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Computer technology adoption in Saudi Arabia: Correlates of perceived innovation attributes

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Abstract. In this paper we investigate how perceived attributes of computer technology influence its rate of adoption in the workplace. In order to achieve this, the diffusion of innovation literature was reviewed looking for a set of common attributes that could be responsible for the largest rate of adoption. The literature suggests that Rogers' five attributes of innovation namely, relative advantage, compatibility, complexity, trialability, and observability explain up to 87% of the innovation rate of adoption. About 1200 knowledge workers in 56 public and private medium and large organizations across Saudi Arabia of different managerial levels and spanning a wide spectrum of industries and services have participated in this study. The findings highlight the role and direction of these factors toward computer technology adoption in developing countries. This should help decision makers in this part of the world cultivate the positively correlating factors to enhance computer technology adoption while trying to reduce the effects of the negative factors. We contend that the findings are also valuable for practitioners from western cultures in applying computer-based information systems solutions to developing countries.

1. Introduction

The emergence of computers and information technologies has been perhaps the single biggest factor impacting organizations during the past three decades [21,40]. As computers move from traditional data processing to the desktops of managers and operating clerical level personnel in user departments, organizations face a host of new problems and opportunities [40]. Many researchers and practitioners pose questions like "how are these resources being used?" and "is the proliferation of information technologies leading to greater productivity, better decision-making, and competitive advantage?"

Information technology (IT) can have an important role in leveraging productivity and efficiency in various organizations – government and private alike. Organizations with successful IT adoption and implementation processes would generate significant performance gains [11,18,27]. For example, Hirschheim [18] found productivity gains between 15% and 340% in a survey of empirical studies that investigated productivity levels prior to and after IT implementation.

These potential gains in productivity should compensate for the high investment cost in IT. According to the Organization for Economic Cooperation and Development (OECD) Information Technology Outlook 2000 [30], the world IT market (hardware, software, and services) grew at an annual rate of 8% between 1990 and 1997. By the year 2000, the projected worldwide revenues of IT producers exceeded 735 billion US dollars. The statistics reported by OECD show that developing countries are far behind developed countries in spending on IT acquisition.

Nevertheless, developing countries are increasingly deploying IT to solve their developmental problems. Lending by the World Bank for IT has been growing at six times the growth rate of total Bank lending, and is present in 90% of Bank's lending operations [17]. However, while the provision of the technology is a necessary condition for achievement of the benefit which IT can bring, there is mounting evidence to suggest that this in itself is not sufficient. Changes are required in the behavior of individuals and organizations also [25].

Moreover, various studies have shown that computer-based information systems can lead to significant productivity gains, cost reduction, and competitive advantage; yet their introduction has met with resistance in many organizations [11,16,18,19]. This resistance was manifested in significant underutilization of computer resources that hinders reaping their benefits toward sustainable development for their societies.

For Saudi Arabia, productivity gain is not the only attraction for IT. IT plays a vital role in limiting the demand for labor in general and semi-skilled labor in particular [1]. It is the recent policy for the Arab Gulf States to control the flow of foreign labor as several negative economic and social effects have started arising. Observers are expecting some tremendous growth in the Saudi IT market in the next few years to come. The advent of the Internet and electronic commerce would be an important catalyst for individuals and organizations for the adoption of IT to their competitive advantage.

Yavas et al. [42] conducted a study based on a survey of professionals, examined the efficacy of the opinion leadership approach in accelerating the acceptance of computers in Saudi Arabia. The opinion leadership approach, in a nutshell, is an interpersonal communication approach from superiors/experts to subordinates/amateurs. It is claimed that communicating to the potential adopters through an opinion leader (a form of interpersonal communication) enhances the effectiveness of the message [42]. Yavas et al. findings indicate that the approach is promising, as opinion leadership expressed greater satisfaction with computers that could be crucial as change agents in the diffusion process. A more recent study by Al-Khaldi and Wallace [6] regarding the influence of attitudes on PC utilization among knowledge workers found that facilitating conditions, co-workers and management support play important roles in the adoption of PCs.

