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Knowledge Transfer Conceptualization and Scale Development in IT Outsourcing: The Initial Scale Validation

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Abstract

Previous studies focused on business related knowledge transfer from the background of multinational companies and international joint venture with emphasize on factors that impeded the knowledge transfer process. However, empirical research regarding technical knowledge transfer in the context of public agencies IT outsourcing is inconclusive. This occurs because most of the knowledge transfer research approach was in-depth case studies. A few empirical studies that claimed to conceptualize and operationalize the knowledge transfer remain a theoretical conjecture. The use of concepts such as absorptive capacity and knowledge creation as a proxy for measuring the transfer of knowledge raises the shortcoming of the knowledge transfer measurements made in the literature. Therefore, the objective of this study is to identify the knowledge transfer measurement item that suitable with the context of IT outsourcing. Data was gathered through a survey among 180 IT scheme staff at three e-government lead agencies in Malaysia was done. The research employed descriptive and factor analysis to confirm that the measurement is valid as well as reliable. The results of this study confirmed that knowledge transfer in IT outsourcing context is multidimensional construct. As such, the proposed scale of knowledge transfer constitutes a valid and reliable measurement for future use in the scientific community in future empirical research.

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1. Introduction

Academic interest in knowledge transfer has grown rapidly over the past decades. Previous research had focused knowledge transfer effects on organizational learning (Chua & Pan, 2008; Cha et al., 2008), firm performance and innovation (Tsai, 2001). Knowledge transfer, particularly in the context of outsourcing of government IT projects is not well represented in past studies. The main reason for this as argued by Willcocks (2011), is the outsourcing industry itself is still in the early stages of professionalizing, even struggling with developing its own body of knowledge. Furthermore, most previous research has discussed knowledge transfer from the inter-organizational (Easterby-smith et al., 2008; Martinkenaite, 2011) or intra-organizational (Schotter & Bontis, 2009; Wijk & Jansen, 2008) perspectives with emphasis on multinational companies (MNC) (Martins & Antonio, 2010; Shiue et al., 2010), international joint venture (IJV) (Park, 2011) and Universities-private partnership (Alexander & Childe, 2012; Landry et al., 2007). Recent research on knowledge transfer conducted by Chang and Gurbaxani (2012) in IT outsourcing has shown that knowledge transfer gives substantial impact on client productivity. There are only a few studies conducted on the transfer of knowledge in the context of IT outsourcing or offshoring (Williams, 2011; Oshri et al., 2008). Thus, even though much research on knowledge transfer exits, there is quite a gap between the theoretical recommendations and the concrete task of establishing and executing knowledge transfer in IT outsourcing context.

A thorough literature review reveals that past scholars typically measure knowledge transfer from the outcome of the process (e.g. number of patents, spin-off companies) or the input such as expenditures and investment, while ignoring the variety of its dimensions and their impacts. However, the use of the outcome and input perspectives to measure knowledge transfer from vendor to client in public agencies IT outsourcing context is inappropriate and there exist several shortcomings in the extant literature on outsourcing. First, many of the previous knowledge transfer measurements are the manifestation of the absorptive capacity and knowledge creation measurement adapted from the university or manufacturing R&D and MNC’s context; whereby, the focus of R&D in manufacturing and universities are more towards product innovation, commercialization and collaborative innovation. On the contrary, IT outsourcing is characterized by contradicting needs and aim between the client and vendors (Li et al., 2010), low level of R&D (Scarso & Bolisani, 2012) and highly control exercised over the development process in IT. Secondly, the R&D process in manufacturing is entirely control by its internal personnel to fully specify, design and develop the quality control procedures for a product to be assembled (Cha et al., 2008); whereas, in most IT outsourcing project, the internal personnel is unable to completely specify the requirements, design and quality control procedures, leaving the external vendor with more complex set of modularization tasks to complete (Cha et al., 2008). As a result, the loss of learning-by-doing knowledge of the client organizations are more prominent and may be more likely to lead to a disruption of specific domain technical skill among the IT personnel in the client organization. Hence, these differences suggest a need for a more valid measure that captures the multiple dimensions of knowledge transfer. We argued the best way in developing reliable and valid scale for knowledge transfer in IT outsourcing for public agencies is by looking at how the researcher conceptualizes the knowledge transfer using existing theory aligning with the research context to provide a sound conceptual definition. Additionally, past researchers do not align the most critical knowledge in IT outsourcing project with employee skills and project lessons learned to produce solid scale. Therefore, it is crucial to develop and validate knowledge transfer measurement specifically for IT outsourcing context that incorporates the findings from the past research. Thus, in this paper we present the reliable and valid multidimensional constructs of knowledge transfer specifically for IT outsourcing project. This study empirically examines
the effects of knowledge transfer in IT outsourcing on knowledge replication and adaptation routines; and the changes in knowledge or skill based among project team members.

