individual users. After all, the ultimate purpose of IS/IT is to benefit each and every individual employee on their job and work activities. For the first time, the aggregate usefulness measure is no longer merely a "white light." With the ERG and JCT theories, we have developed a prism to uncover the full

spectrum of nine distinct benefits. Managers can use the ISBI instrument to pinpoint specific areas of strengths and deficiencies in implementing a new system. This is particularly relevant when certain benefits are expected to be strong, but turn out to be weak. Managers should then take appropriate actions accordingly. For example, a new GSS is expected to boost benefits in the job interaction area. When this fails to materialize, managers should attempt to correct the problems by looking into the three components of the job interaction benefits: commnunication/collaboration, task identity, and influence, and examine possible causes of the problems.

Compared to raw measures of usage frequency and intensity, the ISU instrument is a measure that relates to the actual job activities that the IS is supposed to support, and thus provides a much more accurate gauge of the true extent of "penetration" of various types of IS in employees' jobs. If managers really want to know, "have users really used the system that I worked so hard to implement?", they now have a tool in ISU to provide reliable and insightful answers.

7.3 Limitations

As a first step in launching a new research direction in studying IS success, several limitations may be identified and discussed. First, although this study attempts to capture the full spectrum of ISBI through a multi-dimensional construct, not all facets of this construct may have been conceptualized. However, we do have high level of confidence that the ISBI scale is comprehensive and sound, since the conceptualization is based on the well established theories in human needs and job characteristics, and our empirical results on testing the various types of validities yield excellent results. Nevertheless, future studies may attempt to further refine and expand this instrument. Another limitation of the study lies in the cross-sectional nature of our empirical findings. This means that our results correspond to a variance model, not a process model, and attempts to infer causality should be done with great care.

Third, the sample of subjects selected for the study are MBA students, and this may or may not adequately represent the population of business professionals. We do have good reasons to believe, however, that our sample is a reasonably good one, as the profile of their demographic characteristics indicates (see Table 6.1). Nevertheless, we need to exercise caution in generalizing the results to the entire population of business professionals.

Fourth, although this study attempted to include a number of control variables including industry, years of experience with the current organization, and the organizational size, etc., additional potential relevant variables may also exert influence on the dependent variables. For example, the level of individual's motivation on the job may influence the relationship between ISBI and Corporate IS Satisfaction.

7.4 Conclusion

Information systems benefits for individuals (ISBI) has been a key construct for the IS success model, which has been studied intensively by researchers to build up this theoretical foundation for the IS field. Unfortunately, relatively little research has been done to explore, develop and validate the underlying theoretical dimensions for this crucial construct. Further, related research has been conducted typically in the context of individual IS application instead of the overall IS in the organization. In this study, we have successfully fulfilled four research objectives: (1) Develop a theory-based extended conceptualization of IS Benefits for Individuals (ISBI) in the context of overall use of various types of IT/IS by individuals in an organization (2) Develop a comprehensive theory-based conceptualization for the overall IT/IS use (ISU) (3) Develop and Validate the ISBI and the ISU constructs (4) Apply the two constructs in examining IS success.

This study draws from the ERG theory (ERG stands for Existence, Relatedness, Growth; Alderfer, 1972), Job Characteristic Theory (JCT; Hackman and Oldham, 1975, 1976) and other theoretical perspectives. A theory-based WJT framework was developed which consists of three levels: **W**ork enrichment, **J**ob interaction, and **T**ask performance,

corresponding to the three levels of the ERG theory. The ISBI construct is developed as a formative construct that consists of these three sub-constructs, and each of which, in turn, consists of three sub-constructs based on JCT and other relevant theories. With a sample of 231 responses from business professionals, the validities of the ISBI construct were established. We used the two new scales to test a part of the IS success model, and the results indicate that ISBI mediates the relationship between IS Use and satisfaction. This finding attests to the robustness of the scale in its ability to explain why people are satisfied when using IS.

In addition, the study results reveal that overall IS Use has roughly equal impacts on the three types of benefits, but the job interaction benefit has the highest impact on satisfaction, while the Task Performance Benefits has no impact on satisfaction. Further, DSS (Decision Support Systems) Use is found to be the most important type of IS in increasing employees' job benefit perception, while GSS (Group Support Systems) most greatly contributes to employees' increased Corporate IS Satisfaction. These results provide a more granulated clearer picture of the relationship among IS Use, ISBI, and Satisfaction, in the context of the emerging IS environment which has evolved far beyond the traditional IRS (Information Reporting Systems) and gravitated toward modern DSS and GSS.

In conclusion, this study has succeeded in developing and validating theory-based multidimensional measures for ISBI and ISU, and applying them to test an important part of the IS success model. Further, we have expended the context of the IS success model to the overall IS and the different types of IS, rather than a single system as in previous studies. The theoretical and empirical work of this study has thus contributed significantly to the cumulated research on IS success, a critical foundation area for the IS field.