The literature on information technology and developing countries includes both optimistic and pessimistic opinions as well as critical and apologetic views of changes and forces driving them [29]. The literature suggests that the slow IT diffusion in developing countries could be attributed to poor infrastructure, high costs, language barriers, social factors, and politics contributing impediments to the process. However, the diffusion of innovation research offers a concise set of potential contributing factors that accumulates across different innovations and disciplines. Within this framework this study aims to examine innovation attributes as potential contributing factors to computer adoption in Saudi Arabia.

The rejection of computer technologies is a notable problem that called upon researchers in the field to be occupied for a long time investigating its precedents and determinants. They would name it "causes of systems failure", "motivations and inhibitors", or "critical success factors" in a positive connotation. Major researched success factors can be categorized in three groups: individual, organizational, and technical. The latter group of factors is the main concern of the current study trying to identify most potential technical factors and their relationships to computerization in developing nations.

Research into IT adoption and diffusion has been motivated by the desire to predict the factors, which lead to adoption and use [38]. Over the last two decades, this area of study has received a great deal of attention and has accumulated abundant research. For instance, a literature review by Prescott and Conger [31] included 70 articles on IT adoption and use based on the diffusion of innovation (DOI)

paradigm alone. In fact, of the one hundred studies on IT adoption and use, covered in two recent literature reviews [31,38], none were carried out in developing countries. A newly cited study by Rose and Straub [33] with its extension Straub et al. [36] for predicting general IT use, researched eight countries of the Arabic world. Thus, a study of this phenomenon in the developing countries has been severely limited.

Thus the current study was set to investigate a set of technical factors and how they correlate to computing technology adoption in developing nations. The study uses diffusion of innovation theory to investigate factors that may influence computer adoption and use. More specifically, the objective of this research is to study the correlates of perceived computer technology innovation attributes with its adoption. Five attributes of innovations, identified by Rogers [32] in his seminal work "Diffusion of Innovations", that best determine their rate of adoption were relative advantage, compatibility, complexity, trialability, and observability. These five attributes are investigated in relation to computer technology adoption in Saudi Arabia. In this regard, knowledge workers' perceptions in fifty-six public and private medium and large organizations of different managerial levels across Saudi Arabia and across a wide spectrum of industries and services are being sought in our study.

An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption [32, p. 11]. A computer is a good example of an innovation resembling an object innovation that is perceived as new by an individual or an organization. Rate of adoption is the relative speed with which members of a social system adopt an innovation. It is generally measured as the number of individuals who adopt a new idea in a specific period, such as an year [32].

2. Innovation attributes

The perceived attributes of an innovation are important parts of the explanation of the rate of adoption of an innovation. Innovation characteristics research describes the relationship between the attributes or characteristics of an innovation and the adoption and implementation of that innovation [32,41]. Recently, researchers in IS have begun to rely on the theories of innovation diffusion to study implementation problems [3,9,12,24,31,34]. A major focus of these studies has been how potential users' perceptions of an IT innovation influence its adoption.

In determining what attributes to examine in this research, the researcher relied primarily on the extensive work of Tornatzky and Klein [41], Rogers [32], Davis [14], and Moore and Benbasat [24]. They will be discussed in the subsequent paragraphs.

In a review of 75 articles concerned with innovation characteristics and their relationship to innovation adoption and implementation, Tornatzky and Klein [41] found that three innovation characteristics (1) relative advantage (2) compatibility and (3) complexity, had the most consistent significant relationships to innovation adoption. They found that compatibility and relative advantage were both positively related to adoption while complexity was negatively related to adoption.

Rogers' seminal work "Diffusion of Innovations" [32] is one of the most often cited reviews of the perceived innovation characteristics literature. Rogers, in a survey of several thousand innovations studies, identified five antecedents – *relative advantage*, *complexity*, *compatibility*, *observability*, and *trialability* – affecting the rate of diffusion of a technology. Rogers argues that up to 87 percent of the variance in rate of adoption is explained by these five attributes. Following are the definitions of Rogers' five attributes and brief comments on them.

