

# A Qualitative Evaluation of an Instrument for Measuring the Influence of Factors Affecting Use of Business-to-Employee (B2E) Portals

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**Abstract**—B2E portals represent a new class of web-based information technologies which many organisations are introducing in recent years to stay in touch with their distributed workforces and enable them to perform value added activities for organisations. However, actual usage of these emerging systems (measured using suitable instruments) has not been reported in the contemporary scholarly literature. We argue that many of the instruments to measure usage of various types of IT-enabled information systems are not directly applicable for B2E portals because they were developed for the context of traditional mainframe and PC-based information systems. It is therefore important to develop a new instrument for web-based portal technologies aimed at employees. In this article, we report on the development and initial qualitative evaluation of an instrument that seeks to operationalise a set of independent factors affecting the usage of portals by employees. The proposed instrument is useful to IT/e-commerce researchers and practitioners alike as it enhances their confidence in predicting employee usage of portals in organisations.

**Keywords**—Portal, business-to-employees, instrument, evaluation, qualitative research.

## I. INTRODUCTION

TODAY'S businesses are characterised by the presence of a distributed workforce that is required to stay in touch with corporate offices and access relevant contents and applications in order to make timely decisions [1]. However, the dynamic business environment within which the distributed workforce functions often leads to a lack of communication, and consequently, company loyalty. In response, the IT vendors have introduced business-to-employee (B2E) portals that embrace e-business approaches and internet technologies. These portals claim to provide corporate information tailored to the needs of employees [2] and a set of useful applications for employees for performing their routine tasks [3] as well as serve as a single point of business contact with employees [4].

Several industry sources report the steady growth in the use of B2E portals in organisations [5-6]. According to Banks [7], the number of organisations implementing B2E portals is also increasing in Australia. In their study, Rahim and Singh [8] reported that several Australian academic institutions in recent years have made large investments into B2E portals. Despite

such interests, very little research is reported in the scholarly literature about the actual usage of these portals by individuals. This is not surprising given the fact that portal represents an emerging technology and that academic literature is traditionally slow to follow up the fast-moving trends of e-business in general [9]. We argue that it would be inappropriate for organisations to assume that adoption decisions of B2E portals made by the top management would result in spontaneous usage of these systems by their employees due to the possible imbalance in benefits that can be observed between organisational level and individual employee level. Thus, an evaluation of the use of B2E portals by employees represents a key research concern because the benefits (mentioned earlier) are unlikely to be realised when these portals are not satisfactorily used by employees. Therefore, managers need to be aware of the factors that may potentially affect the use of employee portals.

In response, we have recently developed a factor-based model based on a critical analysis of literature on IS/IT implementation, social psychology, and behavioural theory, and derived an initial instrument drawing on that model [10]. The quality of this instrument in terms of item construction and relevance however was not evaluated and hence it is not clear whether IT managers would have confidence in the administration of such an instrument. In this paper, we report our experience of following a two-stage process for qualitatively evaluating the initial instrument: examination by domain experts and instrument pre-testing by two groups of participants. Thus, the work reported in this paper builds upon our prior work in which a theory driven instrument was developed [10], and extends that work by presenting additional qualitative evidence in support of the instrument's relevance in actual settings. Thus, our paper makes a significant contribution to the body of IT and e-business literature in two ways. First, instrument development and evaluation in general is a challenging task and e-commerce researchers often report sketchy description of their instrument development and validation process with very little attempts to justify their use. We believe that a detailed step-by-step description of instrument development and evaluation of B2E portal usage would benefit the researcher community. Second, a properly validated instrument could be used in surveys to help establish statistical generalisability of the factor-based B2E portal usage model which in turn improves researchers' understanding of portals adoption phenomenon.

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The instrument is also beneficial to e-commerce/IT practitioners because it increases their confidence in the ability to use the factor model for predicting employee portal usage practices within organisations.

The paper is organised as follows. First, a brief outline of the factor-based B2E usage model and some observations about the initial instrument are provided to set the background necessary to understand the need for further evaluating the instrument. Then, the research approach is described. Next, qualitative evaluation of the instrument (which occurred in two stages) is discussed. Finally, the contributions of the paper are highlighted, and directions of further research are indicated.