APPENDIX A

QUESTIONNAIRE FOR THE PRIMARY SURVEY

Dear Students:

The attached questionnaire is a part of a research project approved by UTA's Research Regulatory Office. The objective of the research is to study how business managers and professionals perceive the benefits of using information systems (IS) and information technologies (IT) on their job.

The questionnaire should take no more than 20 minutes of your time. The questionnaire is completely anonymous, and there is no way that your answers can be linked to your identity.

If you are interested in receiving a summary of the research finding, please enter your name and email address below, detach this sheet (to protect your identity), and submit it separately.

Participation in this survey is voluntary. We really appreciate your participation in this important research project. The outcomes of the project should enhance the research reputation of the University of Texas at Arlington.

Sincerely,

James T. C. Teng, Ph.D.
West Distinguished Professor
College of Business
University of Texas at Arlington

Jonghak Sun
Doctoral Research Associate
College of Business
University of Texas at Arlington

The term Corporate Information Systems refers to the collection of all information systems (IS) and information technology (IT) applications in your organization, which you can use to do your job. These applications include:

- Information Reporting applications that provide basic information reports for routine activities
- Decision Support applications that facilitate analysis for better decision makings
- Group Support applications that facilitate communication and collaboration with your colleagues and customers

· **Information Reporting applications provide basic information reports for routine activities through pre-formatted information reports such as purchase order reports, production scheduling reports, project status reports, promotion tracking reports, and customer accounts reports, etc.**

· **Please consider how you use Information Reporting applications in your job, and circle a number between 7 (all the time), 4 (half of the time), and 1 (rarely):**

	Rarely			Half of the time			All the time
I use Information Reporting applications from Corporate IS;							
when I perform routine and repetitive works.	1	2	3	4	5	6	7
when I need to monitor status of day-to-day operations (e.g., cost, sales, projects, customer relations, etc) for deviations from standards.	1	2	3	4	5	6	7
when I need to take immediate corrective actions based on the monitoring of current status.	1	2	3	4	5	6	7
when I plan my daily or weekly work activities.	1	2	3	4	5	6	7

On average, I use the above Information Reporting applications _____ **hours** per day (please estimate).

On average, I use the above Information Reporting applications _____ **times** per day (please estimate).

· **Decision Support applications facilitate analysis for better decision making, and this is provided by applications such as Excel models, data warehouse, business intelligence, data mining, OLAP (On-line analytical processing), business analytics, etc.**

· **Please consider how you use Decision Support applications in your job, and circle a number between 7 (all the time), 4 (half of the time), and 1 (rarely):**

	Rarely			Half of the time			All the time
I use Decision Support applications from Corporate IS;							
when I need to conduct analysis (e.g., analysis of sales trend, customer defection patterns, what-if scenarios, etc) for better decision making.	1	2	3	4	5	6	7
when I try to pinpoint causes of certain problems related to my decisions.	1	2	3	4	5	6	7
when I attempt to explore more alternatives in decision making.	1	2	3	4	5	6	7
when I need to acquire crucial information and knowledge related to decisions.	1	2	3	4	5	6	7

On average, I use the above Decision Support applications _____ **hours** per week (please estimate).

On average, I use the above Decision Support applications _____ **times** per week (please estimate).

· **Group Support applications facilitate communication and collaboration with your colleagues and customers. It includes applications such as GroupWare, email system, wikis, Instant Messaging, Video Conference, etc.**

· **Please consider how you use Group Support applications in your job, and circle a number between 7 (all the time), 4 (half of the time), and 1 (rarely):**

	Rarely			Half of the time			All the time
I use Group Support applications;							
when I communicate with my co-workers.	1	2	3	4	5	6	7
when I engage in joint efforts or projects with co-workers.	1	2	3	4	5	6	7
when I need to coordinate my activities with co-workers.	1	2	3	4	5	6	7
when I need to share information and knowledge with co-workers.	1	2	3	4	5	6	7

On average, I use the above Decision Support applications _____ **hours** per day (please estimate).

On average, I use the above Decision Support applications _____ **times** per day (please estimate).

Demographics - Please check the category that is most appropriate.

Gender _____Male _____Female

Age _____20 and below _____21 to 30 _____31 to 40
_____41 to 50 _____51 to 60 _____Above 60

Level of education _____Some High School _____High School Degree
_____Associate's Degree _____Bachelors Degree
_____Masters Degree _____Doctorate Degree
_____Other – Please Specify_____

For the following possible benefits of using the overall Corporate IS (including applications for Information Reporting, Decision Support, and Group Support), please indicate how strongly you agree or disagree with each statement by circling a number.

