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terms of computer utilization. However, women, high school holders, low-level workers and public sector organizations are experiencing computer underutilization. Rogers' five characteristics of innovations diffusion prove to have significant variations with regard to computer utilization in developing nations. Computer complexity and computer anxiety tend to inhibit computer utilization, while favorable attitudes toward computers, computer experience and organizational support and training tend to promote computer utilization. The study findings highlight significant variations and explain about 57% ($F= 26.35$, $p<.001$) of the variance in computer utilization. These findings should help decision makers and practitioners in Saudi Arabia to encourage promoting factors to sustain computer utilization while trying to restrain the effects of the discouraging factors.

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in the rate and level at which different factors become vividly involved with computers, which may inhibit or promote its adoption and use.

It is important to look at the explanation power (variance) that each of the individual, technological and organizational groups of variables account for in computer utilization and how much control we can have over each set. The variance explained in computer utilization by individual variables was 54.8%, 14.3% by technological variables and 12.3% by organizational variables. It is clear that the individual variables have the largest variance while the technological and organizational variables have little and about equal variance. Thus it is crucial to pay more attention to the individual variables.

The study did not identify variations due to age and nationality with regard to computer utilization but has identified variations due to gender, educational level, attitudes toward computers, computer self-efficacy, computer experience and computer anxiety. However, the latter factors explain 54.7% of the variation in computer utilization. As there can be little control over gender, it is necessary to pay more attention to the rest of factors. It is understood that quality organizational training and support can alleviate computer anxiety, promote positive attitudes toward computers, enhance computer self-efficacy and ultimately develop computer experience. There is much more control that can be done over the technological and organizational factors which are capable of inducing individual characteristics towards higher levels of computer utilization.

In summary, Saudi nationals apart from specific age as knowledge workers demonstrate to compete with foreign workers in Saudi organizations in

differ significantly with regard to computer usage according to their nationality for that favor of non-Saudi. Surprisingly, this study revealed no significant differences between Saudi nationals and non-Saudi computer user groups with regard to computer utilization.

This study succeeded to show similar findings with common prior research in the field regarding the differences between computer user groups related to their attitudes toward computers, computer self-efficacy and computer experience and computer utilization. Our findings revealed differences between computer users with higher levels of each of these three factors as they highly rate computer usage contrary to their counterparts of low levels accordingly. By the same token, this study revealed differences between computer users with higher levels of computer anxiety as they unfavorably rate computer usage contrary to their counterparts of low levels of computer anxiety.

The findings of this study agree to a good degree with previous research findings with regard to the five innovational characteristics reported in innovation diffusion research. Moreover, the findings of this study regarding organizational characteristics are in congruence with that of prior research. All of that should point to the credibility of this study and add further confidence in the study findings.

Researchers, practitioners and decision makers can appropriately make use the findings of this study.

The study serves to alert practitioners and decision makers to some inhibitors and motivators to successful IT adoption which they may encounter as they deal with a variety of interactions. Variations could exist

three groups of variables and computer use in order to illustrate the existence (or otherwise) of such differences.

The descriptions of the individual, technological and organizational backgrounds of the study subjects succeed to demonstrate significant differences between each of these contexts and computer utilization. In fact, out of seventeen plausible variations between each of these contexts and computer utilization, the study unveils that there are fifteen significant differences.

In attempting to illustrate a specific example of such differences, the study failed to find differences between the computer user age groups and computer utilization which might not be attributable to the Saudi culture, but revealed differences between the computer user sex groups and computer utilization which might be so attributable.

It has been noticed that educational level variation with computer utilization reflects the development of the Saudi high school curriculum. Our findings indicate that only users with high school differ significantly (not for their favor) with higher levels of education with regard to computer utilization. In practice, this would imply that those old high school holders lack computer knowledge and their need of some computer training. It also signifies the importance of introducing computer courses in the current curriculum.

Another example of such differences that the study failed to find differences was with regard to computer user nationality groups (Saudi vs. non-Saudi) and computer utilization. Foreign workers were expected to be more skillful with computers and hence achieve higher levels of computer utilization. Thus, it was speculated that knowledge workers in Saudi organizations will

hypothesize that this will be the case in this study. The F value and the significance level of the ANOVA for these two variables were (5.070, 0.002; 6.638, .001) respectively. Hence, these hypotheses are supported and these findings point that KWSO differ significantly with regard to their computer usage according to computer support and computer training provided by their organizations.