## II. B2E PORTAL USAGE MODEL AND INITIAL INSTRUMENT: A BRIEF OVERVIEW

Drawing on the available literature on B2E portals and other relevant sources (e.g. social psychology, innovation and IT implementation), a factor-based research model (Fig. 1) was proposed which includes 9 independent factors and 2 moderating factors. The justification for inclusion of these factors is reported in our previous study [10] and is not reproduced here. However, four important observations about the model are made.

First, out of 9 independent factors 5 [i.e. perceived ease of use (PEOU), perceived system usefulness (PSU), compatibility (C), attitude towards portal (AP), and perceived motivation (PM)] were drawn from a review of several core theoretical frameworks (e.g. TRA [11], TPB [11], DOI[12]). The remaining 4 factors [i.e. education level (E), training (T), help services (HS), organisational support for the portal (OS)] were chosen from an analysis of the existing IT implementation literature. Second, all 9 independent factors were grouped into three broad categories: perceived system characteristics, personal characteristics and organisational support. This grouping is consistent with our argument that the environmental setting of B2E portal comprises three distinct entities: organisation, employee and the portal. Thus, independent factors are associated with each of these entities. Third, according to the advice of several leading IT gurus (e.g. Gefen & Straub [12]; Busch [14]; Morris & Venkatesh [15] and Venkatesh et al. 16]) who report that age and gender are likely to moderate an individuals' usage of IT applications, we wanted to find out if such demographic variables have any moderating effects on the usage of portals by employees. Finally, we acknowledge that the selection of both independent and moderating factors is somewhat influenced by how we view the acceptance and usage of technology phenomenon in relation to B2E portals and other researchers may differ from your viewpoint.

A list of the propositions drawn from the model linking the factors (independent and moderating) with the dependent variable (i.e. use of B2E portal by employees) is shown in Table I. For most factors, we have relied on operationalisations reported in the existing literature. However, items were modified to suit the B2E portal context. While modifying the items, sufficient care was taken so as not to change its meaning all together. In addition, we have also

constructed a set of items for several factors (e.g. training, help services, organisational support for portal and portal usage).

A total of 35 items was generated to operationalise the factors and the dependent variable. A summary of the operationalisation of the factors is indicated in Table II. The last column of this table provides a brief explanation on the items included for operationalising each factor. A list of these items is not produced due to page constraints. The items formed the foundation of the initial instrument.

## III. RESEARCH APPROACH

Drawing upon the suggestions of Lynn [23], a two-stage approach was followed: development and judgement. The development stage is characterised by domain identification, item generation and instrument formation [24,25]. On the other hand, the judgement process entails deliberations with several experts to evaluate the validity of the items and the total instrument. According to Kitchenham and Pfleeger [26], these experts should have knowledge of the subject matter. The number of required experts usually depends on how many of them are identified by the researchers and hence a certain degree of leeway exists in their selection. In addition to the use of domain experts, we have also applied the guidelines of Bradburn et al. [27] and pre-tested the revised B2E portal use instrument (which was improved due to the feedback received from the experts) with several employees (who are representatives from the target surveyed population).

The activities involved in the development stage have been briefly discussed in the previous section and is reported in our previous paper [10]. As such, this section describes how the second stage (i.e. judgement) was conducted using domain experts and pre-testing. A total of three domain experts were consulted and their suggestions about the initial instrument were sought. These experts were selected from a large Australian tertiary educational institution which had introduced a successful B2E portal in recent years. The first expert (A) was involved in the development and implementation of the portal. The second expert (B) is currently involved in maintaining and enhancing the portal, and expert C is a manager for the organisational division responsible for technical maintenance of the portal. Each expert was individually contacted to get his/her consent for participation in the assessment process. Before meeting with the experts, an overview of the project and the model were explained to them. Separate meetings were conducted with all experts.

