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ABSTRACT

This paper draws upon innovation diffusion theory and more recent conceptualizations of IT adoption behavior to examine differences among Jordanian Internet across Rogers' adopter categories. We extend Rogers' theory by characterizing adopter categories based on personality, attitudinal and situational variables recently found to be salient in IT adoption behaviors, and determine that young, educated and upwardly-mobile members of developing economies in the Middle East and North Africa region are the best target for increasing the effectiveness of diffusion of information and communication technology initiatives.

Keywords

Technology Adoption, Developing Nations, MENA Region, Information and Communication Technology

INTRODUCTION

At least half of the citizens of the world live in developing nations (Sahay and Avgerou, 2002), but little research focuses on the technology usage and adoption processes of these developing world citizens (Khasawneh and Regan, 2003; Khasawneh and Stafford, 2008). Among the developing nations of the Middle East and North Africa Region (MENA), the Kingdom of Jordan is a useful testbed for studies of technology diffusion in developing nations of the region (Goodman and Davis, 1992). This is due to several factors, not the least of which is the choice of the Royal Family to leverage technology development as an aspect of competitive advantage in regional business (Ein-Dor et al., 1999). Jordan's King, H.M. Abdullah II, is an influential champion of technology diffusion in the economic interest of the nation (Khasawneh and Stafford, 2008), which serves to reinforce the desirability of technology among the populace

Despite King Abdulla's highly visible technology diffusion initiative (cf., Info-Prod Research, 2005; Ramanathan, 2006; World IT Report, 2003), not all technologies introduced to the Kingdom's population have diffused as quickly as might have been expected; for example, mobile Internet services have not been as successful as was anticipated (Khasawneh and Stafford, 2008). This may be due to the fact that mobile services are still in their development stage. Hence, it may be useful to identify factors that influence user acceptance and adoption of new information and communication technologies, so that knowledge of these factors can guide the effective diffusion of such technology initiatives in developing nations.

The diffusion of innovation paradigm has been useful in studies of technology adoption in the context of developed nations and their industries, and a number of prominent studies demonstrate the use of adoption concepts in technology diffusion in mainly Western scenarios (cf., Agarwal and Prasad, 1997; 1998a; 1998b; 1999; Moore and Benbasat, 1991; 1996), but this robust theoretical perspective has not been widely applied to the developing nation context (Goodman et al., 1994; Corbitt et al., 2004; McCoy et al., 2005), and we believe a fresh application of its original principles can be useful in understanding the case of mobile technology adoption in the specific context of the MENA region developing nations.

DIFFUSION PERSPECTIVES FOR DEVELOPING NATIONS

As part of applying the diffusion of innovation perspective, it is useful to consider the 5 generic adoption categories in the context of these developing nations. These generic categories are characterized by Rogers' (1962) idea that an adopting population is differentially characterized by degrees of innovativeness and timing of the adoption decision among member

segments of the population. The well-known characterization of these general adoption categories is depicted in Figure 1, as summarized by Rogers (1983).
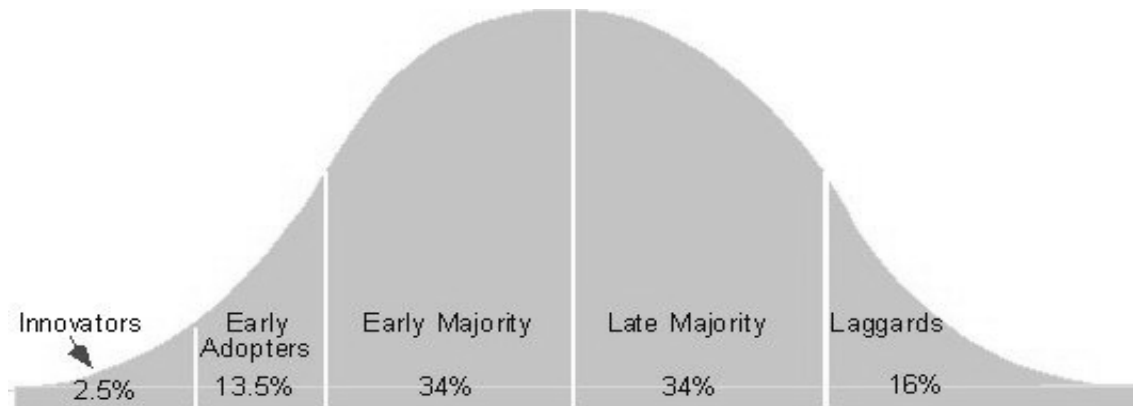

Figure 1. Categories of Adopters (Rogers, 1983)

In this characterization of adoption practices and innovation in a population, the earliest group to adopt, comprising the first 2.5 % of all adopters and characterized as "Innovators," are those individuals willing to try new ideas even in the face of risk and potential failure. As well-explicated by Rogers (1962; 1983; 1995), adopter categories and their typical characteristics are well known. For example, Innovators are usually well educated and have a high enough income to absorb mistakes. Innovators tend to be more cosmopolitan and more active outside of their community than other adoption groupings. They are less reliant on group norms and are more self-confident, and usually obtain their information about innovations from scientific sources and experts.

