

## EVALUATING AN INSTRUMENT TO MEASURE CUSTOMERS' SATISFACTION WITH INTERNET BANKING APPLICATIONS: A QUALITATIVE APPROACH

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### ABSTRACT

Customer satisfaction is an important measure that can affect success of internet-based banking applications. Thus, measurement of customer satisfaction is critical and has far reaching implications for banks in terms of retaining customer loyalty. In this article, we report our experience of evaluating an instrument to measure customers' satisfaction with internet banking applications by developing a model from a synthesis of relevant streams of literature and following a rigorous qualitative process. The instrument includes 24 items and operationalises 9 factors comprising customer satisfaction with internet banking applications. Development of the instrument is significant because bank management can use it as a diagnostic tool to identify the areas of their internet banking offerings in which further improvements are required. The approach adopted in the instrument development can impact the e-business discipline because scholars can apply the process reported in this article for developing sound instruments for other online applications.

**Index Terms**—*internet banking, satisfaction, instrument evaluation, qualitative analysis*

### 1. INTRODUCTION

With the commercial availability of the Internet, many banks worldwide have introduced internet-based banking applications. These applications have received considerable publicity in the media and trade literature; and a large proportion of retail banking customers are reported to have adopted these applications. However, it is inappropriate for the bank management to assume that initial acceptance of their internet banking applications by customers would imply that they would continue to use such applications. It is quite possible that an online banking application, if not properly designed, may create a negative impact on customers who have initially decided to adopt those applications [31]. Negative impact on customers may in turn make them dissatisfied with banks' online delivery of services through internet banking

applications. Moreover, as internet banking applications have created a highly competitive market for bank providers [8], dissatisfied customers may migrate to rival banks [32]. This implies that having dissatisfied customers is an indicator of failure of banks' strategic objectives of using internet banking as a powerful barrier for their customers exiting [36]. Thus, measuring customer satisfaction with internet banking systems is important for devising strategies for customer retention. Our argument is consistent with the views expressed by Polatoglu and Ekin [30] and Floh and Treiblmaier [16]. Therefore, research attention is required to measure customer satisfaction with internet banking applications. In response, some scholars have attempted to evaluate customer satisfaction with internet banking applications. Though they have made significant contribution, their studies suffer from a major weakness. None of the studies reported in the literature provide a thorough discussion on how the instrument was assessed. We acknowledge that although some scholars have provided a description of the reliability and validity aspects associated with instrument development process, an in-depth rich discussion on how each factor included in the satisfaction measurement instrument was evaluated using qualitative means is still lacking. Consistent with the arguments of Aladwani and Palvia [2], we argue that instrument development in general and in the context of web based applications is a challenging task, and hence, deserves much more attention from e-business scholars. We thus suggest that a quantitative evaluation of customer satisfaction instrument needs to be preceded by a rigorous qualitative analysis.

To address this weakness in the literature, we report the development of a model to measure customer satisfaction with internet banking and derive an initial instrument drawn from that model. We then describe how that instrument was refined using three techniques which are rooted in qualitative evaluation approach. We argue that development and evaluation of this instrument can have considerable impact on the e-business discipline because systematic application of a qualitative approach for instrument development (although is encouraged by business methodology gurus) has not been reported in the

e-banking literature. Thus, other e-business researchers can learn from our instrument development experience and can follow a similar approach for developing instruments for measuring satisfaction with other online applications intended for service delivery.

Development of the instrument reported in this paper is also significant to practice. A valid and sound satisfaction instrument could benefit bank management in two ways: a) they can use our instrument as a measurement tool to diagnose how well their internet banking applications are doing in creating a satisfied customer community; and b) use of satisfaction instrument by bank management will allow them to identify those dimensions of satisfaction which are low, this in turn allows banks to prepare appropriate strategies about how to minimise customer complaints owing to low satisfaction.

## 2. BACKGROUND LITERATURE

Based on customer perspective, we divide existing internet banking literature into two broad streams: *factor-based adoption research* and *customer satisfaction research*. The attention of the current literature is however heavily skewed towards factor-based adoption research. In other words, most studies have attempted to identify those factors that either facilitate or inhibit the initial uptake of internet banking applications by retail banking customers. Relatively, less attention has been paid to post-adoption aspect (e.g. satisfaction) of internet banking applications. As understanding adoption by individual retail customers is not our focus, we will provide only a brief summary of the key findings of this stream and elaborate more on the second stream of literature. In particular, we will concentrate to those scholarly works which have either developed models on customer satisfaction or used customer satisfaction as a moderating factor for explaining customer behaviour towards internet banking.