Multiple comparisons between each of these two independent variables groups and the dependent variable (computer usage) was run using the Tukey's honestly significant difference (THSD) test according to the ANOVA approach.

THSD test reveals that the upper quartile of organizational computer support differs significantly with the lowest quartile of organizational computer support. Thus, KWSO with higher levels of computer support tend to highly rate computer usage contrary to KWSO of low levels of organizational support. Likewise, THSD test for organizational computer training reveals that the upper two quartiles differ significantly compared to the lower two quartiles of computer training in rating computer usage. Thus, KWSO with higher levels of organizational computer training tend to highly rate computer usage contrary to KWSO of low levels of computer training provided by the organization.

Conclusions:

The purpose of this study was to illustrate the existence of differences between the individual, technological, organizational and computer utilization factors which form the contexts within which IT is used in development milieus. Data was collected relating to specific aspects of these

computer complexity following the above patterns. Hence, KWSO of high perceptions of computer complexity tend to negatively rate computer utilization.

Organizational Characteristics

The F value and its significance test in the ANOVA table for sector is (F= 13.468 at $p<0.001$). Accordingly, KWSO differ significantly with regard to their computer usage according to the sector (public or private) they belong to.

As sector consists of only two groups (public and private), multiple comparisons between sector groups and the dependent variable (computer usage) is not suitable which requires at least three groups. Paired sample 2-tailed t-test was run ($t = -69.29$, $p<.001$) which revealed that KWSO in the public sector rate computer utilization less significantly than those in the private sector. In other words, KWSO in the private sector highly rate computer utilization than those in the public sector.

KWSO was found to differ significantly with regard to their computer usage according to their organizational level. This finding was based on the F value and its significance test in the ANOVA table (11.609, 0.001) for organizational level as an independent variable. Multiple comparisons between organizational level groups and the dependent variable (computer usage) using the Tukey's honestly significant difference (THSD) test reveals that strategic and tactical managerial levels highly rate computer utilization more than operational level.

Prior research report that users differ in rating computer adoption and usage according to the support and training provided by their organizations. We

relative advantage tend to highly rate computer usage contrary to KWSO of low levels of perceptions of computers' relative advantage. In regard to compatibility, THSD test reveals that the lowest quartile of users perceiving computers being compatible with their work differs significantly with other quartiles of users perceiving computer compatibility in rating computer usage for the favor of upper quartiles.

Observability THSD test reveals that the two upper quartiles of users perceiving computers being observable differ significantly with the lowest quartile of users in this variable in rating computer usage for the favor of the upper quartiles. Another pattern of observability, THSD test reveals that the most upper quartile of users perceiving computers being observable differ significantly with the second low quartile of users in this variable in rating computer usage for the favor of the upper quartile.

Trailability exactly follows the same pattern of that of computer relative advantage. Thus, KWSO with higher levels of perceptions of computers' trailability tend to highly rate computer usage contrary to KWSO of low levels of perceptions of computers' trailability.

Complexity THSD test reveals that the two upper quartiles of users perceiving computers being complex differ significantly with the lowest quartile of users in this variable in rating computer usage for the favor of the lowest quartile. Another pattern of complexity, THSD test reveals that the most upper quartile of users perceiving computers being complex differs significantly with the second low quartile of users in this variable in rating computer usage for the favor of the latter. Thus, KWSO differ significantly with regard to their computer usage according to their perceptions of

rating computer usage for the favor of lower quartiles. Thus, KWSO with lower levels of computer anxiety tend to highly rate computer usage contrary to KWSO of higher levels of computer anxiety. In other words, KWSO of higher levels of computer anxiety tend to negatively rate computer utilization.

Innovational Characteristics

There are five innovation characteristics that usually play significant roles in the adoption and use of an innovation such as computers (Rogers, 1983 and 1995; Tornatzky and Klein, 1982; Davis et al., 1989; Thompson et al., 1991). Prior research identified that four of these characteristics (relative advantage, compatibility, observability and trailability) positively affect computer usage while complexity negatively affects computer usage. This study asserts similar hypotheses of these five innovation characteristics with regard to computer usage. Our findings support all five hypotheses clearly from the F values and the significance levels of the ANOVA tables (3.065, 0.028; 8.816, 0.001; 13.436, 0.001; 11.560, 0.001; 3.112, 0.026) respectively.