The remainder of the paper is organized as follows. The second section explained in detailed the processes undertake for scale development in this study. We start our first step in scale development by reviewing various conceptualizations of knowledge transfer used by past scholars and justify the definition of knowledge transfer employed by this study. Based upon this literature review, in the third section, we report on the methods for knowledge transfer scale item generation that can be a valuable extension to the simple proxies of absorptive capacity and knowledge creation that are commonly used in the literature. Additionally, in section three, we present the data analysis results based from the self-administered survey method at three federal Malaysia public agencies. The data were analysed using SPSS statistical tools. In the fourth section we conclude with some general suggestions for improving the scale, future validity testing and limitations of the research.

2. Scale Development Process

The main steps taken in developing the scale were adapted from the scale development process outlined by MacKenzie et al. (2011) because those steps strike a balance between depth of treatment and breadth of coverage and had been discussed elsewhere (e.g. DeVellis, 2003). Originally, MacKenzie et al. (2011) outlined ten steps in scale development. However, for the purpose of this study, we only employed four steps since this paper address the initial stage of scale validation. The steps employed in this study are; (i) construct conceptualization, (ii) generation of initial scale items, (iii) pilot testing and scale purification and lastly (iv) data collection and analysis.

2.1 Step 1: Knowledge Transfer Conceptualization

In this research, Knowledge Transfer (KT) is the focal construct considered as latent variable (LV). Hence, as a starting point, we start the conceptualization process by identifying the dimensionality to explain the latent variable. This step is a prerequisite for any scale development process since the process would establish a clear link between generated items and their theoretical domain (Bagozzi, 2011; Bollen, 2011). With reference to this research, the prominent definition cited by previous researchers is originated from (Argote & Ingram, 2000) and (Hansen, 1999) definition of knowledge transfer. Hansen et al. (1999) defined knowledge transfer as a process through which one organization or unit identifies and learns specific knowledge that resides in another organization or unit, and applies the knowledge in other contexts. This definition highlights the process of knowledge transfer starting from the knowledge acquisition from one unit later being learned and applied by other unit in different situation. In a similar vein, Argote and Ingram (2000) refer knowledge transfer as “the process through which one unit is affected by the experience of another”. The use of the term “experience” to denote knowledge distinguishes the transfer of knowledge from not only a transfer of simple data or information (Kumar & Ganesh, 2009) but also constitutes a chunk of conclusions or hypothesis derived from the observed event, interaction and intense emotions. Both definitions acknowledge the absences of the knowledge sender and the receiver. Since then, various researchers have tried to define knowledge transfer from the communication theory lens (e.g. Szulanski & Jensen, 2006). From the communication theory-based perspective, knowledge transfer is conceptualized as more focused, unidirectional communication of knowledge between agents (e.g. individuals, groups, or organizations) such that the recipient of knowledge has a cognitive understanding, has the ability to apply the knowledge or directly applies the
knowledge (Ko et al., 2005; King, 2008). However, those definitions do not specifically explain how and in what way does one unit affect the other. Thus, Easterby-smith et al. (2008) suggested that the effect of inter-organizational knowledge transfer is in terms of the learning and understanding that the second unit experiences in sustaining a competitive advantage. The consequences of learning and understanding process are manifested through changes in knowledge or performance of the recipient unit. Williams (2011) for example took this approach by defining knowledge transfer in terms of mechanisms employed by vendor to gain understanding of their client and utilize the knowledge for the benefit of the client. When knowledge transfer is associated with the organizational dimension or learning, then the knowledge can be spread (Schneider, 2009). For the purpose of this study, we conceptualize knowledge transfer unidirectional communication between the client and the vendor exchange and share their useful information, skill, competencies or routines about the project and both parties is affected by changes in the recipient replication capacity, adaptation capacity and changes in skill or knowledge based that occurs as a function of experience from each other. We note that the term of KT is chosen to embrace rather than to exclude the meanings of the earlier discussed KT concepts.