*Factor-based research on customers' acceptance of Internet banking:* A review of the existing literature on internet banking suggests the presence of a large number of studies that examined the factors affecting adoption decision of individuals to use internet banking applications. Typical works representing the factor based research include those of Sathye [34], Polatoglu and Ekin [30], Suh and Han [38], Kamel and Hassan [21], Wang et al. [40], Chan and Lu [11], Williamson et al. [42], Lichtenstei and Williamson [25] and Alam et al. [3]. These studies have included a wide range of factors; however most factors were drawn from such theoretical frameworks as Theory of Theory of Reasoned Action (TRA) [2], Technology Adoption Model (TAM) [13] and Theory of Planned behaviour (TPB) [2] to explain an individual's adoption of internet banking. Typical factors that were identified to influence adoption decision of

individuals include: perceived usefulness, perceived ease of use, convenience and security. The findings of the factor based studies are useful because knowledge of factors will benefit financial institutions to attract greater acceptance of internet banking among population. The factor based research however does not provide any clue on whether customers will continue to use internet banking applications once they have initially decided to adopt these applications. These studies also do not explain whether initial acceptance of the internet banking applications will help improve customer loyalty with banks.

*Customer satisfaction with internet banking:* In recent years, some scholars have begun recognising the need for investigating customer satisfaction with internet banking applications. This is due to the realisation that customers' continuance intention is often determined by their perceived satisfaction rather than their initial acceptance decisions [7]. As a result, there is an emerging body of literature on customer satisfaction with internet banking solutions. Our analysis of this emerging literature indicates the presence of three distinct lines of investigation illustrating the major satisfaction related issues the researchers have dealt with in recent years.

One group of scholars have proposed a number of factors to be included as components comprising customer satisfaction with internet banking applications. The underlying foundation of their satisfaction models is the End-User Computing Satisfaction (EUCS) framework [14] which was specifically developed to measure end-users satisfaction with intra-organisational computer based applications. According to this framework, the underlying dimensions of user satisfaction include five major factors: content, accuracy, format, ease of use and timeliness. However, online bank applications are different from those end-user oriented IT applications used within organisational settings in many respects including channel of delivery, type of user characteristics, and security concerns. This difference is fortunately recognised by this group of scholars who have thus added several additional factors as dimensions of customers' satisfaction with internet banking. For example, Buys and Brown [10] and Hwang, et al. [20] have added such new factors as security, customer support, transaction capability and trust. We have however noted considerable differences among the instruments developed by this group of scholars. For example, some scholars have focused on web appearance while others have emphasised more on transaction support.

In contrast, another group of scholars (e.g. Arunachalam and Sivasubramanian [5]) regard user satisfaction to be a dimension of user experience with internet banking. However, they have not developed an instrument to empirically measure user satisfaction and their experience with internet banking.

Yet another group of scholars (e.g. Chung and Paynter [12] and Floh and Treiblmaier [16]) have measured overall users' satisfaction with internet banking. They have used a single satisfaction item for evaluating the effectiveness and performance of retail internet banking services. Unlike the first group of scholars, these scholars did not produce a comprehensive measurement scale for user satisfaction with internet banking, because satisfaction is considered to be based on cumulative experiences of customers. They argue that customer satisfaction is not affected by successful online transaction and hence operationalising satisfaction with multiple factors is restrictive.

We acknowledge the contribution of these three groups of scholars. They have made an attempt in the right direction. However, we argue that these studies suffer from several weaknesses which demand further research attention. For example, although some scholars (e.g. Buys and Brown [10]; Hwang et al [20]) have added new factors which are relevant for internet banking, they still did not consider the influence of other important characteristics (e.g. customisation, web appearance, information tailored to customer needs, response time) of internet banking applications which are likely to influence satisfaction of customers. We believe that these additional factors need to be included in the satisfaction instrument development (detail justifications are given in the next section). Another weakness is that, according to our knowledge, no existing satisfaction studies until now have reported how they have followed a rigorous qualitative approach for producing a reliable instrument. In other words, only a cursory reference was given to the qualitative approach (if any at all) and attention was given to the use of reliability and validity aspects of instrument using such techniques as factor analysis and Cronbach's alpha. However, quantitative evaluation of an instrument can only begin once its qualitative assessment is successfully completed. This aspect has been ignored by most e-business scholars. We specifically address this particular weakness and report our experience of evaluating an instrument following a rigorous qualitative approach, thus bridging a gap in the e-business literature.

