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**KEY VARIABLES IN SMEs ELECTRONIC DATA INTERCHANGE ADOPTION: THE EXPERTS' PERSPECTIVE**

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**ABSTRACT**

*Studies on the adoption of Electronic Data Interchange (EDI) in developing countries are just starting to emerge, and most are exploratory in nature. Progress has been made in developing conceptual models and on the comprehension of adoption of EDI from the IT Manager's perspective. However, in order to validate the conceptual model of EDI adoption in Jordan, a reliable and valid questionnaire instrument has yet to be developed. Therefore, the aim of this research are: first, to examine content validity (CV), and , pre-test (PT) a questionnaire instrument. Second, using the questionnaire, this project seeks to identify issues that face IT Managers working in EDI adoption; to determine factors that have already been identified as affecting IT Managers in EDI adoption; and to perform a pre-test on the results of the questionnaire in order to gain feedback and make modifications before completing the questionnaire for data collection. Primary elements for each factor were determined from both information system adoption literature and antecedent exploratory studies on EDI adoption. Validation of elements identified was achieved using variations of a quantitative related to content validity. The outcome was a result of content validation that is also discussed. Finally, the article focuses on the limitations of content validation, then looks at possible future research directions in EDI adoption.*

**KEYWORDS**

EDI, Adoption and Content validity.

**1. INTRODUCTION**

The EDI standard is a term that describes the means by which automatic, inter-organizational computer-to-computer communication is facilitated (Becker, 2012). EDI is also a business strategy that utilizes technology to achieve business objectives and enhance business relationships. In order to realize the economic benefits that EDI offers, Jordanian SMEs have established ambitious targets for its adoption. However, while the technology has been available for more than a decade, the adoption rate in Jordan is extremely low. This suggests that the current strategies for adopting EDI are constrained by demand-side factors (Musawa & Wahab, 2012). The issue of demand constraint factors gives researchers an opportunity to examine the issues associated with EDI adoption. Specific studies on EDI adoption are scarce, and most are exploratory in nature. Progress has been made toward developing conceptual models for IT managers' adopting EDI. However, a reliable questionnaire instrument that will allow the examination of the conceptual model of EDI adoption in Jordan has yet to be developed. Validating the final data collection instrument is a critical step before examining model EDI adoption (MEDIA). This is because the rigor of positive outcomes through quantitative research is depends validation of the questionnaire used to collect the data (Straub, Boudreau, & Gefen, 2004).

The purpose of this article is to show content validity and pre-test the EDI adoption questionnaire instrument for this research. This aim is broken down into three sub-aims, which are as follows:

- (i) Identify factors that affect IT Managers in the domain of EDI adoption
- (ii) Determine whether the factors affect IT Managers in the domain of EDI adoption
- (iii) Perform a pre-test on the resulting questionnaire to determine whether the questions are comprehensible to participants and to obtain feedback for modifications and improvements.

By meeting these aims, this article will produce a reliable measure for researchers who hold a particular interest in the study of EDI adoption from an IT Manager's point of view. The questionnaire instrument established in this article is expected to provide assistance to the overall intent of adopting EDI in order to encourage its adoption. This article also contributes to theory by emphasizing the implementation of content validity in a new context.

After having introduced the subject, this article will proceed to provide a short summary of antecedent research literature that addresses EDI adoption in Section Two. Section Three provides a brief summary of the content validation method, and Section Four presents a brief summary of the methods used to perform content validation and the pre-test study. The outcomes of the content validation and pre-exam study are offered and discussed in Section Five, and finally, the limitations and possible future research directions are presented in the concluding section.

**LITERATURE REVIEW**

This article uses secondary literature to define core terms such as EDI, IT Manager and adoption. Musawa & Wahab (2012), for example, said the (EDI) standard is unambiguous, independent of any particular machine, and flexible enough to handle most simple electronic transactions. They say that EDI is standardized computer (application system) to computer (application system) data exchange in electronic formats between companies. According to Gramignoli, Ravarini, & Tagliavini (1999), an IT manager is someone who has the ability to develop dependable and cost-effective software applications, to supervise a reliable and responsive data-process, to effectively manage IT human resources, and to integrate business strategy with the IT planning process.