Relative advantage: the degree to which an innovation is perceived as being better than the idea it supersedes. The degree of relative advantage is often expressed as economic profitability, social prestige,

or other benefits. Rogers suggests that the relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption. Diffusion scholars have found relative advantage to be one of the best predictors of an innovation's rate of adoption [32, p. 216]. Relative advantage indicates the benefits and the costs resulting from the adoption of an innovation.

Compatibility: the degree to which an innovation is perceived as consistent with the existing socio-cultural values and beliefs, past experiences, and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter and fits more closely with the individual's life situation. Rogers suggests that the compatibility of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.

Complexity: the degree to which an innovation is perceived as relatively difficult to understand and use. Any new idea may be classified on the complexity-simplicity continuum. Some innovations are clear in their meaning to potential adopters whereas others are not. Rogers further suggests that the complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption.

Trialability: the degree to which an innovation may be experimented with on a limited basis. The personal trying-out of an innovation is a way to give meaning to an innovation, to find out how it works under one's own conditions. This trial is a means to dispel uncertainty about the new idea. Rogers suggests that the trialability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.

Observability: the degree to which the results of an innovation are visible to others. The results of some ideas are easily observed and communicated to others, whereas some innovations are difficult to observe or to describe to others. Rogers gives an example of the software component of computers to explain the observability of an innovation. He argued that the software component of a technological innovation is not so apparent to observation, so innovations in which the software aspect is dominant possess less observability, and usually have a relatively slower rate of adoption. The observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.

Fred Davis developed a Technology Acceptance Model (TAM) in 1986, which was quite similar to the DOI model. Davis [14] included two constructs, perceived usefulness and perceived ease of use, which were as follows:

Perceived usefulness: the degree to which an individual believes that using a particular system would enhance his or her job performance.

Perceived ease of use: the degree to which an individual believes that using a particular system would be free from physical and mental efforts.

The similarities between these constructs and Rogers' perceived relative advantage and perceived complexity are clear. Usefulness and ease of use are both believed to be important factors in determining acceptance and use of information systems [19,22,23].

Moore and Benbasat [24] developed an instrument to measure the perceptions of adopting an IT innovation. They identified two further constructs beyond Rogers' classification, which were thought important in the decision to adopt an innovation: image and voluntariness of use. Their conclusion confirmed the importance of the five attributes suggested by Rogers. However, the two new constructs need to be further investigated both theoretically and empirically across several innovations to be consistent attributes or otherwise. Thus they were not included in this study.

The main constructs of interest in this study are the perceived attributes to adopt and use an innovation. The perceptions of using the innovation (like, computers) are of interest rather than the perceptions of the innovation itself, because the behavior of individuals is predicted by how they perceive the primary

attributes of the innovation [24]. Because different adopters might perceive primary characteristics in different ways, their eventual behaviors might differ. The importance of perceived attributes in diffusion research is clear and unquestionable. In determining what attributes to examine while recalling the efforts of Davis [14] and Moore and Benbasat [24], we relied primarily on the extensive work of Rogers [32]. Rogers' five attributes of innovations are believed to be most suitable, as a variety of diffusion studies had shown that they consistently influence adoption. These five attributes of innovations are being investigated to understand their relationships with computer adoption in Saudi Arabia.

Thus for the current study to be consistent, while being broad and comprehensive in terms of which innovation attributes to include and terminology to use, we decided to use Rogers' five constructs. They were chosen given their intuitive appeal and wide recognition across several innovation studies and variety of disciplines.

2.1. Computer technology adoption

Adoption and voluntary use of information technology by managerial, professional, and operating level personnel as users is deemed a necessary condition for its success, and resistance to computer systems by managers and professionals is a widespread problem [8,15,16,19]. Davis [15] argues that lack of user acceptance has long been an impediment to the success of information systems, which, if avoided, would improve performance on the job as the goal of most organizationally based information systems.

