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**Extending the Understanding of End User Information Systems Satisfaction Formation
- An Equitable Needs Fulfillment Model Approach**

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3

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9

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Extending the Understanding of End User Information Systems Satisfaction Formation

- An Equitable Needs Fulfillment Model Approach

Abstract

End user satisfaction (EUS) is critical to successful IS implementation. Many EUS studies in the past have attempted to identify the antecedents of EUS, yet most of the relationships found have been criticized for lacking a strong theoretical underpinning. It is generally understood nowadays that IS failure is usually due to psychological and organizational issues rather than technological issues; hence individual differences must be addressed. This study proposes a new model with an objective to extend our understanding of the antecedents of EUS by incorporating three well founded theories of motivation, namely expectation theory, needs theory and equity theory. The uniqueness of the model not only recognizes the three different needs (i.e., work performance, relatedness and self-development) that IS users may have with IS use, but also the corresponding inputs required from each individual to achieve those needs fulfillment, which has been ignored in most previous studies. This input/needs fulfillment ratio, referred to as equitable needs fulfillment, is likely to vary from one individual to another and satisfaction will only result in a user if his/her needs being fulfilled are perceived as “worthy” to obtain.

1 The Partial Least Squares (PLS) method of structural equation modeling was used to analyze
2 922 survey returns collected from the hotel and airline sectors. The results of the study show
3 that IS end users do have different needs. Equitable work performance fulfillment and
4 equitable relatedness fulfillment play a significant role in affecting the satisfaction of end
5 users. The results also indicate that the impact of perceived IS performance expectations on
6 EUS is not significant as most previous studies would have suggested. It is concluded that
7 merely focusing on the technical soundness of the IS and the way in which it benefits
8 employees may not be sufficient. Rather, the input requirements of users for achieving the
9 corresponding needs fulfillments also need to be examined.

10

11 Keywords: User satisfaction; information systems; measurement; equitable needs fulfillment;
12 equity; expectations; IS implementation; PLS

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INTRODUCTION

End-user satisfaction (EUS) is one of the most widely used measures in assessing the success of an IS (Delone and Mclean 1992), and also is particularly critical in IS implementation. Several studies have suggested that IS failures are due to psychological and organizational issues, rather than technological issues (Regan and O'Connor 1994; Garrity and Sanders 1998). One of the main issues in the failure of IS projects is a lack of support and commitment from users (Udo and Guimaraes 1994; Markus and Keil 1994). IS do not independently fulfill the needs of users. They require people to exploit their capabilities before producing organizational benefits. Therefore, in addition to having a sound technical system, it is also necessary to ensure that employees are both willing and able to use the new technology. Several previous studies have discovered that there are strong relationships between user satisfaction and intended use or actual use of IS (Iivari 2005; Athanassopoulos et al. 2001), which can serve as useful predictors of IS implementability (Iivari and Ervasti 1994).

1 To improve EUS, understanding the antecedents of EUS or the factors affecting the formation
2 of user satisfaction is crucial for organizations before, during, and after the implementation of
3 IS. A large amount of research has been carried out in the past that is concerned with factors
4 that influence IS user satisfaction (Bailey and Pearson 1983; Ives et al. 1983; Doll and
5 Torkzadeh 1988). However, the assumption made by many researchers that a technically
6 well-performing IS will automatically lead to higher user satisfaction has not been consistently
7 demonstrated (Goodhue 1995). More importantly, many current measures of user
8 satisfaction have been criticized for lacking a strong theoretical underpinning (Melone 1990;
9 Goodhue 1995; Aladwani 2003). The use of expectancy disconfirmation theory represents a
10 good initial step towards the development of an IS satisfaction theory. Yet, Khalifa and Liu
11 (2004) considered application of expectancy disconfirmation theory in the IS context
12 “questionable”. Indeed, with the dynamic nature of IS development and advancement, it may
13 be difficult for users to articulate accurate expectations of IS performance. In some cases end
14 users may have no prior expectations or are unaware of what IS can offer. Hence, previous
15 models may not have fully captured the real reasons for such differences, nor explained fully
16 the underlying reasons for end-user satisfaction or dissatisfaction with IS use.

17

18 Based on equity (Adams 1965) and needs theories (Alderfer 1969), a new EUS model is
19 proposed. Each individual user’s benefit received (needs fulfilled) is compared against the

1 corresponding input required with IS use. The three equitable needs fulfillments proposed in
2 the new EUS model were conceptually described in Au et al. (2002). This paper is a follow-up
3 study, with the primary objective being to test empirically the key concepts and relationships
4 of the theoretical EUS model that incorporates the three new constructs of equitable work
5 performance fulfillment, equitable relatedness fulfillment, and equitable self-development
6 fulfillment as references for comparison. The secondary objective is to explore their relative
7 impact on EUS. It is believed that the model provides a more comprehensive theoretical
8 framework to investigate the underlying factors affecting EUS. Hence the research question
9 of this study is: "What are the antecedents of IS satisfaction formation under the increasingly
10 advanced and dynamic IS environment?" Such information can help managers identify the
11 strengths and weaknesses of their current IS, which can guide them to plan for more fruitful
12 IS development in the future.

13

14 **BACKGROUND AND RESEARCH MODEL**

15

16 **General Background**

17

18 User satisfaction has continued to be an important topic for IS researchers (Melone 1990;
19 Aladwani 2003; Whitten 2004/05). Yet progress on theoretical development for

1 understanding the way in which EUS was created in the early days seems to be taking place
2 very slowly. A comprehensive review of factors that affected EUS in the past can be found in
3 the studies by Myers (1994), Au et al. (2002), and Shaw et al. (2003). However, not only were
4 most of the relationships found in earlier studies lacking a strong theoretical underpinning as
5 pointed out by Goodhue (1995), contradictory or mixed results have also been reported on
6 the relationships between EUS and different user variables such as user demographic, and
7 user involvement and participation (Ang and Soh 1997; Benard and Satir 1993). On the other
8 hand, technological frames of reference and personality (e.g., self-monitoring, moods, and
9 self-awareness) continue to be popular foci in recent EUS studies (Shaw et al. 2003;
10 Aladwani 2003). Yet not all the personality attributes identified in Aladwani's study have a
11 significant impact on EUS.

12

13 It was not until the early 1990s that new variables such as equity (Joshi 1990; 1992), training
14 method (Simon et al. 1996), task uncertainty (Kim et al. 1998), task complexity (McKeen et al.
15 1994), user source of power (Cho and Kendall 1992), and cognitive ability (Simon et al. 1996)
16 were included in EUS research as factors affecting EUS. In the late 1990s, several
17 researchers started proposing new models such as the "cusp" model (Sethi and King 1998)
18 and task contingent model (Kim et al. 1998). Unlike previous approaches, these models were
19 based on various theories in an attempt to understand the EUS construct. Yet there are still

1 gaps in the ability of these researchers to either generalize their models to embrace broader
2 IS fields under different platforms or to validate their models with actual data. For instance,
3 the “cusp” model assumes a non-linear relationship between IS satisfaction and different
4 IS-related attributes. Yet Sethi and King’s study was conducted with only two control variables
5 (level of involvement and extent of use) based on a relatively small sample of 55 faculty
6 members in a US academic institution. It is doubtful that such a non-linear relationship exists
7 across different sectors under different IS environments. Similarly, in the model of Woodroof
8 and Kasper (1998), it was suggested that for an IS to be considered successful, it must be
9 designed to enhance the user’s process and outcome satisfaction based on equity,
10 expectancy, and needs theories. Although the authors pointed out that any dimension of user
11 affective response could be mapped into the model, it is not yet clear how this would be
12 achieved and operationalized without getting too complicated. In practice, most of the inputs
13 and returns being evaluated are intrinsic and subjective to an individual, so it would be very
14 difficult to know and directly compare the input-return ratios of others. It is also questionable
15 as to why the equity theory merely focuses on the fairness of the process but does not center
16 on the outcome. In addition, the model is yet to be validated with actual data. To address the
17 above issues, a closer examination of what satisfaction is and how the theories of satisfaction
18 can better be applied to the IS environment is needed.

19

1 Landy and Becker (1987) identified three theories of motivation: expectancy theory, needs
2 theory, and equity theory, that use satisfaction as the dependent measure. Indeed, by
3 integrating these three well-founded theories of organizational behavior a big potential to gain
4 more insights into the formation of EUS is possible, which in turn can help IS researchers and
5 practitioners to fill the existing gaps and overcome the deficiencies identified above.

6

7 **Expectancy Theory and Satisfaction**

8

9 Oliver (1997) defined product satisfaction as the consumer's pleasurable level of
10 consumption-related fulfillment response. Fulfillment can only be judged with reference to a
11 standard that forms the basis for comparison; hence, disconfirmed expectation has been
12 widely accepted as one of the key reference standards and determinants of consumer
13 satisfaction (Oliver 1989; Stayman et al. 1992). It is one of the primary theories for explaining
14 satisfaction in the marketing literature (Yi 1990). A number of IS researchers also found that
15 the expectations of IS end users have an impact on their levels of overall satisfaction with IS
16 (Ryker et al. 1997; Bhattacharjee 2001). While contradictory findings have been obtained for
17 the relationships between disconfirmed expectation and user satisfaction (Churchill and
18 Surprenant 1982; Tse and Wilton 1988), it is believed that such a problem is mainly due to
19 the different types of hierarchical expectations (ranging from desired to minimally tolerable)

1 that consumers bring to product experiences during the evaluation process (Spreng and
2 Olshavsky 1992).