A review of the literature showed very little research on EDI adoption by SMEs, particularly in Jordan. One recent study carried out by Musawa and Wahab (2012) focused on SMEs adoption context, and looked at three factors as determinants of EDI adoption: perceived benefits, organizational readiness and perceived pressure. The study was carried out in Nigeria, and so explored the Nigerian context, but it did not include a behavioural intention variable. Stapleton and Fouopilemouchele (2011) used a case-study approach based on institutional isomorphism theory to draw up theoretical propositions and test the strength of the theory in explaining EDI adoption in Cameroon. Nurmilaakso (2008) investigated the organizational and technological factors that can explain the adoption of e-business functions in European companies and migration from EDI-based to XML-based e-business frameworks. Leung and Law's (2009) study examined the adoption of EDI among hotel systems, examining specifically management support for IT departments in a sample of Hong Kong hotels. Leung and Law's (2012) model includes factors like perceived benefits, external pressure, and organizational readiness in terms of how they affect EDI adoption. Within organizational readiness the study included financial resources and IT competence, and adds IT managers' attitude toward and awareness of EDI. Although the earlier study examined the adoption of EDI, it lacked a theoretical underpinning, since it was a data-led study. The second was a case study, and was therefore also exploratory in nature.

An analysis of EDI adoption studies shows that although researchers have begun to examine EDI adoption, studies are still exploratory in nature. Without using validity measures, including content validity, to develop a reliable questionnaire instrument, the outcomes and interpretations may or may not correspond to an actual situation. This research is still in progress and should lead towards a confirmatory study by developing and validating a questionnaire that uses a content validity method.

**1.1 EDI ADOPTION FACTOR**

The methods used in this research were adopted from the EDI adoption model proposed by Benbasat and Dexter (1995), and the model of understanding information technology usage proposed by Taylor and Todd (1995). Acovou *et al.*'s (1995) model combines research on adoption of innovation theory (Rogers, 1983), which developed a model looking at three aspects of EDI adoption influences: technological factors (perceived benefits), organizational factors (organizational readiness), and environmental factors (external pressure) (Figure 1) as the main reasons for EDI adoption, and examined the model using seven

case studies. Taylor and Todd's (1995) theory is derived from the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). A list of the different theories and approaches is offered in Table 2.

## 2. VALIDATIONS IN INFORMATION TECHNOLOGY RESEARCH: CONTENT VALIDITY (CV)

Although the use of statistical techniques such as content validity, pre-test, pilot study, factor validity, reliability and statistical conclusion validity are critical in maintaining a rigorous research program, they are rarely (particularly content validity) applied in the majority of information system studies (Van Slyke, Johnson, Hightower, & Elgarah, 2008). Since content validity is a major focus of this research, more discussion is offered in the following sub sections. Content validity is defined as the "degree to which items in an instrument reflect the content universe to which the instrument will be generalized" (Boudreau, Gefen, & Straub, 2001). In general, content validity involves the evaluation of a new survey instrument in order to ensure it contains all essential items and eliminates undesirable items of a particular construct domain (Boudreau, et al., 2001; Kitchenham et al., 2002). Although content validity is a highly desirable and recommended practice that ensures rigor in any empirical research (Boudreau, et al., 2001), its application is limited in information system research (Straub, et al., 2004). Examples of a few studies that have utilized the content validity approach are: Pavlou, Liang and Xue (2007), Halonen (2007), Torkzadeh and Dhillon (2002), Smith, Milberg, and Burke (1996), Lewis, Snyder, and Rainer (1995), Moore and Benbasat (1991), and Davis (1989). However, it is not widely used in any of the previous studies that focus on EDI adoption related issues. Although only two approaches that comprise judgmental and statistical information are available to determine content validity, its application is unique to each study (Chang, Torkzadeh, & Dhillon, 2004). The application of content validity differs in terms of when it is used, how it is conducted, and how experts evaluate the content. The judgmental approach to establish content validity involves literature reviews and then follow-ups with the evaluation by expert judges or panels. The validation of items is based on a high degree of consensus on the items in question; thus, it is judgmental in nature (Davis, 1989; Moore & Benbasat, 1991; Smith et al., 1996; Torkzadeh & Dhillon, 2002; Kitchenham & Pfleeger, 2002; Straub et al., 2004). An empirical or quantitative approach was first introduced by Lawshe (1975), and involves estimating the statistical validity ratio (Lawshe, 1975; Lewis, et al., 1995). The judgmental approach of content validity procedure requires researchers to be present alongside experts in order to facilitate validation. Therefore, it is also sometimes called "face validity" (Wacker, 2004). However, it is not always possible to have multiple experts of a particular research topic in one location. When experts are located in different geographical areas, it poses a limitation to conducting validity on a survey instrument. In contrast, a quantitative approach allows researchers to send content validity questionnaires to experts working in different locations; meaning distance is not a limitation. In order to perform content validity for EDI adoption research a quantitative approach is considered more suitable in comparison to a judgmental approach (Lewis, 1995; Lawshe, 1975). This is because EDI adoption studies are still emerging; academic experts are few and located in different places. Therefore, the quantitative approach has been pursued in this research is discussed in the next section.