End users are often unwilling to use available computer systems that, if used, would generate significant gain [15,16,19,27]. Understanding why people accept or reject information technology is the first step toward the solution of the problem. Researchers in the field have been occupied in the last two decades predicting the determinants of IT adoption and use. Rogers [32] argues that perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation.

Adoption leading to usage is often the pivotal factor and a central focus of MIS implementation research in determining the success or failure of an IT product [15,16,19,39]. Two popular surrogates were frequently used in the IS research to measure adoption, namely, user satisfaction and usage. The latter was used as a primary indicator in our work to measure computer adoption. This decision was based on the recommendation of several scholars in the field [2,16,20,35,39].

3. Research hypotheses

As said earlier, the aim of this study is to investigate the correlates of the five innovation attributes or characteristics proposed to be associated with computer adoption in Saudi Arabia. A set of five hypotheses emerged to be the research hypotheses:

H1: Relative advantage will be positively associated with computer adoption.
H2: Compatibility will be positively associated with computer adoption.
H3: Complexity will be negatively associated with computer adoption.
H4: Observability will be positively associated with computer adoption.
H5: Trialability will be positively associated with computer adoption.

4. Methodology

Essentially, the current research is a part of a project funded by the Saudi government to investigate IT acceptance in the Saudi environment. As it was intended to cover as many organizations as possible in both public and private sectors, the research methodology thought to be most appropriate was survey questionnaire. Newsted et al. [26] argue that surveys are among the more popular methods used by the IS research community. Their argument includes (1) surveys provide responses that can be generalized to other members of the population studied and often to other similar populations and (2) surveys can be reused easily and provide an objective way of comparing responses over different groups, times, and places.

The five perceived attributes of using an innovation constructs that are investigated in this research are measured using scales or instruments that were published in leading journals in the field and applied for similar research projects. Those scales were originally developed and tested in the English language and therefore in a different environment and culture. To adapt them for the current study in Arabic, the Brislin' [10] back translation method was used. These scales were translated back and forth between Arabic and English by several bilingual professors. The process was repeated until both versions converged.

The following sections deal with the current research sample in the Saudi population and how the survey questionnaire was administered and the data collected.

4.1. Research sample

Several organizations of both public and private sectors were contacted to get the consent of their participation in the study. Addresses and titles of deputy ministers for government departments and general managers for private organizations were collected. A draft letter briefly explaining the purpose of the study and requesting for participation and cooperation with the researcher was prepared. The letter was signed by the vice rector of the university which the researcher is affiliated to.

The letter was sent to 136 public and private organizations. Several organizations agreed to participate in the study and named a contact person. For organizations that did not respond, the researcher made the suitable follow up via telephone calls, letters, or both and few of them by e-mail. Eventually, fifty-six organizations participated in the study of which 66.4% of them were from public and the balance 33.6% were private sector.

4.2. Survey questionnaire

In order to quantify both dependent and independent variables included in the research study, a survey questionnaire was designed. The statements by which to measure each variable were put together and respondents are given instructions on the rating scale used for each set of statements. Each demographic variable consisted of a single item (question), while computer usage and the five innovation attribute constructs were measured using multiple item scales.

Computer usage was operationalized using five items reported in the IS/IT published research: (1) frequency of use, (2) time duration of use, (3) number of application systems used, (4) number of needs and purposes used for and (5) intention of future usage. The items incorporated for the five attribute scales were borrowed from Davis [14] and Moore and Benbasat [24]. Relative advantage and complexity were measured using six items for each of the two constructs. Three items were used to measure compatibility, five items for observability, and two items for trialability.

Table 1
Construct scales reliabilities ($N = 595$)

Construct	Number of items	Alpha
Relative advantage	6	0.90
Complexity	6	0.89
Compatibility	3	0.85
Observability	5	0.80
Trialability	2	0.52
Adoption	5	0.78

The data was collected from the fifty-six organizations distributed across the major provinces of the country. The questionnaire was administered across a variety of public/private, oil, manufacturing, merchandizing, and services organizations. The returned usable responses were 1190 with a response rate slightly over 62%. The subsequent sections deal with findings and analysis of the data gathered followed by discussion and conclusions.