### 3. PROPOSED SATISFACTION MODEL

Drawn on the factors identified in the existing literature and a broad understanding developed through a review of literature, a research model on customer satisfaction (shown in Figure 1) is proposed. The model indicates that customer satisfaction with internet banking applications includes 13 factors: *user-friendliness*, *ease of navigation*, *customisation*, *website appearance*, *online customer support*, *support for transactions*, *accuracy*, *up-to-date*, *sufficient*, *information tailored to specific needs*, *security capacity*, *response time* and *perceived convenience*. In the

following section, we now briefly present our arguments in support of the inclusion of these factors.

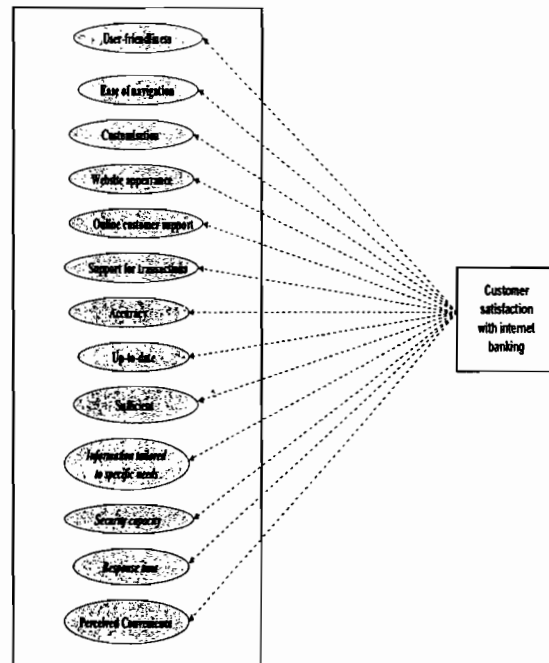


Figure 1: Proposed research model

*User friendliness*: Doll and Torkzadeh [14] identified user-friendliness to be a major element that affects end-user computing satisfaction. For internet banking, it can be argued that customers would be dissatisfied when they find the application hard to use. This line of argument is empirically supported by several scholars like Hwang et al [20].

*Ease of navigation*: Applications which are easy to navigate are likely to create positive feelings in the minds of users towards that application. This view is supported by Liao and Chung [24], who argued that users' satisfaction about website quality is improved when those sites are easy to navigate. Hence, for internet banking applications, ease of navigation can help improve customer satisfaction.

*Customisation*: It refers to the ability of a website to be shaped so as to better meet the needs of individual users. Customisation has been found to be one of the factors which influence user satisfaction with online systems [18, 43]. As internet banking applications are likely to be used by a diverse range of customers, strong customisation capabilities would help creating satisfied customers.

*Web appearance*: According to Kim and Stoel [22], "web appearance" emphasises how well a website guides its

users for its use. The importance of website appearance is also highlighted in several e-commerce studies [17,20]. According to these studies, consumers prefer uncluttered and easy-to-navigate sites. For internet banking context, we argue that an attractive website appearance will help in advancing satisfaction of customers.

*Online customer support:* In the competitive market environment, customers who are not happy with the services offered by a business are likely to seek satisfying their needs elsewhere [16]. In their study, Yang and Peterson [43] measure service quality of online business in terms of three capabilities: a) the abilities of companies to provide customers with wide ranges of product/service packages, b) the abilities of companies to provide customers with products/services with the features they want, and c) the quality of companies' customer services. In the context of internet banking, banks need to provide wider range and higher quality of services in order to satisfy internet banking user's expectations. In their study, Buys and Brown [10] found customer support to be of distinct importance in the context of internet banking. This is due to the fact that many users are not confident with the Internet and the general complexity of the e-banking application itself, lack of support or failure of providing appropriate support from the banks may be an obstacle for increasing customer satisfaction.