## 3. RESEARCH METHOD

Content validity of the EDI adoption instrument was performed using a quantitative approach (Lawshe, 1975). With regards to information system research, the approach was successfully applied to validate information resource management instruments (Lewis, et al., 1995). In order to validate the content of EDI adoption survey instruments using the quantitative approach (Lawshe, 1975; Lewis et al., 1995) the following steps were taken: a sample of items for each construct was identified by employing an exhaustive review of the literature on technology adoption, specifically, EDI adoption. The literature review led to the identification of a total of 97 items for adoption, 32 items for usage and 24 items for impact related constructs. A content validity questionnaire was then generated that comprised definitions of constructs and associated items on a three-point Likert-type scale. The identified experts with experience in EDI adoption were then approached. A total of 12 experts were identified. The content validity questionnaire was then sent to the experts as e-mail attachments. The purpose of the study and instructions to complete the questionnaire were detailed in a covering e-mail. The experts were asked to rate each item's relation to different constructs of EDI adoption on a 3-point scale: "1=not necessary"; "2=useful but not essential"; "3=essential". They were also asked to provide comments on items that were not understandable or to note if items needed to be reworded or new items need added. Responses from all experts were then collated by counting the number indicating "essential" for each item. For the each item, the content validity ratio (CVR) was estimated and evaluated for a statistical significance level of 0.05. This was done using Lawshe's (1975) method mentioned in the previous section. The items that were eliminated from the list were not significant at the 0.05 level. The list of items along with CVR values is presented and discussed in Section 5 (see Tables 1 and 2). A pre-test of the resulting instrument was conducted with respondents from EDI industry, academics and researchers, as well as individual IT Managers. The respondents were asked whether they could understand the wording of the questions and to suggest improvements. The outcomes of the pre-test are provided in the following section.

## 4. OUTCOMES AND INFORMATION SYSTEM DISCUSSIONS

Due to space limitation an inclusion of the complete list of items with CVR and the final questionnaire is not possible within this paper. However, a brief summary of CVR is provided in Tables 1 and 2. The CVR questionnaire was comprised a total of 39 items, of which 17 were perceived benefits, 13 organizational factors, five environmental factors, three intention factors, and one adoption-related factor. The findings presented in Table 2 illustrate that of the 17 listed perceived benefits, 10 were considered essential for the final questionnaire by the majority of respondents, as the CVR value was significant at 0.05. From the total of 13 organizational factors, only seven were considered essential, and only four environmental factors elements were considered essential.

TABLE 1: SUMMARY OF CONTENT VALIDITY RATIO

CVR	AI
0.99 - 1	13
0.89 - 0.98	0
0.79 - 0.88	12
0.69 - 0.78	0
0.59 - 0.68	2
0.49 - 0.58*	6
0.39 - 0.48*	0
0.29 - 0.38*	4
0.19 - 0.28*	0
0.09 - 0.18*	2
0 - 0.08*	0
TOTAL	25
RLH	0
GRAND TOTAL	39



Table 2 illustrates the overall items, average CVR and average mean for each construct. The average CVR value for the seven constructs fell between the minimum value of 0.18 and maximum value of 1 at the 0.05 level of statistical significance. This illustrates that the constructs possess a high level of content validity, which means that the items are representative of construct universe (Table 2).