2.2 Step 2: Knowledge Transfer Scale Items Generation

To date, there are no specific measures for knowledge transfer, especially in the context of IT outsourcing since KT is heavily affected by the types of knowledge, project complexity and outsourcing approach. In echoing to this, the current study attempts to develop a new multi-dimensions measurement scale for assessing the KT in IT outsourcing. From the literature review, we classify KT measurement into three approaches. In the first approach, KT is measured from the various changes at the recipient side (Argote & Ingram, 2000); (i) the changes in recipient’s performance or (ii) the induced changes of recipient knowledge base (iii) changes in collective knowledge that resides in multiple repositories. In the second approach, KT is measured by the outcome and process dimensions. The outcome dimension measures KT from the financial and non financial criteria. From financial criteria, KT is measured by the project cost reduction, stakeholder’s equity, intellectual property or number of patents (e.g. Lichtenthaler, 2010; Perez-Nordtvedt et al., 2008); whilst, for non financial criteria, some researcher measured KT from the number of successful KT engagements during a certain period of time (Li & Hsieh, 2009), marginal change in learning-by-doing knowledge level at certain period (Cha et al., 2008) and frequency of contact with knowledge source (Kang et al., 2010). Basically, the financial and non-financial measurement of knowledge transfer view IT outsourcing as a transactional contract; whereas, IT outsourcing in public agencies is more towards relational partnership (Cha et al., 2008) with a fixed price contract that transfer the risk and obligation to the vendor. Hence, some researcher embarked with the third approach. The third approach measure KT from the learning performance or learning capabilities - the speed, extent, type and nature of the “new knowledge learned” (Martinkenaite, 2011). Predominantly, past researchers measured KT from the outcome perspectives since it is more tangible with accurate supporting data and mostly in documented form compared to process perspectives.

Having argued so, we measured KT in IT outsourcing context from multidimensional routines-based measurement. We focus on the behaviour of the knowledge recipient rather than objective measure such as performance measurement. The ostensible reason for this is, for knowledge to be transferable in an organizational context, it must be linked to human action (Thompson et al., 2009). In this research, we perceived that knowledge replication; adaptation routines and changes in knowledge or skill based are the effects of knowledge transferring activities. We presume that the phenomenon being measure exists in the selected organizations, and therefore items vary, in a sense, when the underlying phenomenon varies.
Empirical evidence confirms that some degree of replication and adaptation gives an impact towards inter-organization KT (e.g. Szulanski & Jensen, 2006; Williams, 2007; Chen & Mcqueen, 2010). Besides, KT is also a manifestation of the changes of knowledge-based or skill-based. Changes in knowledge based is operationalized as client’s efforts toward the goal of generating new ideas, solutions or reinvent practices the vendor held that deemed useful in practice. A client’s commitment to increase their knowledge or skill based will significantly improve organizational competitive advantage and foster ongoing success. This study conceptualized changes of knowledge based from process-outcome view of innovation as suggested by Quintane et al. (2011). The changes of knowledge or skill based measures used in this study are generated from qualitative and quantitative studies done by various researchers (e.g. Williams, 2011; Oshri et al., 2008; Karlsen et al. 2011). Additionally, the development of knowledge transfer measures in this study is also based from Scarso & Bolisani (2012) suggestion. According to them, one way of measuring KT is from measuring the induced changes of recipient knowledge base as the implication of transferring knowledge. With regard to the IT outsourcing, knowledge transfer is measured at the client’s team level instead of individual level. Table 1 lists all 13 pool items for knowledge transfer measurement. The items for replication and adaptation were adapted from previous work; whereas, items for changes in skill or knowledge level is a newly constructed item.