Early adopters are well-educated and financially well-off, possessed of a good degree of social mobility. They are the adoption group most frequently looked to by others for information about new innovations and their experiences with them. This group comprises about 13% of adopters. Though not the first to try new innovations, early adopters do engage in trial early in the product's life cycle. They are, however, more reliant on group norms and shared values than innovators; this social orientation is what leads this group to serve the important function of opinion leadership in the diffusion process. Their opinions typically influence the decisions of later-adopting groups in a population.

The early majority grouping, which comprises the next 34% of adopters in a population, is less comfortable with risk than innovators, but accepts innovations earlier than the average member of the population. They will, however, deliberate before adopting and this group prefers to collect more information and evaluate more options in advance of decision making, hence, the process of adoption will take longer with them. Early majority members are likely to be the friends and neighbors of opinion leaders, and they are an important link in the process of diffusing new ideas to the larger population, since they are positioned between earlier and later adopters.

As Rogers notes, late majority members are more limited on their income and are rather risk-averse. They will typically wait until others have widely adopted a technological innovation before investigating it themselves. Like the early majority, the late majority also represents about 1/3 of the population. These members of the later majority are considered as 'skeptical' which suggests they are socially motivated, since they adopt because most of their friends have already done so (e.g., Rogers 1983). Hence, this late majority group of adopters relies heavily on group norms, and subsequent adoption is the result of pressure to conform. This group tends to be older and below average in income and education. They rely primarily on word-of-mouth communication rather than mass media for their information about innovations.

Laggards – the last and slowest adoption category -- do not adopt easily or quickly. They are usually skeptical of new ideas, and may even only adopt an innovation once it is no longer innovative, such as when a newer innovation is taking its place. They are not responsive to normative pressure, have the lowest income and educational status of all the adopter categories, and are surrounded by other laggards in society. This group represents the final 16% of the population, as categorized by adoption tendencies and characteristics.

Laggards are independent because they are tradition-bound. Decisions are made in terms of the past. By the time laggards adopt a new product, it has probably been superseded by something else – for example, members of this category might well be engaging in the purchase of a fixed line telephone set when mobile phones are already widely owned. Laggards have the longest time of adoption and the lowest socio-economic status. They tend to be suspicious of new products and alienated from a rapidly advancing society.

MODIFIED DIFFUSION CURVES FOR M.E.N.A. NATION APPLICATION

The application of Rogers' (1962; 1983; 1995) classifications in analyzing a population for adoption tendencies presumes that everyone will eventually adopt a new product or a new technology, which may be a dangerous assumption in the developing nation context of the MENA nations we consider here. In this view, the one shortcoming of the Roger approach in the developing world is that the classification does not provide for a non-adopter category. Most people and families might not own a notebook computer, PDA, or even mobile phone. Hence, a simpler three-part classification of early adopters, late adopters, and non-adopters might be more realistic, and that is what we propose as the basis for this study.

In this reduced view, we combine Roger's original innovator and early adopter groups into the catch-all "early adopter" category. Hence, the late adopter grouping in this reduced characterization of adopter categories would combine the early and late majorities as well as the laggards from Rogers' original conceptualization. The final non-adopter group would then provide for the possibility that a sizeable part of the market may simply decide not to adopt the new product, owing the characteristics and exigencies of the developing nation context.

JORDANIAN MOBILE PHONE ADOPTION: A DESCRIPTIVE STUDY

A survey was designed based on measures drawn from the existing technology diffusion literature (e.g., Agarwal and Prasad, 1997; 1998a; 1998b; 1999; Moore and Benbasat, 1991), as adapted for the mobile technology context. The instrument was distributed to a random sample of Jordanian consumers who were identified as current mobile telephone users. The first section of the survey contained questions regarding the experience and ownership of other information and communication technology (ICT) products. The second section used a five point likert-type scale to collect information about attitudinal, personality and technology characteristics. For each scale item, respondents chose varying degrees of intensity on a scale ranging from strongly disagree through strongly agree, including a neutral choice point.