5. Findings and analysis

5.1. General findings

The data gathered for the current study was split randomly into two halves. One half was used for the reliability analysis of the scales (measurement analysis) and the second half was used for testing the hypotheses.

In order to have robust findings, the scales used to measure variable constructs should be reliable. The Cronbach's alpha reliability index was calculated to measure the internal consistency of scales. Since alpha can be interpreted as a correlation coefficient, it ranges in value from 0 to 1. The higher the figure, the more reliable the scale and, as a rule of thumb, alpha should be at least 0.7 to consider the scale to be reliable [28]. However, the accepted level of reliability depends on the purpose of the research project. For example, Nunnally [28] argued that in early stages of research, reliabilities of 0.50 to 0.60 would suffice, and that "for basic research, it can be argued that increasing reliabilities beyond 0.80 is often wasteful of time and funds" (p. 245). The alpha coefficients for the scales used in this study were all above 0.70 except that of trialability which scores only 0.52 which are considered sufficient in "early stages of research" where reliabilities of 0.50-0.60 are sufficient [28]. Table 1 shows the construct variables and their reliabilities.

Respondents profile can give a broad view of the study sample. Four demographic variables were used to describe the study respondents' profile: age, gender, education, and nationality. Table 2 presents the percentages of respondents against different categories of each demographic variable across the entire sample.

5.2. Analysis

Data should be scrutinized to check if any significant data abnormalities exist. This check is a requirement for a well-established analysis [37]. Missing data and critical violations of statistical assumptions – such as normality, homoscedasticity and linearity – need to be checked and corrected before applying statistical procedures.

The current study exhibited only few missing cases that were treated by substitution of means of the same variable. Normality and homoscedasticity are usually assumed with a sufficiently large sample

Table 2
Respondents profile ($N = 1190$)

Variable	%	Respondents
Gender	79.3	Male
	20.7	Female
Age	0.5	Less than 20 years
	37.6	20–30 years
	42.5	31–40 years
	17.1	41–50 years
	2.3	above 50 years
Nationality	91.4	Saudi
	8.6	Non-Saudi
Education	7.7	Less than high school
	15.7	High school
	26.1	Diploma
	45.5	Graduate
	7.9	Higher studies

size like our case here (1190 cases). Linearity, however, was checked by investigating the correlation coefficients between variables as indicators reflecting the nature of their linear relationship. The type of the association between the variables was rigorously tested, by examining the bivariate scatter-grams of the dependent variable (adoption) against each attribute factor, and showed fairly linear relationships.

5.3. Results and discussion

Once the data passed the examination checks for data abnormalities, missing data, and violations of statistical assumptions we can perform statistical procedures in order to test the study hypotheses. The five perceived computer attributes are hypothesized to associate with computer adoption and use. This section shows the results of the Spearman's rho correlation coefficients of these five independent variables with computer adoption and use as the dependent variable (Table 3). The results are discussed below.

Relative advantage

Relative advantage of an innovation, as perceived by members of a social system, is hypothesized to be positively associated with its rate of adoption. The current study findings show a positive significant association between relative advantage and computer adoption and use (0.27 at $p < 0.01$). Diffusion scholars have found relative advantage to be one of the best predictors of an innovation's rate of adoption. However, the study findings show that this relationship, although, significant is not the strongest. Relative advantage proved to be an important predictor of spreadsheets usage [5] as well as of computer usage [4]. These findings are in agreement with Davis et al. [16], Davis [15], and Igbaria [19].

Compatibility

Perceived compatibility of an innovation is hypothesized to be positively associated with its rate of adoption. Past diffusion research suggests that compatibility may be of relatively lower magnitude in predicting rate of adoption than relative advantage. On the contrary, the study findings show that compatibility has a significant positive relationship with computer adoption and use (0.340 at $p < 0.01$). Al-Gahtani and King [5] found compatibility to be an important predictor of spreadsheets usage. The high correlation between compatibility and relative advantage (0.681) could support the findings of Moore and Benbasat [24] who found the two constructs to be confounded.