*Support for transactions:* Banks must support the ability to provide feedback on each transaction completed by customers via their internet banking applications. In the absence of any bank employees, customers would be anxious to know the status of their transactions performed online. Hence, internet banking applications need to assure customers (by such means as pop-up messages) that their online transactions have been acted on. Such feedback helps improve customer confidence in the internet banking applications which in turn contributes to increased customer satisfactions.

*Accuracy, Up-to-date and Sufficient:* In their study, Tojib and Sugianto [39] highlighted the importance of accurate, up-to-date and adequate information for measuring employee satisfaction with B2E portals. Their observation also applies to the internet banking scenario. We believe that the ability of internet banking applications to provide customers with accurate, up-to-date and sufficient information that exactly match their needs positively affects customer perceived value from internet banking [10] which in turn helps create satisfied customers.

*Information tailored to specific needs:* A diverse range of customers with varying taste and needs use internet banking applications. Hence, there is an expectation on the part of the customers that they would not want to be overloaded with too much information from their banks owing to easy connectivity via these applications. They expect to receive only those information which are

relevant to their specific needs. This line of argument is supported by several scholars [17, 20].

*Security capacity:* Technological capacity of websites representing online service delivery is a major contributor of customer satisfaction. The key construct to measure technological capacity is security capacity. Customers consider security as one of the most important concerns, especially in the area of internet banking [12]. Security measures customers' perceptions of online channel reliability and safety [6]. In their study, Hwang, et al. [20] asserted that customer satisfaction with internet banking has a high correlation with security.

*Response time:* Another important feature of technological capacity is "response time of internet banking" which has roots in the concept of "timeliness" drawn from the end-user satisfaction literature. Doll and Torkzadeh [14] identified that "timeliness" is one of the most significant factors affected end-user computing satisfaction. In their study, Sugianto and Tojib [37] defined timeliness as "the ability to deliver requested information with a reasonable response time". Response time also refers to the loading time of the website and the waiting time between users' actions and the website's response [12]. Consumers tend to be highly sensitive to the speed of service delivery [24]. As a result, response time is also one of the important factors which should be considered in order to help raise customer satisfaction.

*Perceived convenience:* Today's customers demand greater conveniences and accessibility, the quality attribute of time and location convenience is likely to be significant in differentiating internet banking from traditional retail banking [4]. Consequently, the ability to access internet banking at anytime and from anywhere is likely to influence customers' satisfaction with internet banking applications. Furthermore, customers interacting with their bank using the Internet without the need to directly interface with bank employees can be valuable in advancing satisfaction because it reduces communication apprehension which may be caused by the profound cultural diversity [6].

#### 4. OPERATIONALISATION OF THE RESEARCH MODEL

The factors involved in the research model are operationalised by identifying their underlying meanings (dimensions) from a review of the background domain of literature. A total of 47 items were then developed and adapted for internet banking context in support of those operationalisations. A summary of these operationalisations is shown in Table 1. A sample of items is listed in Appendix-A.

Table 1: Summary of the operationalisations

Factor	Items	Literature Sources
UF: User-friendliness	6	Wang [40], Sugianto and Tojib [37], Buys and Brown [10], Yang and Peterson [43]
E: Ease of navigation	2	Liao and Cheung [24], Sugianto and Tojib [37]
C: Customisation	3	Horan and Abhichandni [18] and developed by the authors
WA: Website appearance	4	Kim and Stoel [22]
OS: Online customer support	4	Liao and Cheung [24], Alpar [4]
ST: Support for transactions	3	Developed by the authors
A: Accuracy	3	Buys and Brown [10], Tojib and Sugianto [39]
U: Up-to-date	2	Sugianto and Tojib [37], Wang [40]
S: Sufficient	2	Huang, et al. [19]
I: Information tailored to specific needs	3	Kim and Stoel [22], Buys and Brown [10]
SC: Security capacity	5	Buys and Brown [10], Yang and Peterson [43], Awamleh and Fernandes [6], Liao and Cheung [24], Sugianto and Tojib [37]
R: Response time	5	Kim and Stoel [22], Awamleh and Fernandes [6], Sugianto and Tojib [37]
PC: Perceived convenience	5	Liao and Cheung [24], Awamleh and Fernandes [6]

#### 4. RESEARCH APPROACH

Drawing upon the suggestions of Lynn [26], a two-stage approach was followed for instrument construction: development and judgement. The development stage is characterised by domain identification and item generation based on identified domains [29]. The activities involved in the development stage have been discussed in sections 3 and 4. The judgement stage involved execution of three specific activities: deliberations with several domain experts Kitchenham and Pflieger [23], item-factors association analysis [33]

and pre-testing [9]. These activities involve qualitative analysis and are intended to improve instrument quality.