During the pre-test stage, two additional groups took part. The first group comprises 7 knowledgeable and active users of B2E portals selected from the same tertiary institution from which the domain experts were chosen. These users were required to assess the importance of the factors included in the model. Their responses were captured on a scale of 1 to 5 where 1 being least important and 5 being most important. Their ratings were aggregated and any factor (and hence its associated items) for which the average rating fell below 3 was removed. These users were selected based on their role in

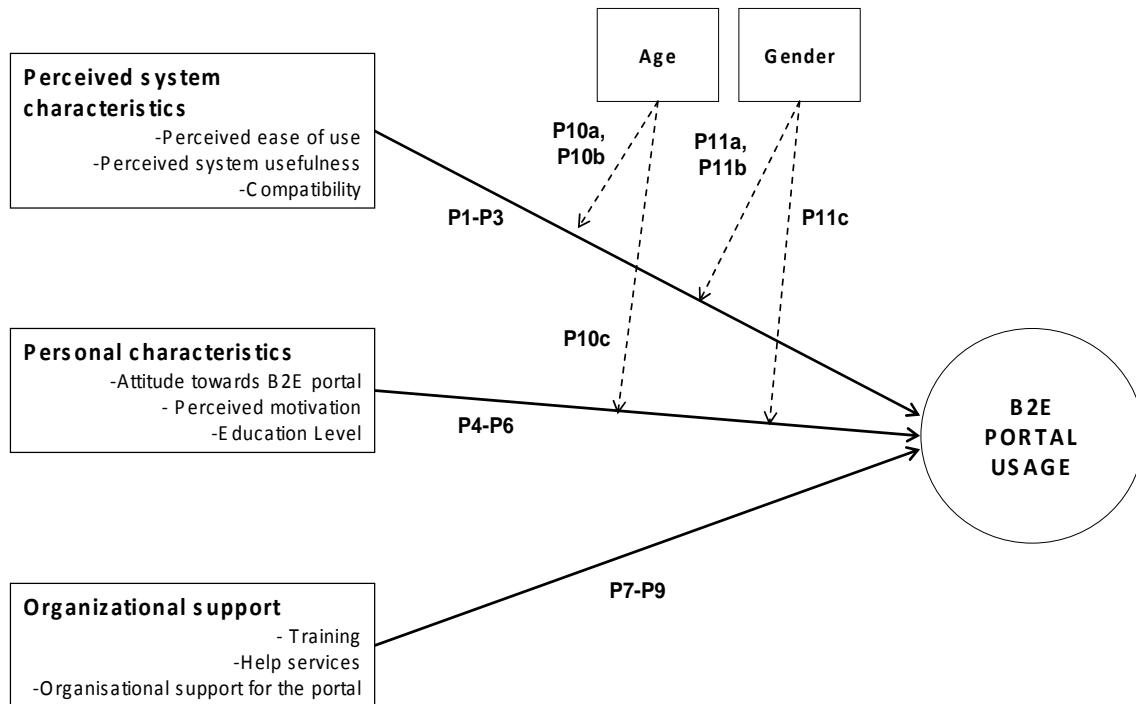


Fig. 1 Factor-based B2E portal usage model

TABLE I  
A LIST OF PROPOSITIONS DRAWN FROM THE MODEL

Propositions
P1: Perceived ease of use (PEOU) has a positive influence on employees' B2E portal usage
P2: Perceived system usefulness (PSU) has a positive influence on B2E portal usage
P3: Compatibility (C) of the portal has a positive affect on its usage
P4: An individual's positive attitude towards portal use (AU) has a positive influence on portal usage
P5: Perceived motivation (PM) positively influence portal use
P6: Higher education level has a positive influence on portal use
P7: Provision of training positively influences portal usage
P8: Availability of helpdesk services has a positive effect on portal use
P9: The organisation's interest in supporting the portal will affect portal usage positively
P10a: Age will moderate the effect of perceived ease of use on portal usage
P10b: Age will moderate the effect of compatibility on portal usage
P10c: Age will moderate the effect of perceived motivation on portal usage
P11a: Gender will moderate the effect of perceived ease of use on portal usage
P11b: Gender will moderate the effect of perceived system usefulness on portal usage
P11c: Gender will moderate the effect of perceived motivation on portal usage