Table 3
Correlates of five computers perceived attributes with adoption ($N = 595$)

	Construct	1	2	3	4	5	6
1	Relative advantage	1.00					
2	Compatibility	0.681**	1.00				
3	Complexity	−0.463**	−0.524**	1.00			
4	Observability	0.403**	0.456**	−0.594**	1.00		
5	Trailability	0.236**	0.259**	−0.319**	0.431**	1.00	
6	Adoption	0.271**	0.340**	−0.305**	0.431**	0.256**	1.00

**Significant at $p < 0.01$.

Complexity

Perceived complexity of an innovation is hypothesized to be negatively associated with its rate of adoption. Past diffusion research suggests that ease of use of an innovation is an important motivator and a predictor of its rate of adoption. Put another way, complexity of an innovation is a significant inhibitor to its rate of adoption. Current study findings show that complexity has a significant negative relationship with computer adoption and use (-0.305 at $p < 0.01$). Al-Gahtani and King [5] found ease of use to be an important predictor of spreadsheets usage. These findings are in agreement with Davis et al. [16], Davis [15], and Igbaria et al. [20].

Trialability

Perceived trialability of an innovation is hypothesized to be positively associated with its rate of adoption. Past research argue that earlier adopters of an innovation perceive trialability as more important than do later adopters. More innovative individuals have no precedent to follow when they adopt, whereas later adopters are surrounded by others who have already adopted the innovation. The study findings show that trialability has a significant positive relationship with computer adoption and use (0.256 at $p < 0.01$). This finding is crucial for IT diffusion research since there isn't enough past research in this area considering this relationship. Slyke et al. [34] found no significant relationship between intentions to use groupware applications and perceived trialability. We argue that this variable is more important to less developing environments than to developed ones where IT might be more available and hence trialable. Also, it can be argued that trialability is more important to pioneer adopters in developing countries.

Observability

Perceived observability of an innovation is hypothesized to be positively associated with its rate of adoption. A technological innovation with dominant component(s) not so apparent to observation possesses less observability, and usually has a relatively slower rate of adoption. The current study deals with computer adoption and diffusion where software (operating and application systems) constitutes dominant components of such innovation. However, in this study computers were dealt with as an integrated technological innovation. Findings show that observability has a strong significant positive relationship with computer adoption and use (0.431 at $p < 0.01$). This finding is also of crucial importance to computer diffusion research in developing countries as it was found to be the strongest relationship with computer adoption and use. It further represents an addition to diffusion research as observability was rarely investigated.

6. Conclusions

The current study was set to investigate the associations of five perceived attributes of computer technology to its adoption and use. Each attribute was hypothesized to positively correlate significantly

with computer adoption and use, except complexity. Complexity, as a negative attribute was hypothesized to negatively correlate with computer adoption and use. The data analysis strongly confirms all the five hypotheses and the hypothesized directions of relationships. Thus the study is successful towards that end and IT decision makers may find these results helpful in guiding their efforts. The five attributes manifest themselves to influence computer users when considering the adoption of computers in their work. Hence, the antecedents of each attribute (like training and education to alleviate complexity) need to be considered for the attribute to favorably contribute towards computer adoption in the workplace.

This study attempts to test whether the innovation diffusion research originated in technologically developed societies is viable in less technologically developed countries. The study used the most widely accepted constructs of the innovation diffusion research with reliable scales published in leading journals in the field. Five rational constructs (relative advantage, compatibility, complexity, observability, and trialability) proved to consistently influence the adoption and diffusion of innovations, were tested in a developing country that is socially and culturally different.

While the adoption of IT by individuals and organizations has been an area of substantial research interest since the early days of computerization [24], identifying a small set of innovation attributes with a strong theoretical and empirical foundation continue to be a priority goal. However, user reactions to computers are complex and multifaceted. Investigating fundamental mechanisms driving user behavior and cultivating more reliable instruments would enable researchers and practitioners to achieve sustainable progress toward a better understanding of computer acceptance leading to adoption.