TABLE 2: SUMMARY OF FACTORS, TI, SI, ACVR AND AM

Factors	TI	SI	ACVR
Behavioural Intention	3	3	1
Direct benefits	10	5	.60
Indirect benefits	7	5	.79
Financial resources	8	4	.69
Technological resources	5	3	.77
External pressure	3	2	.78
Internal pressure	2	2	.92
Adoption	1	1	1
Total	39	25	

The experts also provided a number of suggestions regarding rewording. These suggestions were incorporated during the pre-test questionnaire design. However, due to space limitations discussion of improvements is not included within this paper. Also, the experts agreed that for the final questionnaire, the seven-point Likert scale would be more suitable in comparison to the five-point Likert scale. This is because seven-point Likert scale values are widely spread in comparison to five-point Likert scale and it gives more choices. This change will prevent a respondents' bias, which occurs when respondents select only a neutral value. Therefore, the seven-option Likert scale will be used for the final study. The experts who evaluated the content of the instrument came from several countries, namely, Jordan, the KSA, Egypt, Syria, Iraq and the UAE. Therefore, the content of the questionnaire is not only valid for Jordan, but for the aforementioned countries as well. Therefore, in order to conduct a comparative study it may be possible to pre-test and further validate the questionnaire in the context of a number of countries such as the KSA, Syria and Iraq. The findings also suggest that the content validity experts rated essential mainly those items that were adopted from the previous exploratory studies on EDI adoption (Benbasat & Dexter, 1995; Dwivedi, Choudrie, & Brinkman, 2006; Musawa & Wahab, 2012; Taylor & Todd, 1995). In contrast, the items adopted from the general technology adoption studies (Davis, 1989) were mostly rated but considered not essential. This study thus confirms that the items investigated in the exploratory studies are important in order to understand IT Managers' EDI adoption behavior. The pre-test respondents supported the content of the questionnaire. However, they noticed a few spelling and typographical errors. The respondents also expressed concern about the length of the questionnaire. They suggested that the current questionnaire might be too long and lead to a low response rate. Therefore, the length of the questionnaire should be reduced without losing measurement content. Following the responses from pre-test participants, a number of changes were incorporated.

#### 4.1 REMAINING RESEARCH WORK

The confirmatory study that will investigate EDI adoption must be completed, the next step is to conduct a pre-test of the questionnaire using respondents from a target sample. The primary aim of the pilot study will be to determine the initial response rate, and to ensure appropriate levels of the initial scale reliability. Further, the pilot could alert researchers to any difficulties that respondents might face when completing the questionnaire. For example, whether the questionnaire's length, wording and the instructions are optimal to ensure completion (Dwivedi, et al., 2006). Following the pre-test, an appropriate sample frame will be considered in order to select survey participants. In the context of Jordan, the SME is considered the most appropriate sample frame. This is because there is an exhaustive list of SMEs using EDI in Jordan and regular updates can be provided. The sampling techniques will be determined according to the type of sample frame. For example, if one has to draw a random sample from the SME list, it is appropriate to consider a stratified random sampling technique. This allows selection of participants from all districts, wards and sub wards. In order to generate enough data, determination of an appropriate sample size should be based on the initial response rate obtained from the pilot. Once the above steps are completed the questionnaires will be administered and monitored for response rates. If necessary, a reminder will be sent to participants after two weeks. Late responses will be considered to examine for a non-response bias.

## 5. CONCLUSIONS

This research is an initial step towards a confirmatory study that examines EDI adoption in the IT Manager context. Further, this study validates the contents of a survey instrument using a quantitative approach. It also pre-tested the survey questionnaire, which was formed using content validation. Although this is an initial step towards the confirmatory study, the paper contributes to both theory and practice. This paper contributes to theory by confirming the application of the content validity approach in a novel context. The survey instrument developed and validated in this research paper will contribute to practice by assisting professionals from the EDI community. This will be fulfilled by this research since it aims to demonstrate how an improvement in the use of EDI and in turn its IT Manager base can be obtained. This can also provide assistance to policy makers by showing how a reduction in EDI rejection can be achieved. The survey will help explain the reasons of non-adoption, and formulate a plan for accelerating the adoption process. The final survey instrument will also help researchers interested in examining the adoption of new e-presentation standards within IT Manager contexts in developing countries.

## 6. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Since the content validity questionnaire set out a definition of each construct and related items, it increased the length of the instrument. For example, the content validity instruments in this study were 10 pages long. This discouraged many experts from participating in the content evaluation at first instance. Since the number of experts who validated the content was few, the generalizability of the findings is limited. However, conducting a confirmatory study will overcome this problem and provide an opportunity to do further analysis. Although this study is focused on utilizing a quantitative approach, it is also advisable to employ qualitative methods such as observation and interviews to investigate the EDI adoption. It will help to obtain in-depth and diverse views of IT Manager adoption and will complement the findings obtained from quantitative study.

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