Table 1. Knowledge Transfer Item Measurement

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Items</th>
<th>Data measurement</th>
<th>Adapted</th>
</tr>
</thead>
<tbody>
<tr>
<td>KT1</td>
<td>We tried to manage our application that have been outsourced exactly like our vendor advice</td>
<td>Likert scale ranging from 1= Completely Disagree to 7= Completely Agree [53]</td>
<td></td>
</tr>
<tr>
<td>KT2</td>
<td>We tried to implement suggested practices from our vendor precisely as they existed</td>
<td>Likert scale ranging from 1= Completely Disagree to 7= Completely Agree [53]</td>
<td></td>
</tr>
<tr>
<td>KT3</td>
<td>We tried to imitate standard technical procedures as outlined by the vendor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT4</td>
<td>We spent substantial time making sure the practices that we adopted from our vendor worked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT5</td>
<td>We usually transformed practices from our vendor when we implemented them in our business environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT6</td>
<td>We usually joined ideas from our vendor with internal staff ideas when we adopted new technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT7</td>
<td>We can teach the new implemented outsourced project to other subordinate with the minimum guidelines from the vendor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT8</td>
<td>We have blended hardware and/or software assets with business capabilities to generate a novel process, product or service in our organization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT9</td>
<td>We have enhanced our technical competencies from the IT outsourcing partnership with the vendor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT10</td>
<td>We improved our ability to manage the technology/applications from time to time</td>
<td></td>
<td>Self constructs</td>
</tr>
<tr>
<td>KT11</td>
<td>We reinvent/re-engineer new procedures/process based from the lesson learnt on the previous project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT12</td>
<td>We have learned a great deal about the technology/process know-how held by our vendor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KT13</td>
<td>We have greatly reduced our initial technological reliance or dependence upon the vendor since the beginning of the alliance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4 Step 3: Pilot-testing and Scale Purification

Once the measurement item has been formally specified, the next step is to collect data for the purpose of evaluating and purifying the measures. This research selects respondents from three government agencies (X, Y and Z) as a subset of the overall sampling frame. The respondents are among the top level
management such as Director, Deputy Director, and Chief Director. As suggested by Johanson and Brooks (2009), the suitable pilot testing sample size for instrument development is between 25 to 30 respondents as there is no substantial changes in confidence interval value, even when the number of measured items increases. Therefore, this study collected 32 respondents for pilot testing. As a prerequisite for reliability analysis, the instrument needs to be purified. Purification is a procedure by which the items which do not contribute to the internal consistency of a particular construct are removed. The decision to remove or retain an item is made based on “alpha if deleted” value. The initial total Cronbach’s alpha value for KT was 0.688. Based on the Cronbach’s alpha “if item deleted” values, the authors did several iterations to purify the scale. We deleted two items (KT2 and KT10), after careful consideration of the impact on the construct. The resultant scale had a Cronbach’s alpha of 0.714. The widely-accepted minimum cutoff point is Cronbach’s alpha ranges from 0.60 to 0.7. After purification of all the scales, the instrument had 11 items. These items were subjected to data collection phase for further psychometric property analysis.

2.5 Step 4: Data Collection

The population of this study is ICT scheme personnel of three government agencies in Malaysia; X, Y and Z. Non IT-scheme personnel are not included in this research. These three agencies have been managing e-government IT outsourcing project since 2000 which shows more than 11 years of experience in dealing with outsourcing projects. Non-probability purposive sampling was used in this study due to the limited numbers of personnel involved with the project. This research advocates agencies directory profile which is accessible from the agency’s web site or via personal approach to the agency’s help desk officer or public relation officer. The frame used in this research is accurate as the agency’s directory profile is updated every six months to ensure data accuracy and latest information of the particular directory. A questionnaire using a seven-point Likert scale was used as suggested by Weijters et al. (2010) with endpoint labels without intermediary labels in the data collection stage. A total of 200 purified questionnaires were distributed to the potential respondents. A cross sectional self-administered survey approach was adopted. Both self-completion and interviewer-filled survey techniques were used to receive higher valid response. The process of distribution and collection of questionnaires was carried out over a period of 3 months. All respondents were requested to respond to the survey based on their recent experience in an IT project and all were assured that their response is confidential. A total number of 180 effective responses were obtained from the first stage survey which translates to about a 40.27% response rate. With 180 respondents collected for scale validation, the sample size is deemed enough to achieve a high level of statistical power and sufficient for exploratory factor analysis (Reise et al., 2000). The next section presents the scale validation process.