4 **Equity Theory and Satisfaction**

6 Equity theory (Adams 1965) has been applied in consumer behavior research as a
7 determinant of transaction or product satisfaction (Oliver and Swan 1989). It has received
8 relatively firm empirical support (Goodman and Friedman 1971; Austin and Walster 1974;
9 Carrel and Dittrich 1978). Equity theory in its most pristine form simply suggests that an
10 individual will feel dissatisfied if his/her own inputs are greater than the benefits achieved,
11 regardless of the benefit-input ratios of other people (Pritchard 1969; Oliver 1980). Such a
12 concept can also be found in Howard and Sheth's (1969) definition of satisfaction as "the
13 buyer's cognitive state of being adequately or inadequately rewarded for the sacrifice he has
14 undergone". According to Adams (1965), input is regarded as what an individual perceives to
15 be his/her contribution to an exchange, for which a just return is expected. In an IS
16 environment, while similar concepts can be found in the studies of Goodhue (1995), Joshi
17 (1989), Mahmood et al. (2000), and Boddy et al. (2002) in predicting satisfaction, the inputs
18 and benefits for IS end users are either not clearly specified or too narrowly defined. For
19 example, Woodrooff and Kasper (1998) and Goodhue (1995) identified only physical effort

and time as the major “inputs” of IS end users with the use of the system.

Needs Theory and Satisfaction

A basic assumption of all the theories of needs is that when deficiencies of a need exist, individuals are motivated to take action to remove them in order to satisfy the need (Steers and Porter 1991). Needs fulfillment has been found to be a significant correlate of satisfaction (Oliver 1995). The needs theory is primarily based on the work of Maslow (1943), Alderfer (1969), Herzberg (1959), and McClelland (1965). One of the major commonalities of these theories is that different types of needs do exist among human beings. It has been argued in consumer behavior research that satisfaction is more likely to be determined by the extent to which product performance fulfills innate needs, rather than the extent to which performance compares with pre-purchase expectations (Sirgy 1984). Hence, the emphasis that an individual places on different categories of needs is critical to predicting satisfaction. Although a number of IS studies have included the concept of meeting the user's needs as part of the measure of an overall user-satisfaction construct (Bailey and Pearson 1983; Goodhue 1998), most, if not all, of them did not consider that IS end users have different types or hierarchical levels of needs. For instance, the well-known technology acceptance model (TAM) focuses mainly on how useful IS are in meeting the end user's job performance-related needs,

1 whereas the “higher level of intrinsic needs” have largely been ignored. Ironically, it is often
2 the unawareness of these “intrinsic” needs, such as social and self-development needs, that
3 has potentially caused a lot of user resistance in IS implementation (Wang, 1997).

4

5 **An Equitable Needs Fulfillment Model**

6

7 In view of the deficiencies in previous approaches, a new model, shown in Figure 1, is
8 proposed by incorporating all three theories of motivation. It is believed that the new model
9 will offer higher explanatory power beyond the current models, and will uncover the
10 psychological processes of end users in transforming IS performance into different levels of
11 satisfaction or dissatisfaction.

12

13 ~ Insert Figure 1 Here ~

14

15 **End User IS Satisfaction**

16 With reference to Oliver (1997) and Doll and Torkzadeh (1988), EUS in this research is
17 defined as the IS end-user’s overall affective and cognitive evaluation of the pleasurable level
18 of consumption-related fulfillment experienced with IS. The output of the comparison
19 evaluation will be the overall EUS construct. Based on expectancy disconfirmation theory,

equity theory, and needs theory, EUS is proposed as a function of IS performance, IS performance expectations, equitable work performance fulfillment, equitable relatedness fulfillment, and equitable self-development fulfillment.

IS Performance

Based on the definitions in Laudon and Laudon (2000), IS in this study is defined as a set of interrelated components that consist of technology, organizational environment, and people who collect, process, store, and distribute information to support decision-making and control in an organization. IS performance is defined as the perceived outcome from IS use. The commonly used IS attributes in many previous studies can be classified into three groups: system quality, information quality, and support services quality (Tafti 1995; Myers et al. 1997). Performance of product attributes is one of the primary standards of comparison by which satisfaction is assessed (Oliver 1997). A number of previous studies have found a relationship between perceived performance and satisfaction (Tse and Wilton 1988; Suh et al. 1994), as in the case for IS (Iuvare 2005; Tan and Lo 1990). Hence, the higher the performance level of an IS, the higher the level of user satisfaction. This is represented by the link H1 in the model:

Hypothesis 1 (H1): Higher levels of IS performance result in higher levels of

EUS.

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2

IS Performance Expectation

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User expectations of IS are defined as “a set of beliefs held by the targeted users of IS

4

associated with the eventual performance of IS and with their performance using the system”

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(Szajna and Scamell 1993). A number of studies have found support for the influence of

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predicted expectations (e.g., beliefs in the likelihood of a given level of performance from the

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existing product) on satisfaction (Swan and Trawick 1980; Tse and Wilton 1988). Other

8

studies on expert systems have found a strong positive correlation between expectations,

9

improved performance, and satisfaction levels too (Yoon and Guimaraes 1995; Mahmood et

10

al. 2000). Due to the limitations of data accessibility (before and after IS use), recalled

11

expectations are often used as a substitute for predicted expectations, as the former are

12

generally believed to be more influential and realistic (Zwick et al. 1995). This means that

13

respondents are likely to have implicitly taken current system performance into account. It

14

also eliminates the need to measure expectation disconfirmation. It is proposed that the

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higher the levels of expectations with regard to IS performance are, the higher the levels of

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satisfaction will be due to the so-called “halo” effect. This leads to the next hypothesis, which

17

is represented by the link H2 in the model:

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Hypothesis 2 (H2): Higher levels of IS performance expectations result in higher levels of EUS.

1

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Equitable Needs Fulfillment

3 In the IS environment, with reference to the ERG needs category set (i.e., existence,
4 relatedness, and growth), it is proposed that IS fulfill three categories of needs of IS end
5 users: work performance fulfillment, relatedness fulfillment, and self-development fulfillment.

6 Alderfer's needs categories are chosen as a basis because the scale developed by Alderfer
7 has received significant convergent and discriminate validity support in an initial study by
8 Alderfer (1972), and received further support by Schneider and Alderfer (1973). It has also
9 been preferred by other researchers for measuring categories of needs (Wanous and Zwany
10 1977; Lussier et al. 2000). The identification of three separate needs fulfillments is likely to
11 reveal more insights and additional information on the way in which various needs affect
12 EUS.

13

14 Work performance fulfillment refers to the user's needs that are fulfilled from using IS at the
15 workplace in carrying out assigned job duties. These are the basic and fundamental needs
16 that IS are expected to fulfill. Typical examples include the improvement of work efficiency,
17 functional effectiveness (Laudon and Laudon 2000; O'Brien 2004), and service quality

(Laudon and Laudon 2000). Relatedness fulfillment includes all the socially oriented needs of the user that require interactions with other human beings. Examples of such needs that are obtained from IS include recognition and status, social relations (Alter 1999), and power and control (Eason 1988; Alter 1999). Finally, self-development fulfillment focuses on the user's higher-order needs, in terms of individual self-growth and self-advancement, that are brought about by using IS in areas such as job promotion, work challenges (Eason 1988), and job security (Rosenberg 1997; Regan and O'Connor 1994).

Significance of the New Approach

An end user's satisfaction with an IS depends not only on the levels of different needs being fulfilled (i.e., benefits received) but also whether the effort (i.e., inputs) required to fulfill each category of those needs is worthy or not. The ratio between benefits and inputs is referred to as "equitable needs fulfillment". The main contribution of the new model is to recognize that a user's rating of the benefits that an IS can bring depends on the amount of effort or input that is required to gain those benefits. Simply asking an end user to give an indication of the level of benefits and inputs independently resulting from IS use such as TAM is unlikely to uncover the underlying reasons for EUS. Using an equity approach forces the user to compare the worth of each benefit gained against the corresponding inputs made in order to gain the benefit. In addition, both the inputs and benefits for IS end users cover a much broader range

1 than those suggested by Goodhue (1995) and Joshi (1990).

2
3 The new approach is also different from the traditional cost-benefit measurement, where the
4 cost-benefit identification is from an organizational perspective, instead of from an individual
5 perspective. Employment is essentially a relationship of exchange. The fact that an individual
6 employee is dissatisfied may simply be because the benefits obtained from an IS, even if they
7 are better than expected, are not fair or worthy of the large inputs required from the user. It is
8 believed that it is the possessing of the benefit-input ratio by an individual that partly explains,
9 as predicted by equity theory, the varied levels of user satisfaction with IS. Such information
10 is certainly useful in providing management with more insights into IS impact during its
11 implementation.