TABLE II  
SOURCES OF OPERATIONALISING FACTORS

Factor	No. of Items	Sources	Remarks
Perceived ease of use	4	Davis [17], Alshare [18]	Items relating to IS and relevant to B2E context were retained.
Perceived system usefulness	9	Yang et al. [19] and developed by authors	Seven items for service usefulness was created by the authors to address popular services supported by B2E portals (e.g. communication, collaboration, e-commerce purchases and HR related activities) and 2 items for was adapted from Yang et al [19]
Compatibility	6	Agarwal and Karhanna [20]	These items measure four components of compatibility: preferred work style, past experience, existing work habits and work related values
Attitude toward portal use	3	Hartwick and Barki [21]	
Perceived motivation	3	Davis [17]	These items were selected from Davis et al. [17] to capture economic motive
Training	2	Developed by the authors	Online training and workshops were included
Education level	1	Developed by the authors	
Help services	2	Thompson et al. [22] & Developed by the authors	One item was drawn from Thompson and another was developed by the authors
Organisational support for portal	3	Developed by the authors	These items focus of regular updates of relevant information, services and collection of feedback regarding portal
Portal usage	2	Hartwick and Barki [21] and developed by authors	Frequency of usage was adapted from Hartwick and Barki [21] and another item on diversity of use was developed by the authors

that institution. The roles and nature of duties represented by the users takes into account the diversity among employees in the organization. Table III presents a brief profile of these users.

TABLE III  
USERS' PROFILE

Users	Job profile	Job role
A	Academic	Managerial
B	Academic	Non-managerial
C	Academic	Non-managerial
D	Academic	Non-managerial
E	General staff	Administrative
F	General staff	Administrative
G	General staff	Managerial

The second part of the pre-test involves a panel of 3 employees (who are actual users of a B2E portal in an academic environment) with different job roles. They were invited to attend a discussion session with the researchers.

During the discussion session, these users were given a set of initial items (which emerged through domain expert examination and scrutiny by 7 knowledgeable users) and a definition of all factors included in the research model. The employees were asked to associate each item with its corresponding factor. Any item that failed to associate with its intended factor was discussed and necessary changes were made to align the item with its intended factor. Any item that did not associate with a factor was removed. This approach is rooted in the notion of card sort technique as advocated by Santos [28].

#### IV. EMPIRICAL ASSESSMENT

##### A. Analysing Responses from the Domain Experts

The views offered by the 3 domain experts were analysed using the following criteria: comprehensiveness of items operationalising the factors, scales used in measuring the items and appropriateness of section titles. Comprehensiveness of items was in turn evaluated using: *lack of clarity in items, irrelevant items, redundant items and*

*additional items.* The number of suggestions offered by the domain experts to evaluate item comprehensiveness is presented in Table IV.

TABLE IV  
NUMBER OF SUGGESTIONS BY DOMAIN EXPERTS

Criteria used by domain experts	Domain experts			Total
	A	B	C	
Lack of clarity	8	8	0	16
Irrelevant item	2	0	1	3
Redundant item	1	0	0	1
New item	0	0	1	1

It can be seen that a total of 16 suggestions was offered to improve instrument clarity. More specifically, 3 types of suggestions were offered with regards to item clarity: change of terminology, change of tense and sentence reconstruction. For instance, Item 17 which states “The portal provides information relevant to my *work*” was changed to “The portal provides information relevant to my *role*”. Likewise, Item 27 which states “Using the portal *would change* my work habits” was changed to “Using the portal *has changed* my work habits”. Lastly, some items were rephrased and simplified to convey the right meaning. For instance, Item 29 which initially stated “In order to enhance my efficiency, I use the portal” was changed to “I use the portal in order to enhance my efficiency”.

A total of 3 items were found to be irrelevant to what was intended to measure. Expert ‘A’ did not agree with the concept of influence of an individual’s education level on portal usage and thus suggested the removal of Items 31 and 32. Expert ‘C’ found Item 8 to be irrelevant because according to her, the portal in the participating organisation was developed to be intuitive enough that it does not require a separate user manual to assist with learning how to use it. However, we felt that Item 8 does not imply learning but rather ease of using the portal and was thus retained.

Only one suggestion is available from Expert A regarding redundancy of items. According to Expert ‘A’, Items 29 and 30 which refer to efficiency and productivity are perceived to be the same concept and thus there was no need to represent them as separate items. Thus, Item 30 was dropped from the instrument.