3. Scale Validation

Different authors disagree on what constitutes an adequate demonstration of validity. Nevertheless, a minimal demonstration of the validity of any variable should probably include the content or face validity of its indicators, the variable's construct validity, and its convergent and discriminant validity (DeVellis, 2003). In this research, all 11 items (refer to Table 1) were subjected to exploratory factor analysis (EFA) a for validation purposes. EFA was employed to assess construct, convergent and discriminant validity of the scores obtained from the instrument.

3.1 Step 6: Exploratory Factor Analysis and validation
Exploratory factor analysis (EFA) is a popular items reduction method used in scale development. The major objective of EFA is to reduce the number of observed variables in order to enhance interpretability. The items will be extracted in different components or observed variables based on the loadings. Subsequently, the components are used as constructs in the corresponding model. In this study, we employed exploratory factor analysis with the principal component extraction method (PCA) and promax rotation, which is by far the most popular type in IS research; whereby, the aim of PCA is to retain as much as possible the original measures’ total variance. Besides, the normal distribution is not a prerequisite for PCA since the data collected for the study is still at the preliminary stage. Finally, we validate the measurement based on three validation criteria: construct, convergent, and discriminate validation.

Table 2. Factor Analysis Result of Knowledge Transfer

<table>
<thead>
<tr>
<th>Component</th>
<th>Adaptation</th>
<th>Skill</th>
<th>Communalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>KT5</td>
<td>5.650</td>
<td>0.728</td>
<td>3.525</td>
</tr>
<tr>
<td>KT3</td>
<td>5.189</td>
<td>0.761</td>
<td>-0.872</td>
</tr>
<tr>
<td>KT4</td>
<td>5.439</td>
<td>0.627</td>
<td>-0.936</td>
</tr>
<tr>
<td>KT11</td>
<td>5.622</td>
<td>0.561</td>
<td>-0.784</td>
</tr>
<tr>
<td>KT9</td>
<td>5.767</td>
<td>0.437</td>
<td>-1.473</td>
</tr>
<tr>
<td>KT12</td>
<td>5.544</td>
<td>0.563</td>
<td>0.395</td>
</tr>
<tr>
<td>KT7</td>
<td>5.400</td>
<td>0.622</td>
<td>-0.389</td>
</tr>
</tbody>
</table>