13 **Measurement of Equitable Needs Fulfillment**

14 Many of the negative impacts of the use of IS as identified in the literature are likely to be the
15 inputs or costs incurred by an IS end user. This input refers to what a user may need to invest
16 or sacrifice in using the IS in the hope of obtaining a desirable benefit from it. The input of an
17 individual may include cognitive or intellectual effort in learning to use the IS, or physical effort
18 and time, as identified in the studies of Woodroof and Kasper (1998) and Goodhue (1995).
19 Other possible inputs or negative impacts of the use of IS may consist of extra work load and

1 work stress (Rosenberg 1997; Alter 1999), a reduction in social contact, and a diminishing
2 recognition of non-IT experiences and traditional skills (Regan and O'Connor 1994; Boddy et
3 al. 2002), all of which have been well recognized in the literature. Unlike other product
4 consumers, IS end users rarely have to purchase the system for their use, so financial costs
5 are not normally considered to be an input.

6
7 The benefits are measured in terms of the levels of three different categories of needs
8 fulfillment that result from the use of IS, as identified above. Hence, they are referred to in the
9 model as equitable work performance fulfillment, equitable relatedness fulfillment, and
10 equitable self-development fulfillment. It is believed that when perceived benefits are more
11 than the inputs required (i.e., using the IS generates a needs-fulfillment-to-input ratio of
12 greater than 1), according to equity theory' prediction, it is likely that the user will be satisfied
13 and vice versa (Au et al. 2002). The next three hypotheses, represented by links H3, H4, and
14 H5 in Figure 1, are as follows:

15

Hypothesis 3 (H3): Higher levels of equitable work performance fulfillment result in
higher levels of EUS.

Hypothesis 4 (H4): Higher levels of equitable relatedness fulfillment result in higher
levels of EUS.

Hypothesis 5 (H5): Higher levels of equitable self-development fulfillment results in higher levels of EUS.

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RESEARCH METHODOLOGY

Sampling Design

The population of this study included the hotel and airline industries as representatives of the service sector. The sampling frame for the hotel industry was obtained from the *Hong Kong Hotels Directory* published by the Hong Kong Hotels Association in 2001. A total of 78 member hotels are listed in the directory. The sampling frame for the airline industry was obtained from an internal database compiled by an industry expert. A total of 23 airlines were identified as having a local office in, and travel routes to, Hong Kong. Target departments were restricted to those in which employees frequently need to use IS at work and who also have direct contact with customers. For the hotel industry, typical examples included the front office and food and beverage. For the airline industry, counter check-in, ticketing, and reservations were chosen for this study.

1 A disproportionate stratified sampling technique was adopted in this study, in which a
2 sub-sample is randomly drawn from within each stratum (i.e., department) in the sampling
3 frame. In order to make comparison between different strata meaningful, the percentage of
4 samples drawn from each stratum was higher if the number of participating companies was
5 small, or if the total number in each stratum in proportion to the overall population was small. A
6 letter was initially sent to the general managers or executive directors of the organizations
7 within the sampling frame to solicit their support to participate in the study. Upon their
8 agreeing to participate, they were asked to refer to the researchers the names of the relevant
9 department heads for further contact. A total of 1,950 questionnaires (790 for airlines; 1,160
10 for hotels) were distributed to companies in the two industries. A structured questionnaire was
11 developed based on a review of prior studies and feedback from a focus group interview. The
12 instrument was then refined in a pretest and pilot test.

13

14 **Response Analysis and Sample Characteristics**

15

16 Following the single round of data collection, a total of 922 usable questionnaires were
17 obtained. The response rate from the hotel sector was 61% (i.e., 709) while from the airline
18 sector it was 27% (i.e., 213). The detailed breakdown of the response rates by area for each
19 company is shown in Appendix A. The distributions of position grade and gender between the

1 front office and the food and beverage departments in the hotel sector were rather different.
2 The majority of staff working in the front office were ranked as operational staff (46.9%),
3 followed by supervisory staff (31%), and then by management (19.9%). The distribution of
4 gender was skewed towards females (60.8%). By contrast, the food and beverage
5 department had a relatively higher percentage (51.6%) of employees at the supervisory level,
6 who were mostly male (66.3%). With respect to age of respondents, the front office samples
7 tended to be younger than the food and beverage samples. The majority of the former
8 samples fell in the category of 22-29 years old (50.4%) and 30-39 years old (32.5%), whereas
9 the reverse was the case for the food and beverage department.

10

11 As for the airline sector, the distributions of position grade, gender, and age were similar to
12 those in the front office of the hotel sector. All three sections: reservation, ticketing, and
13 counter check-in, featured a high (68%) to very high (88%) percentage of employees at the
14 operational level. Female employees in the age group of 22 to 39 years were the dominant
15 workers in the airline sector, as is common in the service industry.

16

17

Instrument Development

18

1 Six constructs are measured in this study based on seven-point Likert scales: IS performance,
2 IS performance expectations, equitable work performance fulfillment, equitable relatedness
3 fulfillment, equitable self-development fulfillment, and EUS. Details of all the measures and
4 their sources are listed in Appendix B.

5

6 **IS Performance**

7 Based upon the prior research findings mentioned earlier, and especially upon the often-cited
8 instrument developed by Baroudi and Orlikowski (1988), the major dimensions of IS
9 performance used in this study are information quality, system quality, and system support
10 services. Although system quality was not mentioned in Baroudi and Orlikowski's (1988)
11 measurement, it was, however, included in many other popular instruments such as those of
12 Bailey and Pearson (1983), and Delone and McLean (1992). It has also been suggested by
13 many researchers that EUS is a product of information satisfaction, system satisfaction, and
14 support satisfaction (Tafti 1995). User involvement is omitted from the model as high labor
15 turnover is typical in the service industry, and it is expected that many IS end users have no
16 opportunity to participate in the design of the IS that they use to perform their job functions.
17 However, certain sectors in the service industry such as hotels and airlines feature a
18 piece-meal approach to IS use, whereby many independent IS are used in various individual
19 departments (Ashford et al. 1997). Determining whether the output from the IS is useful to the

1 end user often depends on how it is integrated with other relevant IS in the organization
2 (Kasavana and Smith 1992). Hence, an additional attribute – system integration – is added as
3 one of the items within the dimension of system quality. There are nine items (scales) to
4 measure information quality, six items to measure system quality, and six items to measure
5 system support quality. To simplify the analysis and presentation, summated scales were
6 used to measure each dimension of IS performance, and the resulting three summated
7 scales form the IS performance construct.

8

9

IS Performance Expectations

10 IS performance expectations were measured by asking the respondents to evaluate the
11 quality of IS performance originally expected given their current experience. The
12 measurement items are based on the same 21 IS performance attributes in terms of the three
13 dimensions identified above. The items were all expressed in the first person to ensure that
14 subjects responded based on their own personal feelings and not their opinion of how others
15 feel. Similar approaches were used in Tse and Wilton (1988). Again, to simplify the analysis
16 and presentation, summated scales were used to measure each dimension of the construct
17 of IS performance expectations.

18

19

Equitable Work Performance Fulfillment

1 Equitable work performance fulfillment refers to the ratio of benefits in terms of work
2 performance fulfillment to inputs. Based on equity theory, the more benefits gained in
3 comparison with the inputs required, the higher the ratio will be. Previous measures of equity
4 have typically involved asking respondents to compare benefits and inputs, and to judge
5 whether the deal is a fair one (Joshi 1989; 1990). The measurement of the three kinds of
6 equitable needs fulfillment in this study adopts a similar approach.

7

8 The two benefits of work performance fulfillment are “helping to work more efficiently and
9 effectively” and “helping to improve service quality”. Examples of improving work efficiency
10 and effectiveness may be better decision-making or higher productivity. For inputs, five
11 indicators are identified from the literature: “time required to learn to use the system”,
12 “intellectual skills required to learn to use the system or interpret the information generated”,
13 “work pressure and stress the user faces”, “physical strain the user suffers”, and “gradual
14 reduction in the recognition of the user’s non-IT experiences/skills”. These five inputs are also
15 applied to the measurement of equitable relatedness fulfillment and equitable
16 self-development fulfillment. The respondents were asked to compare each input against
17 each benefit obtained and evaluate whether or not it is fair. This gives a total of ten items for
18 measuring this construct.

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1

Equitable Relatedness Fulfillment

2 Equitable relatedness fulfillment refers to the ratio of benefits in terms of relatedness
3 fulfillment to inputs. The two benefits of relatedness fulfillment are “higher recognition/better
4 relationships and communications with colleagues” and “more power and control over
5 colleagues”. Again, the respondents were asked to compare each input against each benefit
6 obtained and to evaluate whether or not it is fair. This gives a total of ten items for measuring
7 this construct.

8

9

Equitable Self-development Fulfillment

10 Equitable self-development fulfillment refers to the ratio of benefits in terms of
11 self-development fulfillment to inputs. The two benefits of self-development fulfillment are “job
12 security” and “career advancement/meeting new challenges”. Again, the respondents were
13 asked to compare each input against each benefit obtained and to evaluate whether or not it
14 is fair. This gives a total of ten items for measuring this construct.

15

16

End User Satisfaction

17 The use of a single-item measure for EUS has been criticized as unreliable as it is likely to
18 incur a large measuring error (Zviran and Erlich 2003). Other studies using various
19 product-service attributes to operationalize the EUS construct have also created a lot of

1 confusion as these are also commonly regarded as factors affecting EUS, rather than
2 measures of EUS themselves. As defined earlier, overall EUS refers to affective and cognitive
3 evaluation of the entire IS user experience; hence, its measure must take an individual's
4 emotions as well as cognition into consideration. Oliver (1989) suggested that an individual
5 has four possible different adaptive states or response modes: content, pleasure, delight, and
6 relief, for satisfaction. Each response mode is distinguished from the others by the nature of
7 the cognitions, attributions and emotions operating during product consumption. In this study,
8 five items are selected as being relevant to measuring overall EUS: being contented, pleased,
9 delighted, relieved, and satisfied. The measures for overall satisfaction are therefore
10 designed to measure both high- and low-intensity reactions as used by Spreng et al. (1996).