One suggestion was offered by expert ‘C’ with regards to the addition of new items to gather greater detail about employee profile. According to her, in addition to Item 4, which represents the job profile rather than job role type another item should be added to collect data about the employee’s job role which can be managerial or non-managerial. This change was later incorporated in the refined instrument. All three experts agreed with the inclusion of a broader range of age groups to represent all employees working at the tertiary institution. The first range of the age scale was thus modified to include employees aged 18-20 years.

Based on comments by Experts ‘A’ and ‘B’, the scale for Item 4 was changed to reflect profiles that the employees were more familiar with. The old scale was replaced with three new

scale measures: “general staff”, “trades and services staff” and “academic staff”. Furthermore, the addition of a new item to collect data about the job role is operationalized with a binary scale to reflect the level of responsibility an employee might have. The scale measures used for the item are “managerial” and “non-managerial”. Based on suggestions by Expert ‘C’, the scale measures for Item 6 were re-worded to reflect a scale that the organization’s employees are familiar with from other intra-organizational surveys. Furthermore, Expert ‘C’ suggested replacement of Item 7 which refers to the degree of portal use with diversity of use. According to her since the portal only acts as a gateway to other service applications thus while accessing these services the employees may not actually be using the portal but in fact the service application. As a result, the degree of use would reflect a false perception of using the portal. In order to measure the newly incorporated item, a different 4 point scale is used. Finally, no comments were offered for the five-point scale used for items to measure the degree of respondent’s agreement with the items in the instrument.

#### B. Instrument Improvement

Based on the feedback received from the domain experts concerning comprehensiveness of scales and items, several changes were accepted and incorporated in the instrument. Table V lists the items refined in the initial instrument.

TABLE V  
REFINED ITEMS

Item #	Revised item	Type of change
3	Educational Background	Change of terminology
6	Indicate your voluntariness of use on the scale below	Rephrased
9	I need to consult online help source or FAQ’s often when using the portal	Change of terminology
11	I find it easy to find the information or services I am looking for on the portal	Rephrased
12	It is easy for me to remember how to access information and perform tasks on the portal	Rephrased
16	The portal helps me spend less time on HR related activities (i.e. via employee self-services)	Rephrased
18	The portal provides information relevant to my role	Change of terminology
22	The portal presents information personalized to my needs	Change of terminology
23	The portal provides me with personalised search functions	Change of terminology
28	The portal has changed my work habits	Change of tense
29	The portal provides capabilities that run counter to my work related values	Rephrased
30	I use the portal in order to enhance my efficiency	Rephrased

According to expert 'C' "academic background" would create confusion with one of the scale measures for the item job role type and thus it was changed to "educational background". Experts 'A' and 'C' viewed the item to measure "voluntariness of use" to be unclear and ambiguous. This item was thus rephrased as "Indicate your voluntariness of use on the scale below". All three experts expressed concern over the use of the term "user manual" in the instrument since such a manual does not exist for that tertiary institution. Thus, in order to retain the item in the instrument, user manual was replaced with "online help and FAQ's (frequently asked questions)" and is reflected in Item 9. Expert 'B' found the phrase "what I want it to do" in the original Item 10 in the initial instrument to be vague and instead suggested that the item be rephrased to "I find it easy to find the information or services I am looking for on the portal". This change is reflected in Item 11 in the refined instrument. In the original Item 11, expert 'A' suggested that the portal is not used as much to perform tasks as it is to access information. To accommodate this suggestion, Item 12 (same as Item 11 in the original instrument) in the refined instrument was modified to include ease of information access using the portal. As per expert 'B', although employee self-service is integrated into the portal, the portal itself only acts as a gateway to the HR related application and thus time saved on HR related activities actually occurs through the employee self-service application which the portal grants access to. Thus, instead of using "e.g. employee self service" the term "e.g. via employee self-service" is used in Item 16. Furthermore, expert 'B' suggested the use of the term "role" as opposed to "work" because access to information and services is offered based on an employee's role in the organization. This change in terminology is reflected in item 18. The subtle difference between the terms "customised" and "personalised" was also highlighted by expert 'B' who explained the difference as "content pushed to the user based on their role is called personalised; customised is when the user can change the look and feel or content". To address this difference, the word customised was replaced with personalised to measure the personalization factor. This is shown as Item 23 (Table V). Experts 'A' and 'C' expressed the need to change the tense while assessing change of work habits to suit portal usage because the instrument intends to measure the compatibility factor in a post-implementation stage. They also viewed the original Item 29 as ambiguous because the word "values" did not convey whether it was personal value or work related values that portal usage opposed. It is hence stated as "work related values" in item 28 in the new instrument. A final common suggestion shared by experts 'A' and 'C' was reconstruction of the item referring to economic gains motive, as a result the item was rephrased to "I use the portal in order to enhance my efficiency".