Two hundred three usable responses were received from the sample of Jordanian mobile phone users, and this provided data for analysis of user characteristics in view of innovation category status.

RESULTS: DIFFERENCES BETWEEN EARLY AND LATE ADOPTERS

Early adopters play an increasingly important role in the life cycle of a new telecommunications product or service, particularly in developing nation contexts. These early users of an innovation may provide the ability to gain in market leadership by serving as the visible benchmark upon which late adopters rely for their own decisions, and good utilization of techniques to appeal to this category of users can result in forestalling competitive entry to a market segment (Flynn and Goldsmith, 1993). Hence, understanding reasons for early adoption can assist in targeting prospects in the larger population for and innovation, which aids in supporting the continued acceptance of a product introduction to a market (Mahajan et al., 1990).

A two-step approach was followed for classifying the early and late adopters in this study. Firstly, the time of adoption of mobile Internet was measured by elapsed time since its first use. Secondly, based on the opinion of market industry watchers and experts, a revised scale was developed to assess adoption category status using the measure of elapsed time. Based on that operational assessment, and expressed in temporal terms, the 'early adopters' in this study were the people who began using mobile Internet services within the first two years of its market debut. The others were defined as late adopters. Early adopters were a distinct minority of the sample of Jordanian contacted for thus survey, as can be seen in Table 1.

Within this sample of mobile Internet adopters, 83.2% were late adopters and 16.8% were early adopters. This breakdown is in line with results typically found in Rogers's work. Hence, the broad categorization scheme adopted in this study is deemed to be consistent with major adoption studies.

	Frequency	**Percent**
Late Adopter	169	83.2
Early Adopter	34	16.8

Table 1. Classifications of Mobile Internet Early and Late Adopters

DEMOGRAPHIC CHARACTERISTICS

In this section, we investigate the relationship between the demographic characteristics of an individual and subsequent mobile services adoption. Seven demographic variables were assessed, including respondent's age, gender, marriage status, education, location of education, type of employment, and employing organization.   One Way Analysis of Variance (ANOVA) was selected for analysis, comparing across the seven demographic descriptors, using the elapsed time since initial adoption as the metric scale for the adoption category variable. Results of this analysis are displayed in Table 2.

The results of this analysis showed that there are no significant differences according to gender (F=2.6, p=.075) and job responsibilities (F=2.4, p=.091), but that every other descriptor displayed differences according to adoption level. Age (F=50.8, p<.001), marital status (F=23.0, p<.001), educational level (F=7.3, p=.001), place of education (F=3.2, p=.040) and organization sector (F=45.5, p<.001) all were different across adoption levels.

On the basis of these results it may be concluded that the demographic variables included in the study, with the exception of gender and job responsibilities, influence the adoption of mobile Internet. These study findings are similar to findings made by a study of customer adoption of tele-banking technology in Saudi Arabia (Al-Ashban and Burney 2001) that revealed similar demographic characteristics as predictors of early adoption. Other studies (e.g., Lucas, 1975; Brancheau and Wetherbe, 1990) have reported links between age and technology use, with younger age groups showing greater willingness to adopt the new technology once it has appeared. Studies in marketing and telecommunications have also confirmed the importance of individual characteristics in studying adoption (DeSanctis and Poole, 1994; Hoffman et al., 1996; Katz and Aspden, 1997; Hoffman and Novak, 1998; McConnaughey and Lader, 1998; Cooper and Kimmelman, 1999).

Variables	**Mean (Std)**		*df1 = 2, df2 = 281*		
	Early Adopters	**Late Adopters**	**Non-Adopters**	**F**	**p- value**
Age	1.9 (.70)	2.7 (1.30)	4.0 (1.03)	50.8	.000
Gender	1.2 (.39)	1.3 (.45)	1.2 (.36)	2.6	.075
Marriage Status	1.8 (.41)	1.6 (.50)	2.0 (.25)	23.0	.000
Educational Level	1.7 (.45)	1.4 (.54)	1.3 (.64)	7.3	.001
Place of Education	1.3 (.46)	1.3 (.47)	1.2 (.37)	3.2	.040
Job Responsibility	3.9 (.98)	4.1 (1.26)	3.7 (1.90)	2.4	.091
Organization Sector	2.1 (.34)	2.2 (.68)	1.4 (.65)	45.5	.000

Table 2. Anova for Demographic variables

PRIOR ACCESS TO OTHER ICT

Differences between early, late or non-adopters, as compared to their likely use of ICT other than mobile phones/mobile Internet, have been highlighted in previous research (e.g. Kleijnen et al., 2004; Pagani, 2004). On the principle that use of related technologies might be predictive of mobile phone use, we compared across the adopter levels on usage of personal computers, the Internet, pagers and personal digital assistants (PDA). An additional ANOVA was performed in order to examine the patterns of access to various ICTs in relation to mobile phone adoption. Results of this analysis appear in Table 3.