Multiple comparisons between each of these five independent variables groups and the dependent variable (computer usage) was run using the Tukey's honestly significant difference (THSD) test according to the ANOVA approach.

THSD test reveals that the most upper quartile of users perceiving computers of relative advantage differs significantly with the lowest quartile of users in this variable in rating computer usage for the favor of the upper quartile. Thus, KWSO with higher levels of perceptions of computers'

these hypotheses are supported and these findings point that KWSO differ significantly with regard to their computer usage according to their attitude towards computers, computer self-efficacy or computer experience.

Multiple comparisons between each of these three independent variables groups and the dependent variable (computer usage) was run using the Tukey's honestly significant difference (THSD) test according to the ANOVA approach mentioned earlier.

THSD test reveals that the upper two quartiles of attitude towards computers differ significantly with the lower two quartiles of attitude towards computers in rating computer usage. Thus, KWSO with higher levels of attitude towards computers tend to highly rate computer usage contrary to KWSO of low levels of attitude towards computers. Similarly, THSD test reveals that KWSO with higher levels of computer self-efficacy highly rate computer usage contrary to their counterparts of low levels of computer self-efficacy. Likewise, THSD test for multiple comparisons between computer experience groups and the dependent variable (computer usage) shows that the higher the KWSO computer experience level the higher they rate computer usage. Every KWSO computer experience level significantly differs with all lower experience levels in rating computer usage for the favor of higher computer experience levels.

The significance value of the F test in the ANOVA table for computer anxiety is ($F= 36.219$ at $p<0.001$). Accordingly, KWSO differ significantly with regard to their computer usage according to their computer anxiety.

THSD test reveals that the upper two quartiles of computer anxiety differ significantly with those lower quartiles to them of computer anxiety in

the structure of the differences. The Levene significant statistic (p = .041) rejects the null hypothesis that the group variances are equal. Multiple comparisons test between education groups and the dependent variable (computer usage) was run using the Tamhane's test according to the ANOVA approach mentioned earlier.

The Tamhane's test statistics show that average computer usage by high school holders was significantly lower than those holding diploma or university graduate or higher studies. This finding indicates that computer utilization would be significantly emphasized by those who hold a diploma or university graduate or higher studies as they should have some kind of computer courses contrary to high school holders where computers are only recently introduced in their curriculum. There are no significant differences between other educational groups in rating computer usage among knowledge workers in Saudi organizations.

It was speculated that KWSO will differ significantly with regard to their computer usage according to their nationality (Saudi or Non-Saudi) for the favor of non-Saudi.

The F value and the significance level of the ANOVA for nationality independent variable were (3.757; 0.053) respectively. Accordingly, Saudi and Non-Saudi do not differ in rating computer usage in Saudi Arabia.

Previous studies point out that users differ in rating computer adoption and usage according to their attitudes toward computers, computer self-efficacy and computer experience. We hypothesize the same for this study. The F value and the significance level of the ANOVA for these three variables were (13.221, 0.001; 20.988, 0.001; 98.078, 0.001) respectively. Hence,

environment. Hence, the study aims to investigate the variations of some influential individual, technological and organizational variables in relation to computer utilization in Saudi organizations.

Individual Characteristics

The F value and its significance test in the ANOVA table for age is (F= 1.180, p=0.319). Thus, we must not reject the hypothesis that average computer usage scores are equal across age groups. Hence, we can assert that computer usage does not differ among age groups and users of different ages have invariant average amount of computer usage. Saying it differently, age does not make difference to rate computer usage in Saudi Arabia.

The F value and its significance test in the ANOVA table for gender is (F= 29.42, p<0.001). Thus, we must reject the hypothesis that average computer usage scores are equal across sex groups. Now that we know the groups differ in some way, we need to learn more about the structure of the differences. This independent variable has only two groups (males vs. females) thus the paired samples test was used to discover the direction and significance of variability between sex groups. The paired samples test statistics (t = -67.57 at p<.001) show a dramatic variability of computer usage between males and females for the favor of males. Saudi males rated computer usage more highly than their counterparts (Saudi females).