Apart from the changes reflected in the refined instrument, some of the suggestions made by the experts were refuted because these changes were only pertinent to the specific B2E portal used within the tertiary institution. However, since the

aim of this project is to develop and employ generic instrument, the suggested changes were not incorporated. For instance, experts 'A' and 'C' did not want the item referring to training to be included in the instrument. However, it is argued that training is a vital evidence of organisational support so as to promote portal usage and the item was thus retained. Likewise, as the portal deployed in the tertiary institution does not possess e-commerce capabilities to procure work related items, expert 'A' suggested changing the word "items" in the original Item 16 to "information". This change was not incorporated in the refined instrument because e-commerce enabled purchase is one of the services that a portal can offer and the portal's ability to support this feature must be assessed through the instrument.

To better address the level of responsibility an employee holds while measuring the "job role" moderating variable, expert 'C' suggested the addition of an item to distinguish between an employee's job profile and their role in the organisation. According to her, even academic personnel may hold managerial responsibilities and thus item 5 was added to the instrument. Expert 'C' expressed concern about the employee's knowledge about the degree of portal use because the portal only acts as a gateway to the services offered by the institution to the employees. Thus, an employee may perceive time spent in using different applications as time spent on the portal. In accordance with this view, the degree of usage was replaced with diversity of usage and is reflected in item 8. Although expert 'A' suggested the removal of Item 31 because it was redundant, he offered alternative measures of outcome based motivation such as job performance and effectiveness at the job. This suggestion was found to be in accordance with the instrument developed by Davis [1989] to measure perceived usefulness. Thus, two new items, Items 31 and 32 were adapted from Davis' [1989] instrument to operationalise perceived motivation. According to expert 'A' employees can also find assistance regarding using the portal online through FAQ's and online help. A new item (i.e. Item 34) was added to operationalise help services to accommodate this suggestion. In summary, the revised instrument contains 35 items. Out of them, 31 items were used to operationalise the independent factors, 2 for the dependent variable, and remaining 3 were about user profile.

### *C. Pre-testing: Analysis of Factor Importance*

Those 7 participants who took part at the first phase of pre-testing stage were provided with an explanation for each factor included in the research model. This assessment forms the basis for further refining the instrument in such a way that when a factor is found to be unimportant or irrelevant to the study it will be removed from the model. The participants scored the importance of each factor in influencing B2E portal usage on a scale of 1 to 5 with 1 being least important and 5 being most important. Table VI shows the scores received by each factor. It can be observed that education level (F5) received the lowest score (1.71) in terms of its importance as a determinant of portal usage. Education level was thus removed from the research model but was still retained in the

TABLE VI  
IMPORTANCE SCORES FOR FACTORS GIVEN BY PARTICIPANTS

Participant	Factors								
	F1	F2	F3	F4	F5	F6	F7	F8	F9
A	5	5	3	3	2	4	3	4	4
B	4	5	3	3	2	3	4	4	4
C	5	5	-	5	1	5	3	2	4
D	5	5	5	5	1	3	3	2	3
E	5	5	4	4	2	4	4	4	4
F	5	5	4	4	3	4	4	5	5
G	5	5	2	4	1	5	5	5	4
Mean	4.8	5.0	3.5	4.0	1.7	4.0	3.7	3.7	4.0

Legend: F1 - Perceived ease of use, F2 - Perceived system usefulness, F3 - Compatibility, F4 - Attitude toward B2E portal use, F5 - Education level, F6 - Perceived motivation, F7 - Training, F8 - Help services, F9 - Organization's interest in supporting the portal