| Eigenvalues | 2.220 | 1.790 |
| % of variance | 27.748 | 22.369 |

SD: Standard Deviation; SK: Skewness; KR: Kurtosis

Construct validity testifies to how well the results obtained from the use of the measure fit the theories around which the test is designed. Constructs reliability can be accessed using item loadings. We used a cutoff value for loadings of 0.6 as significant in order to increase scale validity (Hair et al., 2010). The item that is below the cutoff value is deleted. Each scale considered has an equally reliable effect items of construct are interchangeable. With this assumption, all items are reflecting the same underlying construct, sampled from the same conceptual domain and can represent all aspects of it. This entails that deleting one or two equally reliable items from the measurement model should not alter the meaning of the construct (MacKenzie et al., 2005). The result of EFA analysis is summarized in Table 2. The analysis extracted two components, each with eigenvalues above one, which explain 50.12% of the total variance. The KMO was 0.697 indicating sufficient sample size based on Kaiser’s and Bartlett’s test of sphericity was significant (chi-square=217.783, p<0.000). However, based on the pattern component matrix, out of the 11 items, one item was dropped (KT13) due to the low loadings (below 0.5). First component was renamed as adaptation while second component was named as changes in skill-based. Adaptation components constitutes four items (KT3, KT4, KT5 and KT11). Changes in skill based constitutes of three items; KT9, KT 12 and KT 7. The results also show that all the items of the scale load more on their respective constructs than on the other constructs, thus confirming construct validity.
Once item validity and reliability have been assessed, the next step is to evaluate convergent validity. Convergent validity of a construct is confirmed when the construct is measured by multiple indicators. For convergent validity, again we employed factors analysis within the earlier determined factor in order to obtain a more in-depth judgment of the dimensionality of the construct under study. Convergent validity is established when items all fall into one factor as theorized. All the three components displayed unidimensionality with adaptation dimension exhibits KMO value at 0.698 explaining 52.24% of the variation; while changes in skill-based dimension indicates KMO value as 0.578 explaining 50.25% of the variation. Thus, the analysis provided evidence of convergent validity. Finally, we proceeded to test the discriminant validity. The discriminant validity is the degree to which items differentiate among constructs or measure distinct concepts. A bivariate correlation analysis was done on the two components generated from the factor analysis and the result is presented in Table 3. In this analysis, we tested the measurement against IT outsourcing success construct. As can be seen, all components are not perfectly correlated where their correlation coefficient value is 0.005. This indicates that, each dimension measure unique characteristics based from the tested item. Hence, we can conclude that discriminant validity has been established.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Adaptation</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptation</td>
<td>5.475</td>
<td>0.487</td>
<td>1.000</td>
<td>0.005</td>
</tr>
<tr>
<td>Skill-Based</td>
<td>5.570</td>
<td>0.382</td>
<td>0.005</td>
<td>1.000</td>
</tr>
</tbody>
</table>

4. Discussion and Conclusion

The initial development has shown an acceptable measure of knowledge transfer that can be enhanced. All components show that the proposed scale of knowledge transfer constitutes a valid and reliable measurement, making it appropriate for use in the scientific community in future empirical research. The results of this study follow those obtained by Williams (2007), which indicate that knowledge transfer in IT outsourcing is a process composed of knowledge adaptation routines. Further, we enhanced knowledge transfer measurement by incorporating the changes in skill or knowledge based among the IT staff. The study outlined the procedures involved in the development and validation of an instrument to measure the knowledge transfer of IT outsourcing project team members, specifically to the Malaysian public agency context. The new measurement instrument was constructed and validated following the most frequent recommendations in the scientific literature on the development of scales in the IS research. We operationalized the knowledge transfer construct based on the review of literature pertaining to theories of communication and organizational learning. From the foregoing, it can be concluded that the theoretical and practical contribution of this paper is important. From a theoretical perspective, the paper reduces the problem of measuring and identifying the dimensions that shape knowledge transfer. Besides, the study incorporates construct validation or scale development process based from Mackenzie et al. (2011) seminal paper in MIS and behavioural research; thus guarantees a rigorous empirical validation and methodological process. From a practical point of view, this instrument develops empirical research much needed in the academic community that includes some of the dimensions of knowledge transfer.

This research has several limitations that suggest further possibilities for empirical research. First, this research lack of criterion validity. Criterion validity can be confirmed when the scale being tested in
different situations or context. Cross-validation of the psychometric properties in different setting are important especially when researchers develop a new scale for example changes in skill or knowledge developed in this study. Second, this scale is only tested using limited sample size for initial validation. Future studies should be based on larger samples and different sector, preferably in private organization which has different environment of managing the outsourced technologies or applications. Third, the cross-sectional nature of the research into a dynamic concept allows analysis of the teams’ situation at only one specific point in time, not their overall conduct over a period of time. Other research recommends using an additional time lag in data collection, but this was not possible due to cost and time constraints. Future research should focus on a longitudinal study to see the absolute changes in knowledge and skill as the implication of transferring knowledge. Further, empirical papers, especially longitudinal studies, supporting (or rejecting) these results in different contexts about the three constituents of knowledge transfer would be welcomed. Finally, this paper had presented steps and types of information needed to show the validity and reliability of the measures used in survey research.

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