11

12 **Pre-test and Pilot Test**

13 A pre-test of the survey was carried out to improve the face validity of the instrument. A small
14 focus group interview was conducted with ten part-time students who were working either in
15 the hotel or airline industry, and who had over five years' worth of experience in the related
16 industry. Feedback was gathered on the applicability of the items used to measure each
17 construct in the related industry, the layout of the questionnaire, the time required to complete
18 the questionnaire, and the conciseness of the sentence structure and wording used. As a
19 result, one item - "ability of support staff to keep accurate records" - was added to the

1 measure for the support service dimension within the IS performance construct, and five
2 items related to service quality benefits were removed from the equitable work performance
3 construct. In addition, six items related to costs in terms of skills required, physical strain, and
4 non-recognition of non-IT skills were removed from the equitable relatedness fulfillment
5 construct. Finally, four items related to costs in terms of physical strain and time consumption
6 were removed from the equitable self-development fulfillment construct. The reasons for the
7 removal of each of these items are detailed in Appendix C.

8

9 A pilot test was conducted using the improved survey instrument that resulted from the
10 pre-test to assess the validity and reliability of the instrument before the questionnaire was
11 distributed to the chosen samples in the field. To establish content validity, a convenience
12 sample of 65 questionnaires was distributed to part-time students working in either the hotel
13 or airline industry, and to the departments within the sampling frame. To assess the reliability
14 of the measures, Cronbach's alpha coefficient was used. To further validate the scale items,
15 an exploratory factor analysis (EFA) with a principal component method was conducted for
16 each construct and sub-construct to establish unidimensionality. To determine the
17 appropriateness of performing the factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of
18 sampling adequacy was calculated, and the Barlett's test of sphericity was conducted. All the
19 items with a poor factor loading (<0.70) were removed from further analysis. The results are

1 summarized in Appendix D and the finalized items contained in the instrument are shown in
2 Appendix E.

3

4

DATA ANALYSIS AND RESULTS

5

6

Measurement Model Assessment

7

8 The research model was tested using the partial least squares (PLS) method of structural
9 equation modelling (PLS-Graph version 3) in view of PLS method's ability to handle formative
10 constructs and highly complex predictive models. Unlike reflective indicators, whereby the
11 latent variable causes the observed variables, formative indicators can be viewed "as causing
12 rather than being caused by the latent variable measured by the indicators" (Diamantopoulos,
13 1999). The acceptability of the measurement model was assessed by the reliability of
14 individual items, internal consistency between items, and the model's convergent and
15 discriminant validity. Items that share a high degree of residual variance with other items
16 were eliminated from further analysis (Gefen et al. 2000; Gerbing and Anderson 1988). Table
17 1 shows the composite reliability, average variance extracted (AVE), and square root of the
18 AVE, as well as the correlations between the constructs. The composite reliability values of
19 all the constructs were above the recommended level of 0.70, indicating adequate internal

1 consistency (Bagozzi and Yi 1988). Convergent validity is demonstrated as the AVE values
2 for all constructs were higher than the suggested threshold value of 0.50 (Fornell and Larcker
3 1981). Comparing the square root of the AVE (bold figures on the diagonal) with the
4 correlations among the constructs indicates that each construct is more closely related to its
5 own measures than to those of other constructs, and discriminant validity was therefore
6 supported (Chin 1998).

7

8 ~ Insert Table 1 Here ~

9

10 The weights (for formative items), loadings (for reflective items) and their t-values are shown
11 in Table 2. Unlike reflective items (i.e. items caused by a latent construct), for formative items
12 (i.e. items themselves causing a latent construct) only the weights rather than the loadings
13 need to be considered in assessing the measurement model (Chin 1998). It can be seen that
14 the loadings for all the constructs with reflective measures were well above the 0.70 guideline
15 and statistically significant at the 0.01 level (Hair et al. 1998). Similarly, the weights for the
16 formative measures were also statistically significant at the 0.01 level, indicating satisfactory
17 item reliability for both the reflective and formative measures.

18

19 ~ Insert Table 2 Here ~

Structural Model Assessment and Hypothesis Testing

Figure 2 presents a graphical depiction of the PLS results, which shows the standardized path coefficients among the constructs using the bootstrap resampling method and the R^2 value for EUS. As hypothesized, IS performance is positively correlated with EUS, with a path coefficient of 0.45 and a significant t-value of 13.12 at the 0.05 level of significance. Hypothesis H1 was therefore supported. The paths from equitable work performance fulfillment (H3) and equitable relatedness fulfillment (H4) to EUS were also found to be positive and significant, with path coefficients of 0.19 ($t = 3.40$) and 0.17 ($t = 3.51$) at the 0.05 level of significance, respectively. Hypotheses H3 and H4 were also supported. These constructs explained over half (53.5%) of the variance of EUS.

Against expectations, IS performance expectations and equitable self-development fulfillment have no significant effects (with $t = 1.39$ and $t = 1.71$, respectively) on EUS as shown by the two dotted lines. Hypotheses H2 and H5 were therefore not supported. To gain further insight into the possibility of interaction effect of IS performance expectations on the IS performance/EUS relationship, an interaction score was computed by multiplying the scores for IS performance and IS performance expectations. The results give a standardized

1 path coefficient of 0.435 from IS performance to EUS, -0.013 from IS performance
2 expectations to EUS, and an insignificant interaction effect of 0.059 ($t = 1.5475$) with a total
3 R^2 of 0.538. Hence there was insufficient evidence of a moderating influence of IS
4 performance expectations on the relationship between IS performance and EUS.

5
6 An additional analysis was also performed in order to highlight the significant impact of the three
7 equitable needs fulfillment constructs on EUS. This was done by comparing the amount of
8 variance explained between the full and the reduced models (i.e., removing all the equitable
9 needs fulfillment constructs) using the F-test. The resulting f^2 value was 0.202. Cohen (1988)
10 suggested that the values of 0.02, 0.15, and 0.35 be used as operational definitions of small,
11 medium and large effect sizes, respectively. This provides further reinforcement that the
12 inclusion of the three equitable needs fulfillment constructs as antecedents of EUS has in fact
13 enhanced our understanding of the factors that drive EUS.

14
15 Data analysis using the PLS method was also performed by sub-industry. It was found that there
16 was little difference in the model fit. The total variance (R^2) of EUS for the hotel industry
17 explained by the five constructs was 53.6%, whereas for the airline industry it was 56.8%,
18 compared with the combined impact of 53.5% in the original full model. In terms of hypothesis
19 testing results, they were almost the same as the original model except for H4 in the airline

1 industry, where there was no significant impact of equitable relatedness fulfillment on EUS.

2

3

DISCUSSION

4

5 This study seeks to provide a theoretical framework to investigate the antecedents of EUS
6 formation. In particular, the main objective is to identify the impact of perceived IS
7 performance, IS performance expectations, equitable work performance fulfillment, equitable
8 relatedness fulfillment, and equitable self-development fulfillment on EUS.

9

10 The results of the study indicate that perceived IS performance is the most significant
11 determining factor of EUS, with a standardized coefficient of 0.45 (H1). This is consistent with
12 previous research findings (Swan and Trawick 1980; Suh et al. 1994) and implies that
13 product performance as perceived by end users is still the core determinant of satisfaction.
14 Nevertheless, equitable work performance fulfillment and equitable relatedness fulfillment do
15 play a significant role in directly affecting satisfaction (H3 and H4), with standardized
16 coefficients of 0.19 and 0.17, respectively. Hence there is evidence to suggest that both
17 constructs have more or less equal impact in affecting users' levels of satisfaction.

18

1 In contrast, the absence of a direct significant impact of equitable self-development fulfillment
2 on EUS (H5) could be explained by two reasons. First, the application of IS in the service
3 industry still mainly focuses on operational work. The scope of IS use is therefore likely to be
4 routine-based. Hence, those employees who have the opportunity to seek greater challenges
5 from IS are likely to be in the minority. Second, as IS are mainly used for routine operational
6 work, employees can quickly get acquainted with the required technical skills. To relate job
7 security or career advancement to an individual's exceptionally poor or outstanding IT
8 performance would be difficult, and therefore equitable self-development fulfillment is not
9 significantly linked to EUS. If this model is applied to higher level strategic IS in other
10 industries, it is likely that such an impact would be more significant.