TABLE VII  
A LIST OF MODIFIED ITEMS

Item No	Original factor	Revised factor	Revised Item	Type of change
1	PEOU	PEOU	I do not need to consult online help sources or FAQ's often when using the portal	Addition of words "do not"
2	PEOU	PEOU	The portal is easy to interact with	Replaced "rigid and inflexible" with "easy"
3	PEOU	PEOU	It takes me little effort to find the information or services I am looking for on the portal	Replaced "I find it easy" with "It takes me little effort"
4	PEOU	PEOU	It is easy for me to remember how to access information and perform tasks on the portal	No change
5	PSU	PSU	The portal helps me efficiently carry out work related communication	No change
6	PSU	PSU	The portal offers collaboration facility with other employees	Replaced "provides greater" with "offers" and "opportunities" with "facility"
7	PSU	PSU	The portal provides me with ready access to information sources which enables me to find job related information quickly	No change
8	PSU	PSU	The portal reduces the time spent on HR related activities (i.e. via employee self-service)	Replaced "helps me spend less" with "reduces"
9	PSU	PSU	The portal helps me quickly acquire work related items (e.g. office stationery)	Addition of "(e.g. office stationery)"
10	PSU	PSU	The portal provides role-specific (e.g. managerial, academic, administrative) information	Restructured and re-worded item
11	PSU	PSU	The portal provides me with accurate information to fulfill my needs	Added "to fulfill my needs"
12	PSU	PSU	The portal provides up-to-date information	Removed "access to"
13	PSU	PSU	The portal provides single point of access to work related information	
14	PSU	-		Removed from instrument
15	PSU	-		Removed from instrument
16	PSU	Compatibility (C)	The portal provides me with layout and interface customized to my taste	Operationalises a different factor

TABLE VII (CONTINUED...)

Item No	Original factor	Revised factor	Revised Item	Type of change
17	C	C	The portal is consistent with my past experience of using similar web-based systems	Restructured item
18	C	-		Removed from instrument
19	C	C	Using the portal fits well with the way I like to work	No change
20	C	C	My work habits had to be changed to get accustomed to using the portal	Restructured item
21	C	C	The portal provides capabilities that contradict my work related values	Replaced "run counter to" with "contradict"
22	PM	PM	I use the portal in order to enhance my efficiency	No change
23	PM	PM	Using the portal improves my job performance	No change
24	PM	PM	Using the portal enhances my effectiveness on the job	No change
25	T	T	I was provided with the necessary training to use the portal	No change
26	T	T	I attended workshops to learn how to use the portal	No change
27	HS	HS	A specific person or group (e.g. ITS Helpdesk) is available for assistance when I have difficulty using the portal	No change
28	HS	HS	Sufficient assistance in the form of online help and FAQ's is available to me when I have difficulty using the portal	No change
29	OS	OS	My organization collects feedback from me regarding the portal	No change
30	OS	OS	My organization regularly updates the <i>features</i> of the portal	No change
31	OS	OS	My organization updates relevant <i>information</i> on the portal regularly	No change

instrument in order to describe respondents' profile. The remaining 6 factors were retained in the revised model because each received a score which exceeded a value of 3 on a scale of 1 to 5 (3 being neutral).

#### D. Pre-testing: Analysis of Item-to-Factor Association

The second phase of pre-testing was concerned with establishing the strength of association between each item and the corresponding factor that it is supposed to measure. Three participants (as described in the Research Approach section) were selected and were provided with short document containing the definitions of the factors included in the model. A discussion led by the researcher was initiated with all three participants present at the same time. Each participant was asked to match the items with their corresponding factors based on their interpretation of the definitions of factors. The items were modified if even one of the participants classified it into a different factor and the changes were unanimously agreed upon. This activity helped in establishing a shared meaning conveyed by the items such that researchers and

practitioners, who would deploy the instrument in the future, would have the same understanding as of the researcher about the items and the factors they measure. During the discussion session, 5 types of changes were proposed by the participants to establish a consistent association between the items and factors: (a) addition of missing words, (b) removal of words, (c) replacement of words and (d) restructuring the entire item (e) removal of items. Some items were removed from the instrument due to their inability to convey what they measure. Table VII summarises the results of the discussion with the participants.