Following the suggestions of Kitchenham and Pflieger [23], a total of 3 domain experts were consulted and their suggestions about the items included in the initial theory driven instrument were analysed using two criteria proposed by Eklim and Rahim [15]: *completeness of factors* and *comprehensiveness of items operationalising those factors*. The initial instrument was improved based on the analysis of the views expressed by the domain experts. The revised instrument was then given to a group of participants for evaluating item-factor association. According to the recommendations of Nielsen [28], a total of 5 participants (including 2 IT post-graduate students having prior job experience, 1 undergraduate student, 1 academic staff and 1 administration staff) were selected for evaluating item-factor association. They were required to associate each item with a factor which they think represents the best match. Their responses were captured on a scale of 1 to 5, where 1 represents strongly unrelated, 3 represents neutral and 5 represents strongly related. It may be possible for the participants to associate an item with more than one factor. If it happens, the item would need to be either improved or removed. Based on the assessment of item-factor association, the survey instrument was further revised. The revised instrument was then subject to pre-testing by a group of 14 postgraduate students who were randomly selected from a tertiary institution. This group was targeted because they match the profile of the typical Internet banking users [10]. These students were required to complete the revised survey questionnaire. The purposes of the test were: (a) to evaluate the time for completing the survey; and (b) to identify those items which were hard to understand by participants. Based on the views expressed by these participants, the instrument was again improved and is now ready for survey administration.

#### 5. EMPIRICAL ASSESSMENT

##### 5.1. Analysing responses from the domain experts

*Completeness of factors:* Three useful suggestions for completeness of factors were offered by the domain experts. Experts 'A' and 'C' both considered "user-friendliness" and "ease of navigation" to have overlapping meanings; hence these two factors were flagged for merger. Expert 'A' did not believe that "website's design and appearance" have any influence in forming Internet banking satisfaction of customers. Experts 'B' and 'C' considered "Sufficient" to be a redundant factor which has overlapping meaning with "Up-to-date" and "Information tailored to specific needs." As a consequence, there was no need to include this factor for measuring customer satisfaction with internet banking.

Comprehensiveness of items: Item comprehensiveness was evaluated in terms of 4 criteria: lack of clarity in items, irrelevant items, redundant items, and new items. A total of 69 suggestions were received from the domain experts which were later grouped in light of these criteria. These 4 groups are summarised in Table 2 and are briefly described below:

Table 2: Number of feedback offered by domain experts

Criteria	Experts			Total
	A	B	C	
Lack of clarity in items	9	25	13	47
Irrelevant items	0	2	4	6
Redundant items	5	4	6	15
New item	0	0	1	1

Clarity in items: Forty seven suggestions were offered for improving clarity of items which can be improved by: *rephrasing an item, removing grammatical errors from an item, and removing banking specific or technical terms used in items.* Out of 47 suggestions, 30 were about rephrasing an item. Another 9 suggestions were about removing grammatical errors from items. The errors are minor in nature, thus these items can be easily revised. Domain experts 'B' and 'C' identified 8 items that contain banking specific and technical terms. For instance, terms like "synchronous communication", "blackboards" and "asynchronous discussion group" used in items O3 and O4 were considered as technology terminology which may not be understood by survey participants. The domain experts thus emphasised that these items should rather focus on customer opinions.

Irrelevant items: Six items were found to be irrelevant as to what they were intended to measure. Expert 'A' pointed out that item UF2 was out of place and should belong to factor "Ease of navigation". Expert 'B' indicated that item CU2 requires further improvement in relevance, because she considered the purpose of customisation is to suit users' needs or preferences rather than to suit their tastes. Item SC4 was found to be irrelevant for factor "Security capacity" by Expert 'B', as authorized access represents a type of authorisation and is not a part of security concern. Expert 'C' considered Items C3 and C4 to be irrelevant because according to her, cost-effectiveness and time saving did not imply convenience but rather customer perceived value from Internet banking.