The F value and its significance test in the ANOVA table for educational level is (F= 4.334, p=0.002). Thus, we must reject the hypothesis that average computer usage scores are equal across educational groups. Now that we know the groups differ in some way, we need to learn more about

Innovation Characteristics H9: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer relative advantage.	3.065 (0.028)	Supported
H10: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer complexity.	11.560 (0.000)	Supported
H11: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer compatibility with their work requirements.	8.816 (0.000)	Supported
H12: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer observability.	13.436 (0.000)	Supported
H13: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer trailability.	3.112 (0.026)	Supported
Organizational Variables H14: KWSO will differ significantly with regard to their computer usage according to the sector (public or private) they belong to.	13.468 (0.000)	Supported
H15: KWSO will differ significantly with regard to their computer usage according to their organizational level.	11.609 (0.000)	Supported
H16: KWSO will differ significantly with regard to their computer usage according to the organizational support offered to them.	5.070 (0.002)	Supported
H17: KWSO will differ significantly with regard to their computer usage according to the organizational training offered to them.	6.638 (0.000)	Supported

Discussion

This study is set to empirically investigate potential variations of seventeen variables with regard to computer utilization. These variables belong to three main groups of variables: individual, innovation (technological) and organizational. These groups of variables usually addressed in prior research as potent and influential to computer usage that felt important in the Saudi

the null hypothesis, that the means are the same, can be rejected. This test criterion was applied to the study hypotheses using the ANOVA tables 5, 6, & 7.

Table 8 below presents results summary for each hypothesis and declares whether it is supported or otherwise. In fact, all the study hypotheses were supported except that of H2 regarding knowledge worker's age and H8 that deals with knowledge worker's nationality.

Table 8: Results summary

The three main sets of potential influencing variables (individual, innovational or technological (computers), and organizational) and each specific hypotheses related to computer utilization.	F and its Significance	Result
Individual characteristics H1: KWSO will differ significantly with regard to their computer usage according to their gender.	29.415 (.000)	Supported
H2: KWSO will differ significantly with regard to their computer usage according to their age.	1.180 (.319)	Not Supported
H3: KWSO will differ significantly with regard to their computer usage according to their educational level.	4.334 (.002)	Supported
H4: KWSO will differ significantly with regard to their computer usage according to their attitude towards computers.	13.221 (.000)	Supported
H5: KWSO will differ significantly with regard to their computer usage according to their computer experience.	98.078 (.000)	Supported
H6: KWSO will differ significantly with regard to their computer usage according to their computer self-efficacy.	20.988 (0.000)	Supported
H7: KWSO will differ significantly with regard to their computer usage according to their computer anxiety.	36.219 (0.000)	Supported
H8: KWSO will differ significantly with regard to their computer usage according to their nationality (Saudi or Non-Saudi)..	3.757 (0.053)	Not Supported

Organizational Level	Between Groups	776.837	2	388.418	11.609	.000
	Within Groups	11978.205	358	33.459		
	Total	12755.042	360			
Organizational Support	Between Groups	19.408	3	6.469	5.436	.001
	Within Groups	424.758	357	1.190		
	Total	444.166	360			
Organizational Training	Between Groups	23.881	3	7.960	6.763	.000
	Within Groups	420.285	357	1.177		
	Total	444.166	360			

Table 7: ANOVA for Five Innovation Characteristics (Relative Advantage, Complexity, Compatibility, Observability and Trailability)

Innovation Characteristics		Sum of Squares	df	Mean Square	F	Sig.
Relative Advantage	Between Groups	12.274	3	4.091	3.381	.018
	Within Groups	431.892	357	1.210		
	Total	444.166	360			
Complexity	Between Groups	33.002	3	11.001	9.549	.000
	Within Groups	411.164	357	1.152		
	Total	444.166	360			
Compatibility	Between Groups	27.116	3	9.039	7.739	.000
	Within Groups	417.050	357	1.168		
	Total	444.166	360			
Observability	Between Groups	62.025	3	20.675	19.322	.000
	Within Groups	382.141	357	1.070		
	Total	444.166	360			
Trailability	Between Groups	11.320	3	3.773	3.113	.026
	Within Groups	432.846	357	1.212		
	Total	444.166	360			

Test criterion

The results of the tests for all hypotheses are interpreted by examining the significance levels of the F statistic (the ratio of the within-groups mean square and the between-groups mean square). If the means of the groups are similar, F approaches 1. If the significance level (based on the F value and the degrees of freedom for the two mean squares) is small, say .05 or less,

dependent variable for each of the individual, organizational and innovational characteristics groups are shown in Tables 5, 6, and 7.