11

12 Similarly, both the direct (H2) and moderating effects of IS performance expectations on EUS
13 were found to be insignificant, suggesting that the expectations of end users are not a
14 dominating factor that influences EUS, as documented in many previous studies. In the hotel
15 industry in Hong Kong, the majority of the hotels use the same handful of off-the-shelf
16 software packages, so it is likely that the IS users in hotels have had experience in using the
17 software before. The lengthy timeframe may have caused users' recollection of their
18 expectations to decay, which could diminish the impact of expectations on satisfaction, as
19 found in the study of Droge and Halstead (1991). Hence expectations may be important for

1 EUS only in the early IS adoption stage, but this may not be the case for experienced users
2 when the IS has been implemented for some time.
3
4 Caution needs to be exercised with the results from the airline industry, as the responses
5 mainly came from three airlines, two of which use the same information system. Similar to the
6 hotel sector, their expectations of IS performance may decay over time. Due to the complex
7 nature of their operations, most airline information systems are specifically developed for the
8 exclusive use of the airline, and have special features and functions. Users, especially new
9 employees, may not know for sure what level of performance to expect from an IS. As long as
10 the IS can perform the tasks that it is designed to accomplish, user satisfaction is likely to be
11 dependent on how well the IS meets users' needs, rather than on how well it meets their
12 expectations.

13

14 **Theoretical Implications**

15 This study provides a number of unique contributions to EUS research. First, it provides
16 empirical support for a new approach to understanding the antecedents of EUS formation by
17 incorporating three additional comparison referents: equitable work performance fulfillment,
18 equitable relatedness fulfillment, and equitable self-development fulfillment. The major
19 implication of successfully applying equity theory by focusing on the individual benefit-input

1 ratio in this study is that it demonstrates that IS users' needs are fulfilled at a cost (tangible
2 and intangible), which has been overlooked in past research. This study gives evidence to
3 suggest that when users feel that their input requirements are unfair or far outweigh the
4 benefits gained from the use of IS, dissatisfaction is likely to occur. The identification of the
5 various inputs involved in the fulfillment of different types of needs helps to uncover the
6 complex relationships between perceived IS performance and EUS. Through the examination
7 of the results of the individual item of each equitable needs fulfillment construct, a better
8 picture of the underlying causes for user satisfaction or dissatisfaction with an IS emerge. It
9 also points to another worthwhile direction for future research in identifying other possible
10 types of users' inputs that are applicable only to certain IS in specific industries. For example,
11 a web-based (networked) strategic IS enables senior managers to monitor business and
12 communicate with employees, as well as external business partners anywhere outside their
13 normal work place. Creativity, flexibility and self-discipline are likely the crucial inputs required
14 of senior managers in realizing significant business values from such an IS.

15

16 Second, the results of various reliability and validity tests provide evidence to support the
17 notion that work performance needs, relatedness needs, and self-development needs are
18 three distinct constructs, and that IS end users do have different needs related to IS use.
19 Although it was found that equitable self-development fulfillment has no direct impact on EUS,

1 whether it has any indirect impact mediated through other variables is yet to be found out.
2 This may help to partly explain why a higher level of user evaluation of IS performance has
3 not always resulted in a high level of user satisfaction in previous studies.
4
5 Finally, contrary to previous findings, it is found that IS performance expectations have no
6 significant relationship with user satisfaction, nor do they have any moderating effect on the
7 relationship between IS performance and EUS. This highlights the potential importance of
8 taking the equitable needs fulfillment approach to “predict” EUS, particularly for evaluating
9 current IS where long-serving users’ expectations of IS performance have “faded away”.
10 Using the duration of IS usage as a control variable would be interesting to explore in future
11 studies. As new technologies often emerge with new features and capabilities, the
12 manipulation of user expectations of IS performance alone perhaps may not be an effective
13 way to enhance EUS.

14

15 **Managerial Implications**

16 The findings of this study reveal that IS performance is the most critical factor affecting EUS.
17 Therefore managers need first of all to ensure that an IS is technically sound, with a good
18 support service provided to end users. In realizing that equitable work performance fulfillment
19 and equitable relatedness fulfillment are two other factors that significantly affect EUS,

1 managers need to ensure an IS has the needed functions to fulfill the work performance
2 needs of the employees, as well as be aware of the importance of workers' social interaction
3 needs at work brought about by IS use.

4

5 Yet the results also reveal that human nature dictates, and employees in general accord, a
6 higher priority to their own interests when it comes to the use of IS. If managers would like to
7 ensure EUS in their organizations, then they need to address the issues from the employees'
8 points of view by examining their benefit-input ratios, rather than simply focusing on the
9 technical performance of IS. One major contribution of the application of equity theory in the
10 model, in addition to needs theory, is that it emphasizes the fact that an IS that benefits
11 employees is not enough to achieve user satisfaction. Technically advanced IS can only be
12 desirable if employees equally perceive that the IS can actually help them at work, and more
13 importantly, at a cost that is worthwhile for them to achieve those benefits. The following is an
14 example to demonstrate how this could be the case. A feasibility study was undertaken by a
15 large Canadian financial services company to examine the degree of employee resistance to
16 the implementation of telework in its web-based IS for its sales and customer service
17 operations (Wicks, 2002). The results indicated that while employees generally believed it
18 would bring improved performance (work performance fulfillment) due to fewer distractions by
19 working remotely, significant relationships were also found between social isolation

1 (relatedness fulfillment) and unwillingness to telework. Most employees also indicated
2 telework inhibited their promotional opportunities (self-development fulfillment) due to less
3 contact with their superiors. With such insights, managers thus can examine these complex
4 relationships for each individual in ensuring the successful implementation of new
5 technologies.

6
7 In addition, resistance from users may simply be due to a small benefit-input ratio (less than
8 1), which is a relative concept. This may vary not only from one individual to another, but also
9 may vary depending on what benefits are obtained in return. For instance, the benefit-input
10 ratio is likely to be high for employees with sound IT skills when learning advanced software
11 at work, rather than for those who are less experienced and require more effort. On the other
12 hand, an employee may regard the effort spent in using an e-mail system as worthwhile as it
13 allows him/her to communicate with other colleagues much easier, but not so worthwhile as
14 this creates extra workload resulting from handling many irrelevant e-mails. Hence an
15 examination of the input requirements of individual employees will reveal the inputs required
16 from users in achieving the benefits, which in turn can shed light on the hidden cause for
17 dissatisfaction (e.g., e-mail in this case).

18

19 This has important implications for managers, in terms of determining the appropriate levels

1 or inter-changeability of inputs and benefits so as to manipulate the benefit-input ratios of IS
2 end users. The common inputs required of users to fulfill the various needs identified in this
3 study are the time and skills needed to learn to use the system and the work pressure and
4 stress they face. Managers can ensure EUS by minimizing the corresponding input
5 requirements or by making the benefits more valuable in the user's mind.

7 **LIMITATIONS OF STUDY**

9 The nature of the samples and the selected sampling frame in this study impose several
10 limitations. One limitation of the study is that the focus is on front-line departments in the hotel
11 and airline sectors. This means that only IS used by front-line employees who are mainly at
12 operational levels in these two sectors are addressed. If the survey were expanded to include
13 IS end users in other departments in the back office, as well as in other types of industries,
14 then, due to the differences in the nature of their work and in the role of their IS, the levels of
15 influence of IS performance, performance expectations, and equitable needs fulfillment of
16 EUS might be different. Similarly, if the focus is restricted only to managerial employees using
17 a higher level strategic IS, then their needs priorities are likely to be different from operational
18 employees, as are their benefit-input ratios of IS use. This might offer a partial reason why
19 equitable self-development was found to have no significant impact on EUS in the current

1 study.

2

3 Another limitation is that other variables that might affect the constructs such as internal and
4 external communications and users' backgrounds were excluded from the boundary set for
5 the analysis of the proposed EUS model. In terms of the study of down-stream chains, no
6 attempt was made to link satisfaction with other behavioral actions such as improvement in
7 performance. Future studies may therefore expand the boundaries of the analysis to other
8 sectors and include the variables mentioned above. It is worth conducting a future study to
9 examine the types of performance-related behavior that might be linked to EUS in specific
10 industries, and to consider how these could be measured and carried out.

11

12

13 **CONCLUSION**

14

15 The model presented in this study provides a broad conceptual framework with a strong
16 theoretical platform that helps enhance our understanding of the antecedents of EUS
17 formation. As mentioned earlier, the findings have significant contributions both to theoretical
18 development related to EUS formation and managing IS users before, during, and after IS
19 implementation. The results uncover the underlying factors that affect EUS in addition to IS

1 performance and expectations and, more importantly, their relative impacts. The application
2 of needs theory and equity theory also allow us to appreciate that IS users have different
3 needs with IS, and that it is in fact the individual evaluation of the “worthiness” of inputs
4 required to achieve different needs fulfillments that partly explains EUS variations. Such
5 insight of various input/needs fulfillment relationships of each individual should be of benefit
6 to an industry in developing more effective strategies to enhance EUS in the future.

7
8 It is clear that the recognition of the “inputs” side in achieving different levels of IS users’
9 needs represents an important initial step on which future research in EUS can build. Though
10 the category of needs with IS use will remain the same for individuals, it is likely that
11 “fine-tuning” may be required for certain industries where specific “inputs” are needed. Such
12 “inputs” may be intangible and hidden in nature, which could well be the underlying reasons
13 for subsequent behaviors towards IS implementation such as resistance to change. This will
14 shed some light on research in the “downstream” link in a causal chain explaining the
15 behavior affected by EUS. Organizations are to benefit most as studies in downstream
16 activities (i.e., employees’ behaviors) will bring greater practical implications and have a
17 direct impact on resulting profits and repeat business.