Redundant items: Fifteen items were considered redundant by the domain experts. According to Expert 'A', Items UF1 and Item E1 which refer to "User-friendliness" and "Ease of navigation" represent the same concept and there was no need to represent them as separate items. Thus, original Item UF1 was dropped from the instrument and Item E1 has now become the new Item

UF1. All the experts agreed that Item WA2 had the same meaning as Item WA1, therefore, item WA2 should be removed. Expert 'B' found the meanings of Items O2 and O4 to be similar as both refer to communication between customers and the bank. Item A2 was considered to be redundant by Expert 'A'. He also indicated that the meanings of Item S2 and S1 were similar; thus there was no need to retain these two items. Likewise, Item I3 was identified by Expert 'A' to be redundant because it reflects the same meaning as Item I1. Items R2, R3, R4 and R5 which are intended to measure "Response time" were perceived by Experts 'B' and 'C' to have similar meanings. These experts suggested retention of only two items. Similarly, Expert 'C' believed that Items W2 and Item W3 represent the same concept and thus Item W3 could be combined with Item W2.

New items: Only one new item was suggested. According to domain expert C, one useful support typically received from Internet banking is the "ease with which one can make transactions between his/her multiple accounts"; she thus suggested the inclusion of a new item for factor "Support for Transactions."

Based on the suggestions received from the domain experts concerning the comprehensiveness of items, most changes were incorporated in the instrument. In total, 28 items were revised, 2 items were relocated, 16 items were removed and 1 new item was added. A revised survey questionnaire was thus prepared which contained 32 items. Table 3 shows an example of items for which changes were incorporated.

Table 3: A sample of items which were improved

No	Item description	Type of change
E1	I find it easy to follow instruction for navigating the Internet Banking website	Moved to User-friendliness, became new UF1
WA2	The Internet Banking website is visually pleasing	Removed. Dimension Website appearance is removed from the model
ST4	The Internet Banking website supports transactions between my multiple accounts	New item
UF2	I find it easy to interact with the Internet Banking website	Completely rephrased
PC1	I find that Internet Banking is a more convenient way to manage my finances	Banking/technical terms were removed from the item

## 5.2 Evaluating of item-factor association

The responses of the five participants (which were captured on a scale of 1 to 5) for indicating assessment of



each item with the factor(s) it best describes were recorded in a table for analysis. A sample of the ratings given by the participants for some items are summarised in Appendix. Our analysis of factor-item association is expressed in terms of: a) Fine items, b) Items need to be removed, c) items to be revised, d) Items to be moved to other factors, e) comments overruled due to misinterpretations by participants and hence items were retained. These are described below.

**Fine items:** A total of 21 items were found to be associated with (called loading) their respective intended factors. The status of these items is shown as 'Fine items' in the last column of Table 5. The average scores of these items are all above 3 out of 5. The remaining items which did not load on intended factor are discussed below. An exception is however Item UF4 which is also considered as a "Fine item" with average score is less than 3. The item UF4 was rated PC (*Perceived Convenience*) by 2 participants but was rated UF (*User-friendliness*) by 3 remaining participants. The item was then discussed with those participants who rated it as PC. Through the discussion, the meaning of the item was clarified and they agreed that they misinterpreted the item.

**Items to be removed:** According to the suggestions made by Participant A, B and C, Item UF6 loaded on four different factors: "*Customisation*", "*Perceived Convenience*", "*Online Customer Support*", and "*User-friendliness*." Thus, Item UF6 was removed from the instrument. Likewise, Item A2 did not load in its intended factor "*Accuracy*." Thus, this item too was dropped. Item SC3 can be interpreted as an indicator of factor "*Accuracy*" and was thus removed.

**Items revised or moved to other factor:** Three participants have interpreted Item C1 as an indicator of factor "*Information tailored to specific needs*". In order to avoid this misinterpretation, Item C1 which states "I am able to choose the manner in which I want to receive information/reports from the Internet Banking website" was changed to "I am able to customize information/reports generated from the Internet Banking website". Three participants have interpreted Item O1 as an indicator of factor "*User-friendliness*". Therefore, Item O1 was revised and moved to factor "*User-friendliness*" from "*Online customer support*". Item ST2 has been misinterpreted by Participant E as an indicator of factor "*Accuracy*". To avoid this misinterpretation, Item ST2 which originally states "I can assign a narrative description of every transaction made through the Internet Banking website" was changed to "I am happy that my Internet Banking allows me to write a narrative description in support of my transactions". Participant B has interpreted Item ST3 as an indicator of factor "*Perceived Value from Internet Banking*" and therefore this item was moved from factor "*Support for transactions*" to factor "*Perceived Value from Internet Banking*". This particular factor is not a component of