__Variables__	__Mean (STD)__	*df1 = 2, df2 = 281*			
	__Early Adopters__	__Late Adopters__	__Non-Adopters__	__F__	__P- Value__
Access to PC	1.0 (.00)	1.0 (.00)	1.2 (.40)	25.1	.000
Access to Pager	1.9 (.24)	1.9 (.15)	1.9 (.16)	.6	.520
Access to Internet	1.0 (.17)	1.0 (.12)	1.3 (.46)	33.1	.000
Access to PDA	1.4 (.50)	1.5 (.50)	1.9 (.35)	19.9	.000

TABLE 3. ANOVA FOR ACCESS TO ICTS

As can be seen, the results of this analysis showed no significant difference between the three groups of adopters for access to a pager (F=.6, p=.520), but there were differences found for each other ICT. Personal computers, Internet access, and PDAs all related significantly to level of adoption for mobile phones among Jordanians (F=25.1, p<.001, F=33.1, p<.001 and F=19.9 p<.001, respectively). It can be seen that, among the Jordanian adopters of mobile phones, assess to other ICT is reasonably associated with likely level of adoption.

These results were supported with findings by other researchers into technology adoption and diffusion. For example, the study of computer use by Shih and Venkatesh (2002) identified prior experience and access to the Internet and other ICTs as a major source of influence on adoption. Individuals were able to use their existing IT skills to perform tasks with new ICTs. Consequently, using computers and having some experience with the Internet were likely to improve a Jordanian citizen's positive perception about other ICTs and make adoption more likely.

PERSONALITY CHARACTERISTICS

Personality characteristics have been shown to vary across adopter categories in the original diffusion research (e.g., Rogers, 1983). We undertook to assess the impact of personality variables among the Jordanian respondents in the form of self-confidence and venturesomeness, which we would expect to relate to earlier adoption. However, in preparing to examine for differences on the variables, we noticed that sample responses on the self-confidence measure were in violation of the assumptions for use of parametric statistics (i.e., issues related to homogeneity of variance). As assessment of Levene's test of homogeneity, shown in Table 4, indicates that the variances for self-confidence are not equal (p<.001), though variances are equal for the test variable venturesomesness with (p-value=.221). Hence, ANOVA was appropriate to test for differences based on venturesomesness, but not for self-confidence. For that variable, the nonparametric Kruskal-Wallis test (K-W) was employed.

Table 4 and Table 5 represent the output of K-W testing on self-confidence.

	__MEAN RANK__		
SELF CONFIDENCE	__EARLY ADOPTERS__	__LATE ADOPTERS__	__NON-ADOPTERS__
	159.43	141.29	136.09

Table 4. Mean Ranks

	CHI-SQUARE	DF	ASYMP. SIG.
SELF CONFIDENCE	1.994	2	.369

Table 5. K-W test for Personality Characteristics

The K-W test indicates that there is no significant difference in the medians, Chi Square = 1.996 (df=2, N=283, p-value=.369). On the basis of these results it may be concluded that there are no differences with regard to self-confidence variable within the adopter's categories. Table 6 and table 7 represent the associated parametric testing via ANOVA for venturesomesness.

VARIABLES	F	SIG.
VENTURESOMENESS	9.827	.000

Table 6 the results of One way analysis of variance

As shown, the test is significant, (F = 9.827, p<.001); among Jordanian consumers, venturesomness does influence rates of adoption as indicated by adoption category membership. To identify the differences, the Tukey HSD multiple comparisons test was performed. (This can be used whenever the variance assumption is valid). Table 7 demonstrates the multiple comparisons results.

The results of the Tukey test can be summarized as follows: A high association between the variables of venturesomesness and the independent variable early adopter was observed. This effect did not manifest itself nearly as strongly in the case of late adopters. Since venturesomeness is defined as the willingness to take risks in the purchase of a new product (Rogers, 1962; Robertson, 1971), it appears that the Jordanians most willing to take risky steps to try new technology are also the ones most likely to be early adopters. Therefore, being an early adopter is more strongly associated with venturesomesness than it is for late or non-adopters.