Table 1 – Inter-Construct Correlations: Consistency and Reliability Tests

Construct	Composite Reliability	*AVE	IS_Per	IS_Exp	Equ_Re	Equ_Sd	Equ_Wp	EUS
IS_Per	0.929	0.813	0.902¹					
IS_Exp	0.967	0.907	0.480	0.952				
Equ_Re	0.892	0.734	0.505	0.274	0.857			
Equ_Sd	0.900	0.692	0.542	0.296	0.726	0.832		
Equ_Wp	0.870	0.627	0.583	0.328	0.679	0.745	0.792	
EUS	0.925	0.804	0.664	0.304	0.564	0.567	0.604	0.897

¹ The shaded numbers on the diagonal are the square root of the variance shared between the constructs and their measures. Off-diagonal elements are correlations among constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements.

* Average Variance Extracted

Table 2 - Weights, Loadings, and t-statistics for the Full Model

Construct	Measurement Item			
IS Performance (Reflective)		Weight	Loading	T-statistics
inf	Information quality		0.912	41.973*
sys	System quality		0.934	51.189*
sup	System support service quality		0.857	27.241*
IS Performance Expectations (Reflective)				
exp_inf	Information quality expectations		0.950	29.852*
exp_sys	System quality expectations		0.959	32.730*
exp_sup	System support service quality expectations		0.949	29.372*
Equitable Work Performance Fulfillment (Formative)				
wp_time1	Helps me to work more efficiently and effectively vs. the time required to learn to use the software/system	0.384		6.099*
wp_skil1	Helps me to work more efficiently and effectively vs. the intellectual skills required to learn to use the software/system and interpret the information generated	0.323		4.891*
wp_stre1	Helps me to work more efficiently and effectively vs. the level of work pressure and stress faced	0.331		4.893*
wp_nit1	Helps me to work more efficiently and effectively vs. the gradual reduction in the recognition of non-IT experiences and skills at work	0.216		3.460*
Equitable Relatedness Fulfillment (Formative)				
re_stre1	To have higher recognition and better relationships/communication with colleagues at work vs. the level of work pressure and stress faced	0.445		6.937*
re_time2	To have more power and control vs. the time			

	required to learn to use the software/system	0.475		7.480*
re_stre2	To have more power and control vs. the level of work pressure and stress faced	0.242		3.239*
Equitable Self-development Fulfillment (Formative)				
sd_skil1	Allows me to secure my job vs. the intellectual skills required to learn to use the software/system and interpret the information generated	0.376		4.849*
sd_stre1	Allows me to secure my job vs. level of work pressure and stress faced	0.234		3.504*
sd_nit1	Allows me to secure my job vs. the gradual reduction in the recognition of non-IT experiences and skills at work	0.198		2.649*
sd_skil2	Opportunity for career advancement and meeting new challenges at work vs. the intellectual skills required to learn to use the software/system and interpret the information generated	0.382		5.708*
EUS (Reflective)				
contented	I am very contented with the information system		0.877	41.541*
delighted	I am delighted with the information system		0.917	46.431*
satisfied	Overall, I am very satisfied with the information system		0.896	43.360*

* Significant at .01 level

Figure 1 – An Equitable Needs Fulfillment Model

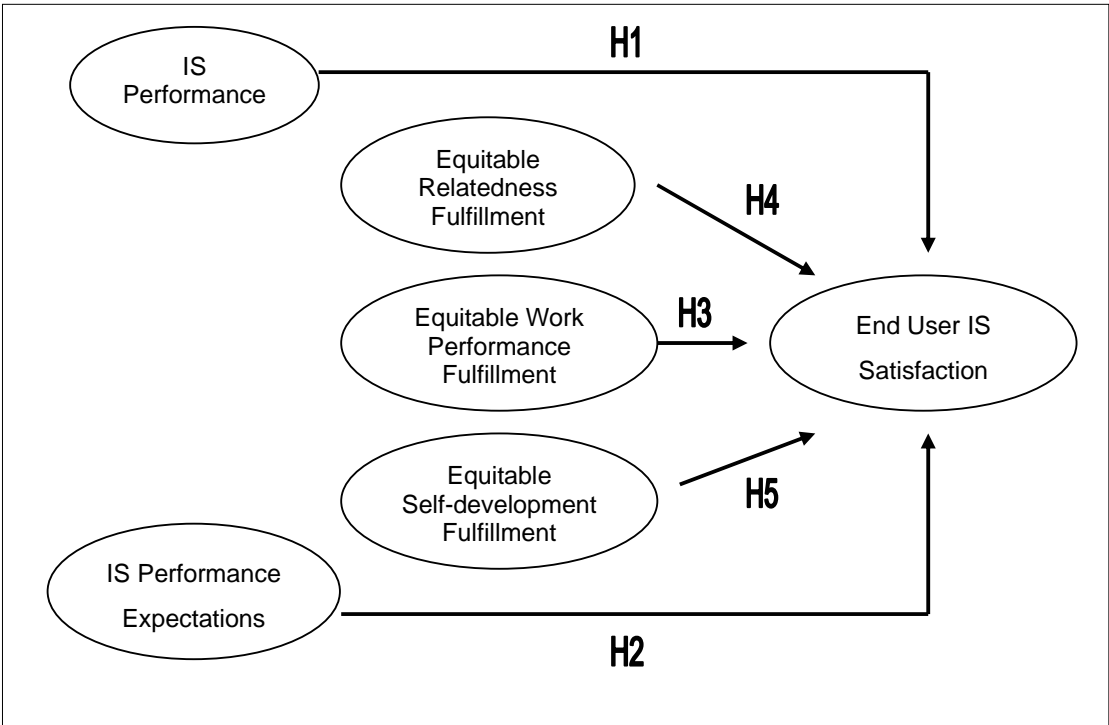
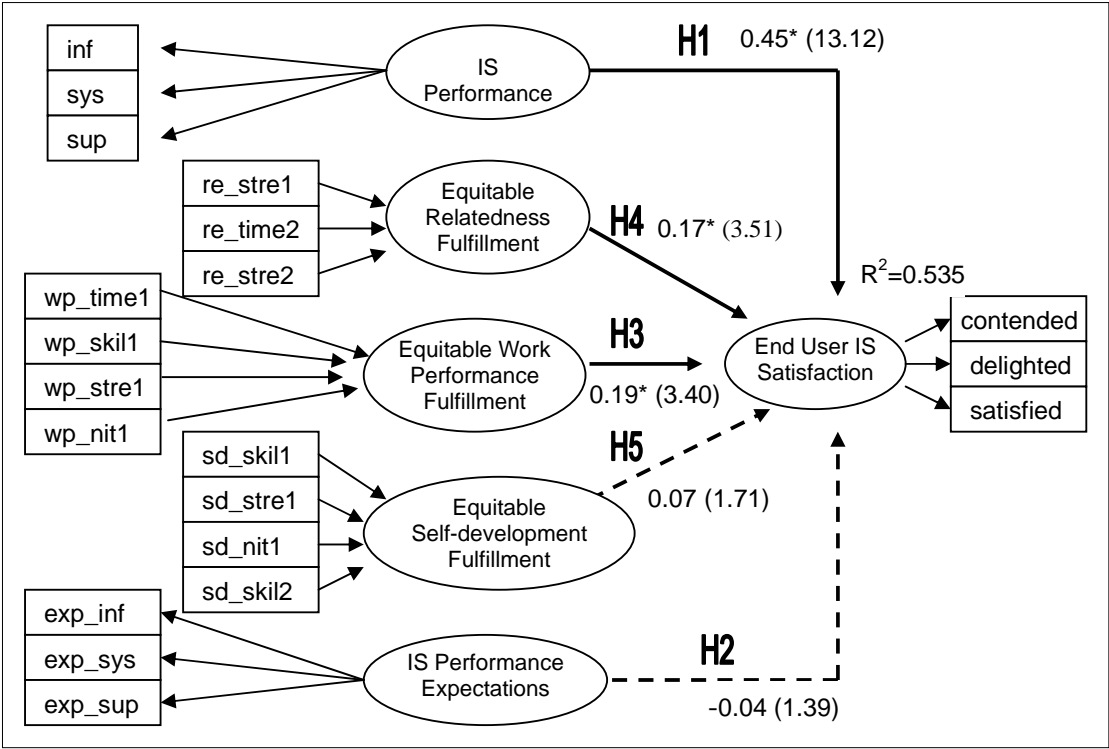


Figure 2 – Results



*Significant at .05 level

Path coefficients with t-values in parentheses

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Appendix A – Breakdown Response Rates by Areas for Hotel and Airlines Sector