customer satisfaction but relates to the impact of satisfaction and hence is not discussed here as it is beyond the scope of this article. Two participants have interpreted Item I1 as an indicator of factor "*Customisation*". In order to avoid this misinterpretation, Item I1 which states "When I interact with the Internet Banking website, I can get information tailored to my specific needs" was revised to "When I interact with the Internet Banking website, I can get information which address my needs". Item I2 has been interpreted by all the participants and has to be completely rephrased. Based on the comments made by the participants, this item originally states "When I interact with the Internet Banking website, I can use interactive features of the website to produce information/reports relating to my transactions" was changed to "When I interact with the Internet Banking website, I can use interactive features to perform my transactions". Likewise, Item PV1 was misinterpreted by Participants D and E, the word "attractive" was removed from the item to avoid misinterpretation.

**Suggestions ignored or overruled, items were still kept:** Item O3 has been misinterpreted by Participant E. This comment was ignored because "*the supports*" mentioned in Item O3 can be about "*supports of anything from Internet banking website*" and is not only concerned with transactions. The meaning of Item ST4 has been misunderstood by some participants and this item is retained in the instrument. The meaning of UF1 has been misunderstood by some participants and thus no change was necessary for this item. Participant D has interpreted Item R2 as an indicator of factor "*Up-to-date*." This view was overruled because this item is not about how up-to-date the reports are but how quickly transactions could be processed.

**The whole factor removed:** Based on the analysis of item-factor association, a large number of different items were interpreted as an indicator of factor "*Perceived Convenience*" by all the participants. Therefore, the factor *Perceived Convenience* was removed from the model.

In summary, based on the feedback received from the participants, necessary changes and revisions were made in six items (e.g. C1, O1, ST2, ST3, I1, I2). In addition, seven other items (e.g. UF6, A2, ST3, SC3, PC1, PC2, PC3) were removed from the instrument. Upon incorporating these changes, the revised instrument now contains 25 items.

### 5.3 Pre-testing the instrument

The revised instrument was then subject to pre-testing by a group of 14 postgraduate students. The average time of survey questionnaire completion is 7 minutes, the minimum time is 6 minutes and the maximum time is 10 minutes. Therefore, it could be argued that the intended participants of this survey are likely to take no longer 10 minutes to complete. During the pre-testing stage, the participants also expressed their views about their

difficulties in interpreting the meaning of several items for which further changes were incorporated in the instrument. For instance, according to Participants P1 and P4, Items I1 and I2 are not easy to understand and thus require improvement. Likewise, items O1 and O2 need to be further improved according to Participant P5. According to both Participants P7 and 10, Items UF3 and UF4 are perceived to have the same meaning. Thus, Item UF4 was dropped from the instrument. Based on the comments of Participants P2 and P11, the meaning of Item R1 is difficult to understand, thus this item was rephrased. Participant P13 suggested that the word "also" in Item IS1 should be removed to improve its clarity. Based on the comments of all the participants, a revised questionnaire was prepared which contain 24 items.

## 6. DISCUSSION

A total of 47 items was generated to operationalise the 13 factors which were identified from the literature and are believed to form customer satisfaction with Internet banking. These items formed the foundation of the initial instrument. After analysing the feedback received from the domain experts, a number of items were removed, revised and added resulting in a 32-item instrument. As a result of these changes, 3 factors such as "Ease of navigation", "Website appearance" and 'Sufficient' were removed. Hence, only 10 factors are retained as the components of customer satisfaction with internet banking. This instrument was then subject to item-factor association analysis which yielded a 25 items instrument. At this stage, another factor (i.e. perceived convenience) was removed. During the pre-testing stage, another 1 item was removed which however did not lead to the removal any factor. As a result, 24 items remained in the instrument which operationalised 9 factors comprising customer satisfaction with internet banking. Table 4 captures the evolution of the items operationalising the instrument. As a result of the changes in the operationalisation of the factors (indicated in Table 4) comprising customer satisfaction with internet banking, the initial research model (shown in Figure 1) was revised.