	Strongly Disagree						Strongly Agree
Using Corporate IS helps me to:							
keep informed on how well I am doing my job.	1	2	3	4	5	6	7
identify strengths and weaknesses in my job performance.	1	2	3	4	5	6	7
easily tell if my job performance is good or bad.	1	2	3	4	5	6	7
gather information on the quality of my work on the job.	1	2	3	4	5	6	7
Using Corporate IS enables me to:							
see exactly how my work contributes to the company's success.	1	2	3	4	5	6	7
have more opportunities to improve company's performance.	1	2	3	4	5	6	7
clearly see positive impact of my job on the company.	1	2	3	4	5	6	7
connect my job responsibilities to the company's performance objectives.	1	2	3	4	5	6	7

By using Corporate IS, I am able to:							
improve the quality of decisions.	1	2	3	4	5	6	7
gather better information for decisions.	1	2	3	4	5	6	7
make decisions faster.	1	2	3	4	5	6	7
analyze more alternatives in decision making.	1	2	3	4	5	6	7

Please estimate the total number of employees in your organization: _____

Years with your organization: ____ Years **Years on your current position:** _____ Years

Your job title: _____

For the following possible benefits of using the overall <u>Corporate IS</u> , please indicate how strongly you agree or disagree with each statement by circling a number. Strongly Disagree							Strongly Agree
Using Corporate IS helps me to:							
communicate more effectively with co-workers.	1	2	3	4	5	6	7
cooperate and collaborate more closely with my colleagues.	1	2	3	4	5	6	7
do team-work better with my colleagues.	1	2	3	4	5	6	7
better integrate my job with others' work in the company.	1	2	3	4	5	6	7
By using Corporate IS with my colleagues, I am able to;							
see how an overall business process works across different units.	1	2	3	4	5	6	7
recognize where the workflow begins and ends in different parts of the organization.	1	2	3	4	5	6	7
understand how an entire piece of work gets accomplished in various units of the organization.	1	2	3	4	5	6	7
visualize how related activities flows through an entire business process from one unit to another.	1	2	3	4	5	6	7
Using Corporate IS helps me to:							
get recognition of my expertise from my colleagues at work.	1	2	3	4	5	6	7
make my colleagues realize the importance of my knowledge and skills.	1	2	3	4	5	6	7
apply my expertise to influence decision making in the company.	1	2	3	4	5	6	7
enhance my professional reputation among my colleagues.	1	2	3	4	5	6	7

Please indicate how strongly you agree or disagree with each statement by circling a number.	Strongly Disagree						Strongly Agree
By using Corporate IS, I am able to:							
take more initiatives with less instruction from supervisors.	1	2	3	4	5	6	7
gain more freedom in carrying out my job responsibilities.	1	2	3	4	5	6	7
reduce the need to always check with my supervisors on what to do.	1	2	3	4	5	6	7
have more discretion in making decisions on my own.	1	2	3	4	5	6	7
Using Corporate IS helps me to:							
come up with new ideas for my job.	1	2	3	4	5	6	7
do new things that are not possible before.	1	2	3	4	5	6	7
identify innovative ways of doing my job.	1	2	3	4	5	6	7
find new ways to improve my job performance.	1	2	3	4	5	6	7
By using Corporate IS, I am able to:							
acquire more complex and higher level skills for my job.	1	2	3	4	5	6	7
obtain skills needed to do a wider variety of things at work.	1	2	3	4	5	6	7
gain more knowledge to do better on my job.	1	2	3	4	5	6	7
develop more competencies in doing my work.	1	2	3	4	5	6	7

Please indicate the Industry of your organization by checking the appropriate blank:

____Manufacturing	____IT/Telecommunications
____Banking/Insurance/Financial Service	____Consulting/Business Service
____Hotel/Entertainment/Service Industry	____Health Care
____Constructions/Architecture/Engineering	____Government, including Military
____Other: Please specify_____	____Education

The following questions are about the overall usefulness of <u>Corporate IS</u>. Please indicate how strongly you agree or disagree with each statement by circling a number.	Strongly Disagree						Strongly Agree
Using Corporate IS on my job;							
enables me to accomplish tasks more quickly.	1	2	3	4	5	6	7
improves my job performance.	1	2	3	4	5	6	7
increases my productivity.	1	2	3	4	5	6	7
enhances my effectiveness on the job.	1	2	3	4	5	6	7
makes it easier to do my job.	1	2	3	4	5	6	7
Overall, I find Corporate IS useful in my job.	1	2	3	4	5	6	7

The following questions are about how you <u>feel</u> about the overall <u>Corporate IS</u>. Please indicate how strongly you agree or disagree with each statement by circling a number.	Strongly Disagree						Strongly Agree
I am contented with Corporate IS.	1	2	3	4	5	6	7
I am pleased with Corporate IS.	1	2	3	4	5	6	7
I have a positive feeling toward Corporate IS.	1	2	3	4	5	6	7
I feel happy with Corporate IS.	1	2	3	4	5	6	7
I feel delighted with Corporate IS.	1	2	3	4	5	6	7
Overall, I am satisfied with Corporate IS.	1	2	3	4	5	6	7

In this space, you may describe the <u>benefits</u> you have experienced using Corporate IS in general or its specific application in information reporting, decision support, and group support.

Thank you for your time and cooperation!

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