The changes in the items included in Table VII are explained below. Item 1 was perceived as implying that the portal is difficult to use rather than easy to use and thus it was altered to state that the individual does not need assistance while using the portal. For item 2, the phrase "rigid and inflexible" was found to be unclear as it did not refer to what aspects of the portal exhibited such attributes. Item 2 was thus altered to simplify its meaning. In Item 3, the phrase "I find it easy" was associated with compatibility rather than ease of



use. In order to associate the item with PEOU the phrase was replaced with "It takes me little effort". The phrase "provides greater collaboration opportunities" in Item 6 was viewed as vague because although it implies comparison, it does not state what the portal's capability is being compared to. Secondly, it was suggested that the portal facilitates collaboration and thus provides collaboration facility rather than opportunity. In accordance with these suggestions, the item was changed to "the portal offers collaboration facility with other employees". It was suggested in the discussion that the phrase "helps me spend less time" in Item 8 should be simplified and replaced with "reduces" because it was perceived as redundant. An example of work related items was added to Item 9 because the concept of work related items was not clear. Item 10 was reworded for clarity. According to the participants' suggestions, Item 11 did not clearly state the use of accurate information and thus "to fulfill my needs" was added to the item. As the portal actually serves the information available for employees, the participants suggested removing "access to" in Item 12 as it was redundant. Item 13 was restructured for clarity. Items 14 and 15 were associated with compatibility instead of PSU and were removed because according to the participants personalisation would not yield any work related benefits per se. Item 16 too was intended to measure personalisation but was perceived as strongly associated with compatibility. It was argued that if the portal can be customised to suit one's liking, then it would be compatible with their work preferences. Item 17 was restructured because it was perceived to be vague and did not clearly state the item's intent. Item 18 was removed because it did not address as to how the portal was compatible with specific aspects of an individual's work. Item 20 was reworded to imply compatibility with habits more clearly. Table VIII summarises the number of changes made to the instrument classified according to the types of changes made.

TABLE VIII  
SUMMARY OF CHANGES IN THE INSTRUMENT

Type of changes	No. of changes made
Addition of missing words	3
Removal of words	1
Replacement of words	5
Restructuring the entire item	4
Removal of items	3

## V. DISCUSSION

The initial instrument on B2E portal use which was derived from theory had 35 items for operationalising 9 independent factors and a dependent variable. This instrument was then subject to an examination by domain experts. Based on their feedback, the instrument was improved and the resulting version contained 31 items. The changes however did not affect the underlying research model (Fig. 1). However, both the model and the instrument have undergone changes during the pre-testing stage. For example, education level was removed from the model but the question on education level

was still retained for understanding the profile of participants rather than using it as an independent factor. Another change in the model took place when personalisation (which was considered to be a dimension of 'Perceived System Usefulness') was removed from the model because the participants indicated that the ability to personalise various aspects of the portal would not lead to any job related performance improvement. Furthermore, the items used to operationalize personalization were found to be strongly associated with compatibility. Although this change is incorporated in the research model, no major structural changes were made to the model. Due to the removal of personalisation, the final instrument contained 28 items.

## VI. CONCLUSION

Past research has focused on the benefits and organisational adoption decisions for introducing B2E portals and paid little attention to instrument development efforts associated with portals. As such, no instrument exists that operationalises how various factors affect usage of employee portals in organisations. In this paper, we report on our experience with using a two-staged qualitative research process that has resulted in a 28-item instrument and claim that a detailed description of instrument development and validation has often failed to receive much attention from the IT researchers and our work reported in this paper fills a much neglected but important area research.

The research reported in this paper however suffers from a major weakness. It lacks a numeric evaluation of the psychometric property (e.g. reliability) of the instrument. Further work is currently in progress to address this concern. We also acknowledge the need for additional evaluation of the instrument by undertaking a pilot study in which several employees chosen from various organisations (which have introduced b2e portals) could be invited to participate in a card sorting exercise to further enhance the validity of the construct used within the instrument. We encourage fellow researchers to do so.

The instrument on B2E portal usage has practical as well as theoretical and research implications. In terms of practical applications, a validated instrument provides an important tool for assessing the degree of portal usage by employees in organisations. The low usage may indicate that organisations may be lacking in certain dimensions and it may take necessary corrective actions to encourage usage.

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