Table 4: Evolution of the items operationalising the instrument

Factors	From theory	After meeting domain experts	After item-factor association	After pilot test
User-friendliness	6	6	6	5
Ease of navigation*	2	Nil	Nil	Nil
Customisation	3	3	3	3
Website appearance*	4	Nil	Nil	Nil
Online customer support	4	3	2	2
Support for transactions	3	4	3	3
Accuracy	3	3	2	2
Up-to-date	2	2	2	2
Sufficient*	2	Nil	Nil	Nil
Information tailored to specific needs	3	2	2	2
Security capacity	5	4	3	3
Response time	5	2	2	2
Perceived Convenience*	5	3	Nil	Nil
<b>Total items</b>	<b>47</b>	<b>32</b>	<b>25</b>	<b>24</b>

\* means this item/factor was removed

## 5. CONCLUSION

Satisfaction represents an important dimension of customers' post-adoption behaviour towards e-business technology. In context to internet banking applications, measuring satisfaction is particularly vital because it is indicative of the success of those applications. Bank customers will continue to use internet banking applications when they are satisfied with such applications. Moreover, satisfied customers may even participate in promoting banks reputation through their word-of-mouth recommendations. Therefore, a high quality instrument is necessary to measure customer satisfaction with internet banking applications. We



acknowledge that even though attempts have been made by some scholars for developing an instrument for measuring customer satisfaction with internet banking, these scholars rely purely on statistical analysis for establishing instrument reliability and validity. While the use of advanced statistical analysis is useful, a thorough qualitative investigation prior to undertaking quantitative evaluation (via statistical analysis) can further contribute in developing a very high quality instrument. This particular aspect, although is recognised in the business research literature [26], is rarely applied by the e-business scholars. To address this gap in the literature, we have reported our experience of an instrument development process by following a rigorous qualitative approach. In doing so, we have explained how a set of qualitative analysis can be applied to improve instrument quality in relation to customer satisfaction with internet banking.

We acknowledge that instrument development should not be a research objective in its own right. As such, future studies should employ our instrument to understand the influence of satisfaction on customer retention and loyalty. From a practical perspective, bank management can use our instrument as a diagnostic tool not only to measure overall customer satisfaction with internet banking initiatives but also to identify which dimensions of satisfaction are more closely related to customer loyalty. Prior research has shown that unmet customer expectations are considered a primary cause of both online and offline complaints. Hence, by identifying which dimensions of satisfaction are low, bank management can prepare appropriate strategies about how to minimise customer complaints.

There are several ways to extend our work. There is a clear need to further validate our survey instrument using statistical analysis. We are currently engaged in a survey to address this concern. Moreover, in line with Serenko and Turel [35] who observed that it is impossible to find measures that do not vary over time and contexts, we recommend that future studies should consider validating the instrument involving corporate bank customers who may have different expectations. By including corporate customers, researchers may potentially identify other dimensions of customer satisfaction which were not captured through our study. This recommendation is in line with Wiley and Wiley [41] who argued that the same survey instrument of a research construct (e.g. satisfaction) administered to two different populations may produce different factor structure and even indicator reliability of the constructs may vary considerably.

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Appendix A: Sample Indicators

Factor	Sample Indicators
User-friendliness	UF1: Content provided by e-bank website is easy to understand UF2: The e-bank website makes it easy to find the content I need
Ease of navigation	E1: Easy to follow instruction for navigating the e-bank website E2: When I am navigating the e-bank website, I feel that I am in control of what I can do
Customisation	C1: I am able to choose the manner in which I want to receive information or report from the e-bank website
Website appearance	WA1: The e-bank website displays visually pleasing design
Accuracy	A1: The e-bank website provides accurate information
Up-to-date	U1: The e-bank website provides me latest information on transactions

Appendix B: Ratings for item association with factors given by participants

Item Code	Participants					Av. Score	Comments
	A	B	C	D	E		
SC2	SC (5)	SC (5)	SC (4)	SC (5)	SC (5)	SC: 5	Fine item
UF6	UF(5) + C(4)	PC (5)	O (3)	UF (5)	UF (5)	-	Remove
IS1	IS (5)	IS (5)	O (2) + IS (3)	IS (5)	IS (5)	IS: 4.6	Fine item
A2	A (5)	ST (5)	U (3)	SC (5)	SC (5)	-	Remove
ST4	ST (5)	ST (5)	I (4)	PC (5)	O (4) + ST (5)	-	Retained

Note: the number in the brackets indicates the rating given by a participant