	Department for hotel		Total	% of Total
	Front office	Food and Beverage		
Charterhouse Hotel	8	5	13	1.8%
Excelsior Hotel	33	11	44	6.2%
Grand Hyatt Hong Kong Hotel	19	4	23	3.2%
Grand Stanford Inter-Continental Hotel	16	0	16	2.3%
Great Eagle Hotel	23	14	37	5.2%
Harbour Plaza Hotel	21	29	50	7.1%
Harbour View International House	15	0	15	2.1%
Hyatt Regency Hong Kong Hotel	9	1	10	1.4%
Island Shangri-La Hotel	12	28	40	5.6%
JW Marriott Hong Kong Hotel	25	36	61	8.6%
Kowloon Shangri-La Hotel	15	26	41	5.8%
Mandarin Oriental Hotel	10	12	22	3.1%
Miramar Hotel	17	23	40	5.6%
New World Renaissance Hotel	0	10	10	1.4%
Newton Hotel Hong Kong	7	0	7	1.0%
Nikko Hong Kong Hotel	20	10	30	4.2%
Novotel Century Harbourview Hotel	4	2	6	0.8%
Novotel Century Hong Kong Hotel	10	11	21	3.0%
Regal Airport Hotel	19	27	46	6.5%
Regal Kowloon Hotel	21	19	40	5.6%
Royal Pacific Hotel & Towers	29	7	36	5.1%
Royal Park Hotel	12	2	14	2.0%
Sheraton Hongkong Hotel & Towers	22	5	27	3.8%
The Emperor (Happy Valley) Hotel	1	4	5	0.7%
The Park Lane Hong Kong Hotel	21	15	36	5.1%
The Peninsula	7	5	12	1.7%
Windsor Hotel	7	0	7	1.0%

	Functional area for airline			Total	% of Total
	Reservation	Ticketing	Counter		
Cathay Pacific Airways Ltd	66	35	43	144	67.6%
Dragonair	25	5	0	30	14.1%
United Airlines	12	11	16	39	18.3%

Appendix B – Sources of References for Information Quality, System Quality, and System Support Quality

Information Quality

Item	Source
Accuracy	Bailey and Pearson (1983); Ives, et al. (1983); Baroudi and Orlikowski (1988); Doll and Torkzadeh (1988); DeLone and McLean (1992); Goodhue and Thompson (1995)
Availability	Miller and Doyle, 1987.
Reliability	Bailey and Pearson (1983); Ives, et al. (1983); Baroudi and Orlikowski (1988); DeLone and McLean (1992); Saarinen (1996).
Updatedness	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle, 1987; DeLone and McLean (1992).
Relevance	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle, 1987; Baroudi and Orlikowski (1988); DeLone and McLean (1992); Saarinen (1996).
Timeliness	Bailey and Pearson (1983); Ives, et al. (1983); DeLone and McLean (1992); Doll and Torkzadeh (1988); Goodhue and Thompson (1995).
Completeness	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle, 1987; Baroudi and Orlikowski (1988); Doll and Torkzadeh (1988); Saarinen, 1996;
Presentation	Doll and Torkzadeh (1988); DeLone and McLean (1992); Saarinen (1996).
Accessibility	Ives, et al. (1983); Miller and Doyle, 1987; Doll and Torkzadeh (1988); Goodhue and Thompson (1995).

System Quality

Item	Source
Response Time	Bailey and Pearson (1983); DeLone and McLean (1992)
Reliability	Bailey and Pearson (1983); DeLone and McLean (1992).
Functionality	DeLone and McLean (1992); Miller and Doyle (1987).
Flexibility	Bailey and Pearson (1983); Ives, et al. (1983); DeLone and McLean (1992).
User Friendliness	Ives, et al. (1983); Doll and Torkzadeh (1988); DeLone and McLean (1992).
Ease of Integration	Bailey and Pearson (1983); Ives, et al. (1983); DeLone and McLean (1992); Goodhue and Thompson (1995)

System Support Quality

Item	Source
Promptness	Bailey and Pearson (1983); Miller and Doyle, 1987; Kettinger and Lee (1994).
Reliability	Kettinger and Lee (1994); Pitt et al. (1995).
Responsiveness	Bailey and Pearson (1983); Kettinger and Lee (1994).
Technical Competence	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle (1987).
Attitude	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle (1987); Baroudi and Orlikowski (1988); Doll et al. (1995).
Keeps Accurate Records	Focus group
Provision of Training Course	Bailey and Pearson (1983); Ives, et al. (1983); Miller and Doyle (1987); Baroudi and Orlikowski (1988);

Equitable Needs Fulfillment Inputs

Item	Source
Time required to learn to use the system	Regan and O'Connor (1994); Joshi (1989; 1990).
Intellectual skills required to learn to use the system and interpret the information generated	Zuboff (1988); Regan and O'Connor (1994); Rosenberg (1997).
Work pressure and stress	Rosenberg (1997); Alter (1999).
Physical strain	Eason, 1988; Regan and O'Connor, 1994; Rosenberg (1997).
Gradual reduction in the recognition of user's non-IT experiences/skills	Regan and O'Connor, 1994; Boddy et al. (2002).

Work Performance Fulfillment (benefit)

Item	Source
Helps me to work more efficiently and effectively	O'Brien (2004); Laudon and Laudon (2000).
Helps me to improve service quality	Laudon and Laudon (2000); Regan and O'Connor (1994).

Relatedness Fulfillment (benefit)

Item	Source
Higher recognition / better relationships and communications with colleagues	Alter, 1999.
More power and control over colleagues	Eason (1988); Alter (1999).

Self-development Fulfillment (benefit)

Item	Source
Job security	Rosenberg (1997); Regan and O'Connor (1994).
Career advancement / meeting new challenges	Eason (1988).

End User IS Satisfaction

Item	Source
Contented	Oliver (1997); Spreng et al. (1996).
Pleased	Oliver, 1997; Spreng et al. (1996).
Delighted	Oliver (1997); Spreng et al. (1996).
Relieved	Oliver (1997).
Very satisfied	Oliver (1997); Spreng et al. (1996); Kim, Suh and Lee (1998).

Appendix C – Summary of Items Added/Removed from the Pre-test

Construct/Item	Result	Reasons
<i>IS-performance – Support Services</i>		
Ability of support staff to keep accurate records	added	As the IS of most airline and hotel companies contain databases that store valuable customer data, it was suggested whether IS staff can keep accurate records of customers is one of the important criteria for evaluating the performance of IS support services
<i>Equitable Work Performance Fulfillment</i>		
Compare the input of “time required to learn to use the system” against the benefit of “improved service quality”	Removed	Most of the respondents agreed that the “primary” objective and benefit of using an information system in an organization is to enhance work performance through the improvement of operational efficiency and functional effectiveness. However, they believed that service quality in a hotel can only be improved by employees, and hence it is not necessarily a direct benefit brought about by an information system
Compare the input of “intellectual skills required to learn to use the system and interpret the information generated” against the benefit of “improved service quality”	Removed	
Compare the input of “work pressure and stress” against the benefit of “improved service quality”	Removed	
Compare the input of “physical strain” against the benefit of “improved service quality”	Removed	
Compare the input of “gradual reduction in the recognition of user’s non-IT experiences/skills” against the benefit of “improved service quality”	Removed	
<i>Equitable Relatedness Fulfillment</i>		
Compare the input of “physical strain” against the benefit of obtaining “higher recognition / better relationships and communications with colleagues”	Removed	The respondents did not feel that physical strain was a major input/cost that they had to bear in achieving better relationship or more control over colleagues through IS usage, even though the use of IS for the improvement of work efficiency means that a system will be used for a longer period during the operation
Compare the input of “physical strain” against the benefit of obtaining “more power and control over colleagues”	Removed	
Compare the input of “intellectual skills required to learn to use the system and interpret the information generated” against the benefit of obtaining “higher recognition / better relationships and communications with colleagues”	Removed	The respondents believed that those who aim to achieve higher recognition and better relationships with their colleagues with their proficiency in IT knowledge are likely to be relatively skillful in using the system, and the skill required to learn the system would hardly be a major cost to them
Compare the input of “intellectual skills required to learn to use the system and interpret the information generated” against the benefit of obtaining “more power and control over colleagues”	Removed	
Compare the input of “gradual reduction in the recognition of user’s non-IT experiences/skills physical strain” against the benefit of obtaining “higher recognition / better relationships and communications with colleagues”	Removed	The respondents believed that those who aim to achieve higher recognition and better relationships with their colleagues with their proficiency in IT knowledge would be unlikely to think that the non-recognition of their non-IT skills is a major concern
Compare the input of “gradual reduction in the recognition of user’s non-IT experiences/skills” against the benefit of obtaining “more power and control over colleagues”	Removed	

<i>Equitable Self-development Fulfillment</i>		
Compare the input of “physical strain” against the benefit of obtaining “Job security”	Removed	The respondents did not feel that physical strain was a major input/cost that they had to bear in achieving job security or career advancement through IS usage
Compare the input of “physical strain” against the benefit of obtaining “Career advancement / meeting new challenges”	Removed	
Compare the input of “time required to learn to use the system” against the benefit of “obtaining “Job security”	Removed	The respondents believed that those who are looking for more challenges and career advancements would normally not regard spending more time playing with a system to be a cost or sacrifice at all
Compare the input of “time required to learn to use the system” against the benefit of “Career advancement / meeting new challenges”	Removed	

Appendix D - Summary of factor analysis results from the pilot test

Construct /sub-construct	No. of Items	Reliability coefficient	Eigenvalue	Variance explained	KMO	Bartlett's test
Information Quality	9	0.948	6.388	70.978	0.939	0.000
System Quality	6	0.922	4.347	72.445	0.889	0.000
System Support Service Quality	6 (after 1 item was dropped)	0.917	4.649	66.408	0.871	0.000
Information Quality Expectation	9	0.951	6.505	72.274	0.908	0.000
System Quality Expectation	5 (after 1 item was dropped)	0.960	4.584	76.404	0.867	0.000
System Support Service Quality Expectation	7	0.943	5.679	89.29	0.940	0.000
Equitable Work Performance Fulfillment	5	0.841	3.190	63.799	0.861	0.000
Equitable Relatedness Fulfillment	4	0.943	3.420	85.501	0.851	0.000
Equitable Self-development Fulfillment	6	0.883	4.010	66.833	0.765	0.000
EUS	4 (after 1 item was dropped)	0.961	3.872	77.448	0.868	0.000