User acceptance tests performed early in design, if sufficiently predictive of future user acceptance, could reduce the risk of user rejection by enabling designers to better screen, prioritize and refine application ideas [15]. Although early testing is widely used and encouraged by practicing designers, it is not known how well measures captured early in design reflect the level of user acceptance that will lead to eventual adoption and use of the implemented system.

In practice, user testing occurs as early as in the design process. The typical approach is to build a prototype of the system, have representative potential users interact with it, measure various performance criteria and subjective evaluations, and iteratively refine the design. Accordingly the system functionality (relative advantage), the level of compatibility of the system to the tasks to be later used for, and the degree of complexity of the interfaces and other interaction aspects with the system are tested. This should advise system designers and developers to make sure that the system is functionally rich to have an appeal to potential adopters and to gear the system to comply with the type of work related tasks aimed to be performed using the ultimate system. It should also signal the negative effect of complexity calling for the need to design user-friendly interfaces and ensure delivering an easy to use system. However, inherited complexity could be overcome through adequate familiarization and hands-on training for potential adopters.

Computer systems that are subject to early user testing and employing these three attributes (relative advantage, compatibility, and complexity) besides effectively accommodating those corrective measures in iterative basis should technically yield a successfully adopted systems. Furthermore, incorporating these rational attributes in user testing would, not only, save considerable costs but would also ensure higher level of ultimate user acceptance at the end of the implementation process.

Organizations that make the technology available at no risk to the individual adopter minimize the discriminating power of trialability when compared to other attributes; on the other hand, trialability should be a significant concern for those who would adopt an innovation at their own risk [24]. Another dimension of trialability is the distinction between earlier and later adopters, as earlier adopters need more care whereas later adopters are surrounded by peers who have adopted computers. Organizations

should invest in early adopters to act as vicarious trial for later adopters, and hence payoff is compensated in the adoption process. Informally, with time these peers would be enough in number to help others in the organization to try the various uses of computers. However, formally, adequate support and training programs and the availability of free computer trials are some opportunities for potential adopters to satisfactorily try various computer applications. In short, potential adopters should be permitted to use computers on a trial basis long enough to see what it could do for them in the workplace.

Theoretically, the observability construct encompasses two dimensions (1) visibility, and (2) result demonstrability. To reflect that into practice, computers should be very visible for anyone to see them on many desks in the organization for potential adopters to be acquainted with the technology. The results of using the technology should also be apparent to potential adopters to be able to communicate to others the favorable consequences of using computers in the workplace. Computers are provided to be utilized for performing work tasks. Thus, they should be powered on most of the time rather than being merely dummy gray boxes on top of workers' desks. As computers in the organization become more visible and widely used, they would be highly observable and their status-conferral would be emphasized to potential adopters. This calls for management to let the IT systems be visible and the ultimate adoption results be demonstrable to potential adopters.

To summarize, the current study contributes to several areas of prospects. Firstly, the five attributes were carefully identified from the innovation diffusion studies that were tested for similar research areas and published in leading journals in the field. Secondly, these five constructs were subject to reliability and validity tests in the Saudi context. Thirdly, a short instrument of 23 items incorporating these five constructs is now readily available for application. It is argued that this instrument can be cultivated by Saudi decision-makers and IT policy planners for successful adoption and diffusion of IT systems. Hence, before commissioning new IT products, Saudi organizations can employ it to test the perceptions of potential adopters after a short period of introducing a trial product. This can be very useful to pinpoint the underlying areas of shortcomings for management to enhance various dimensions of acceptability of the system while saving costs of rejecting the final system.

Several conclusions for academia and practice stem from the study findings: (1) diffusion of innovations research is further supported in developing nations; (2) innovation attributes are further confirmed to be important determinants of innovation adoption; (3) the relative impacts of these attributes to computer adoption may differ among societies as for the current sample it came to be observability, compatibility, complexity, relative advantage and trialability in order, (4) these findings should be helpful for decision makers involved in the adoption and diffusion of IT in developing nations and (5) furthermore, they should be helpful to multinational and overseas firms as success factors for their IT plans.

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