Tukey HSD *Dependent Variable:* *Venturesomesness*		Mean Difference (I-J)	Std. Error	Sig.	95 % Confidence Interval	
Adopters (I)	Adopters (J)				Lower Bound	Upper Bound
Non Adopter	Late Adopter	-.4231*	.1037	.000	-.6661	-.1801
	Early Adopter	-.5294*	.1564	.002	-.8960	-.1628
Late Adopter	Non Adopter	.4231*	.1037	.000	.1801	.6661
	Early Adopter	-.1063	.1436	.739	-.4429	.2303
Early Adopter	Non Adopter	.5294*	.1564	.002	.1628	.8960
	Late Adopter	.1063	.1436	.739	-.2303	.4429

The mean difference is significant at the .05 level.

Table 7. Multiple Comparisons for Venturesomeness

DISCUSSION

Among Jordanian citizens, it is the young, well educated, professionally employed who seem to have the greatest proclivity to try mobile phones and mCommerce early, and, hence, serve as the early adopters whom are looked to be late adopters for leadership in the innovation process. Notwithstanding, these young Jordanian professionals also tend to have computer and Internet experience and use PDAs, though it is interesting to see that pager use is not a differentiator. Lastly, as parametric and nonparametric testing demonstrated, the young well-educated Jordanian professional with computer and Internet experience, also exhibits personality traits of self-confidence and venturesomeness as an aspect of membership in the early adopter category of innovation.

For the policy maker in the developing nation the implications are useful – it would appear to be the case that young and upwardly mobile college students and recent graduates are the venue through which high technology innovations must be introduced. The other Jordanian citizens who indicated they had adopted mobile technology, if characterized by contrary demographic and usage trends compared to the youth segment, were – at best – late adopters. Hence, if Rogers' prescription of leading the innovation process through the opinion leadership of early adopters is to hold in the MENA group of developing nations, it will be essential for policy makers and marketers to focus the majority of their resources and attention upon this young, upwardly mobile technologically-oriented contingent of the population, so that their subsequent adoption might be best observed as a shining example to the later adopter groups.

While this seeming discriminatory approach to promoting the diffusion of technological innovations in developing economies may seem unegalitarian, it is not at all out of step with the practices of CRM in developing nations, where maximum promotional attention is focused on the constituencies most likely to return the desired outcome. Categorization of promotional efforts toward the high-yield customers being the rubric of CRM, in developing nations with technology diffusion initiatives, such as is the case with Jordan, the more attention paid to disseminating key technologies among the young and educated venturesome early adopters, the more likely that high profile opinion leadership will subsequently take place to the benefit of the recruitment of the members of the late adopter category.

CONCLUDING COMMENTS

In this study we present an investigation of key differences between early, late and non-adopters among the Jordanian population. This is representative of the developing nations in the MENA region that see technology as an economic productivity venue. This study focused on exploring relationships between various variables as stipulated in the mobile Internet adoption model. Evaluation of the analyses performed in this study showed that in each of the given sets of variables, there were many individual variables on which there were significant differences among adopter and non-adopter categories. From this arises a clear picture of the Jordanian early adopter, and this must be the focus of marketer and policy makers in their efforts to maximize the effect of diffusion initiatives, in view of the critical role that early adopters play in facilitating later adoption of technological innovations.

Early and late adopters were a diverse group of people in terms of their demographic profile and their experience with other ICTs. Non-adopters were also found to be different in terms of demographic variables. Lack of prior experience with other ICTs and lack of Internet experience appeared to be predictive of non-adopter status.

One observation deserves special mention. It appears that of the three groups compared above, the early adopters have relatively more homogeneity than of late adopters. The non-adopters were the most heterogeneous group. This may have implications for further research on the nature of technology adoption among developing nations of the MENA region, as it cannot be determined with certainty that non-adopters are the singular highly similar class of individuals that it would see that early adopters are. On the one hand, it will be easy to identify and promote to early adopters. They are a homogenous and well-characterized group. But, the non-adopters appear to be a more fractious grouping, and to the extent that government policy and industrial strategy requires the inclusion of non-adopters, there will be much more work yet to be done in understanding exactly what characterizes the non-adopter in this developing nation context.

This paper reports on empirical research into the adoption of mobile Internet by individuals in Jordan. This study makes a number of significant contributions to adoption theory and practice. The research is relevant to other developing nations in the Middle East and North Africa region, as these countries share similar cultures, languages and borders. The findings of this research offer guidelines for industry practitioners to encourage faster and more efficient adoption of mobile Internet and for

researchers who wish to use this study as a foundation for future research. The results have important implications for those who are concerned with the diffusion of mobile technology in such developing countries.

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