KMO: Kaiser-Meyer-Olkin

Appendix E

Measurement of Expected and Actual Information Systems Performance

	Information Quality	<div>Very Low<div>←</div>Neutral<div>→</div>Very High</div>						
1a	The quality of information <i>accuracy</i> originally expected was	①	②	③	④	⑤	⑥	⑦
1b	The quality of information <i>accuracy</i> experienced was	①	②	③	④	⑤	⑥	⑦
2a	The quality of information <i>availability</i> originally expected was	①	②	③	④	⑤	⑥	⑦
2b	The quality of information <i>availability</i> experienced was	①	②	③	④	⑤	⑥	⑦
3a	The quality of information <i>reliability</i> originally expected was	①	②	③	④	⑤	⑥	⑦
3b	The quality of information <i>reliability</i> experienced was	①	②	③	④	⑤	⑥	⑦
4a	The quality of information <i>updatedness</i> originally expected was	①	②	③	④	⑤	⑥	⑦
4b	The quality of information <i>updatedness</i> experienced was	①	②	③	④	⑤	⑥	⑦
5a	The quality of information <i>relevance</i> originally expected was	①	②	③	④	⑤	⑥	⑦
5b	The quality of information <i>relevance</i> experienced was	①	②	③	④	⑤	⑥	⑦
6a	The quality of information <i>timeliness</i> originally expected was	①	②	③	④	⑤	⑥	⑦
6b	The quality of information <i>timeliness</i> experienced was	①	②	③	④	⑤	⑥	⑦
7a	The quality of information <i>completeness</i> originally expected was	①	②	③	④	⑤	⑥	⑦
7b	The quality of information <i>completeness</i> experienced was	①	②	③	④	⑤	⑥	⑦
8a	The quality of information <i>presentation</i> originally expected was	①	②	③	④	⑤	⑥	⑦
8b	The quality of information <i>presentation</i> experienced was	①	②	③	④	⑤	⑥	⑦
9a	The quality of information <i>accessibility</i> originally expected was	①	②	③	④	⑤	⑥	⑦
9b	The quality of information <i>accessibility</i> experienced was	①	②	③	④	⑤	⑥	⑦

	System Quality	<div>Very Low ← Neutral → Very High</div>						
10a	The quality of system <i>response time</i> originally expected was	①	②	③	④	⑤	⑥	⑦
10b	The quality of system <i>response time</i> experienced was	①	②	③	④	⑤	⑥	⑦
11a	The quality of system <i>reliability</i> originally expected was	①	②	③	④	⑤	⑥	⑦
11b	The quality of system <i>reliability</i> experienced was	①	②	③	④	⑤	⑥	⑦
12a	The quality of system <i>functionality</i> originally expected was	①	②	③	④	⑤	⑥	⑦
12b	The quality of system <i>functionality</i> experienced was	①	②	③	④	⑤	⑥	⑦
13a	The quality of system <i>flexibility</i> originally expected was	①	②	③	④	⑤	⑥	⑦

13b	The quality of system <i>flexibility</i> I experienced was	①	②	③	④	⑤	⑥	⑦
14a	The quality of system <i>user friendliness</i> I originally expected was	①	②	③	④	⑤	⑥	⑦
14b	The quality of system <i>user friendliness</i> I experienced was	①	②	③	④	⑤	⑥	⑦
15a	The quality of system <i>ease of integration with other systems</i> I originally expected was	①	②	③	④	⑤	⑥	⑦
15b	The quality of system <i>ease of integration with other systems</i> I experienced was	①	②	③	④	⑤	⑥	⑦

	System Support Service Quality	Very Low	Neutral					Very High
		←					→	
16a	The quality of the promptness of the support service I originally expected was	①	②	③	④	⑤	⑥	⑦
16b	The quality of the promptness of the support service I experienced was	①	②	③	④	⑤	⑥	⑦
17a	The quality of the reliability of the support service I originally expected was	①	②	③	④	⑤	⑥	⑦
17b	The quality of the reliability of the support service I experienced was	①	②	③	④	⑤	⑥	⑦
18a	The quality of the responsiveness of the support service people I originally expected was	①	②	③	④	⑤	⑥	⑦
18b	The quality of the responsiveness of the support service people I experienced was	①	②	③	④	⑤	⑥	⑦
19a	The technical competence of the support service people I originally expected was	①	②	③	④	⑤	⑥	⑦
19b	The technical competence of the support service people I experienced was	①	②	③	④	⑤	⑥	⑦
20a	The attitude of the system support people I originally expected was	①	②	③	④	⑤	⑥	⑦
20b	The attitude of the system support people I experienced was	①	②	③	④	⑤	⑥	⑦
21a	The ability of the system support people to keep accurate records that I originally expected was	①	②	③	④	⑤	⑥	⑦
21b	The ability of the system support people to keep accurate records that I experienced was	①	②	③	④	⑤	⑥	⑦
22a	The provision of training courses that I originally expected was	①	②	③	④	⑤	⑥	⑦
22b	The provision of the training courses I experienced was	①	②	③	④	⑤	⑥	⑦

Measurement of Equitable Needs Fulfillment

		Equitable Work Performance Fulfillment	Benefits are much less than input ← Fair → Benefits are much more than input						
Benefits / Outcome		The information systems help me to work more efficiently and/or effectively (e.g., higher productivity; better decision-making).							
Inputs / Costs	23	Amount of time required of me to learn to use the software / system at work.	①	②	③	④	⑤	⑥	⑦

	24	Level of intellectual skills required of me to learn to use the software / system or interpret the information it generates.	① ② ③ ④ ⑤ ⑥ ⑦
	25	Level of work pressure and stress I face (e.g., updating IT skills, information and work overload, and electronic monitoring).	① ② ③ ④ ⑤ ⑥ ⑦
	26	Amount of physical strain I suffer (e.g., eye strain; pain in the neck / back / waist / hand / shoulder, legs).	① ② ③ ④ ⑤ ⑥ ⑦
	27	Gradually reducing the recognition of my non-IT experiences / skills / control at work.	① ② ③ ④ ⑤ ⑥ ⑦
		Equitable Self-development Fulfillment	Benefits are much less than input ← Fair → Benefits are much more than input
Benefits / Outcome		Knowing how to use the information systems effectively allows me to have more chances to secure my job.	
Inputs / Costs	28	Level of intellectual skills required of me to learn to use the software / system or interpret the information it generates.	① ② ③ ④ ⑤ ⑥ ⑦
	29	Level of work pressure and stress I face (e.g., updating IT skills, information and work overload, and electronic monitoring).	① ② ③ ④ ⑤ ⑥ ⑦
	30	Gradually reducing the recognition of my non-IT experiences / skills / control at work.	① ② ③ ④ ⑤ ⑥ ⑦
		Equitable Self-development Fulfillment	Benefits are much less than input ← Fair → Benefits are much more than input
Benefits / Outcome		Knowing how to use the information systems effectively provides me with the opportunity to advance my career and/or to meet new challenges at work.	
Inputs / Costs	31	Level of intellectual skills required of me to learn to use the software / system or interpret the information it generates.	① ② ③ ④ ⑤ ⑥ ⑦
	32	Level of work pressure and stress I face (e.g., updating IT skills, information and work overload, and electronic monitoring).	① ② ③ ④ ⑤ ⑥ ⑦

	33	Gradually reducing the recognition of my non-IT experiences / skills / control at work.	① ② ③ ④ ⑤ ⑥ ⑦
		Equitable Relatedness Fulfillment	Benefits are much less than input ← Fair → Benefits are much more than input
Benefits / Outcome		Knowing how to use the information systems effectively enables me to get more recognition and/or establish better relationships / communications with colleagues and customers at work.	
Inputs / Costs	34	Amount of time required of me to learn to use the software / system at work.	① ② ③ ④ ⑤ ⑥ ⑦
	35	Level of work pressure and stress I face (e.g., updating IT skills, information and work overload, and electronic monitoring).	① ② ③ ④ ⑤ ⑥ ⑦
Benefits / Outcome		Knowing how to use the information systems effectively enables me to have more power and control over colleagues at work.	
Inputs / Costs	36	Amount of time required of me to learn to use the software / system at work.	① ② ③ ④ ⑤ ⑥ ⑦
	37	Level of work pressure and stress I face (e.g., updating IT skills, information and work overload, and electronic monitoring).	① ② ③ ④ ⑤ ⑥ ⑦

Measurement of Overall User Satisfaction

	Overall Information Systems Satisfaction	Strongly Disagree ← Neutral → Strongly Agree
38	I am very <u>contented</u> with the information systems.	① ② ③ ④ ⑤ ⑥ ⑦
39	I am very <u>pleased</u> with the information systems.	① ② ③ ④ ⑤ ⑥ ⑦
40	I feel <u>delighted</u> with the information systems.	① ② ③ ④ ⑤ ⑥ ⑦
41	Overall, I am very <u>satisfied</u> with the information systems.	① ② ③ ④ ⑤ ⑥ ⑦