Table 5: ANOVA for Individual Characteristics (Education, Age, Gender, Nationality, Attitude, Self-Efficacy, Computer Experience, Computer Anxiety)

Individual Characteristics		Sum of Squares	df	Mean Square	F	Sig.
Age	Between Groups	5.811	4	1.453	1.180	.319
	Within Groups	438.356	356	1.231		
	Total	444.166	360			
Gender	Between Groups	965.965	1	965.965	29.415	.000
	Within Groups	11789.077	359	32.839		
	Total	12755.042	360			
Education	Between Groups	592.260	4	148.065	4.334	.002
	Within Groups	12162.781	356	34.165		
	Total	12755.042	360			
Nationality	Between Groups	132.093	1	132.093	3.757	.053
	Within Groups	12622.948	359	35.161		
	Total	12755.042	360			
Attitude Towards Computers	Between Groups	44.414	3	14.805	13.219	.000
	Within Groups	399.752	357	1.120		
	Total	444.166	360			
Computer Self-Efficacy	Between Groups	1912.327	3	637.442	20.988	.000
	Within Groups	10842.714	357	30.372		
	Total	12755.042	360			
Computer Experience	Between Groups	5762.863	3	1920.954	98.078	.000
	Within Groups	6992.179	357	19.586		
	Total	12755.042	360			
Computer Anxiety	Between Groups	2976.300	3	992.100	36.220	.000
	Within Groups	9778.742	357	27.391		
	Total	12755.042	360			

Table 6: ANOVA for Organizational Characteristics (Sector, Level, Support, Training)

Organizational Characteristics		Sum of Squares	df	Mean Square	F	Sig.
Sector	Between Groups	14.192	1	14.192	11.846	.001
	Within Groups	429.974	359	1.198		
	Total	444.166	360			

Results

The results of the homogeneity Levene statistic are presented in Table 4. The observed significance of the test is small, only for educational level. Therefore, the null hypothesis that all variances are equal can be rejected. For the other independent variables, it is clear from Table 4 that, the Levene statistic levels of significance are considered large enough so that the null hypothesis cannot be rejected and there is therefore insufficient evidence to suspect that the variances are unequal.

Table 4: Homogeneity Levene Statistic

Independent Variable	Levene Statistic	df1	df2	Significance
Age	1.013	4	356	.401
Gender	.020	1	359	.887
Educational Level	2.524	4	356	.041*
Nationality	.468	1	359	.494
Attitude Towards Computers	1.722	3	357	.162
Computer Self-Efficacy	.556	3	357	.645
Computer Experience	1.862	3	357	.136
Computer Anxiety	.478	3	357	.698
Sector	.188	1	359	.664
Organizational Level	2.356	2	358	.096
Organizational Support	.525	3	357	.665
Organizational Training	1.970	3	357	.118
Relative Advantage	.542	3	357	.654
Complexity	.757	3	357	.519
Compatibility	.371	3	357	.774
Observability	2.268	3	357	.080
Trailability	1.411	3	357	.239

* The significance of the test is small, the null hypothesis, that all variances are equal, can be rejected.

The results of the ANOVA for testing the differences between the

amount of computer usage.

(2) Should the significance of the F test be at the 0.05 level or better, we can assert that computer usage differs among some of the independent variable groups. (2.1) Now that we know the groups differ in some way, we need to learn more about the structure of the differences. Post hoc test for multiple comparisons indicates which means (of the independent variable groups) differ significantly from the others.

There are two types of post hoc test for multiple comparisons tests:

(a) Post hoc tests that assume equal variances between the independent variable groups, and

(b) Post hoc tests that do not assume equal variances between the independent variable groups. To choose which of these types should be used depends on the Levene statistic. If the Levene statistic is less than or equal to 0.05, then we can use a post hoc test for multiple comparisons between the independent variable groups such that this test does not assume equal variances between groups (for example, the Tamhane's test). If the Levene statistic is greater than 0.05, then we can use a post hoc test for multiple comparisons between the independent variable groups such that this test does assume equal variances between groups (for example, the Tukey's honestly significant difference (THSD) test).

For those independent variables of less than three groups (gender, sector, nationality) post hoc test for multiple comparisons tests between groups is not viable. The alternative was to run the paired samples test to discover the direction and significance of variability between the independent variable groups.

the group differences.

One of the assumptions required for this test is that the variances of the groups in their populations are equal, and this is tested using the Levene test for homogeneity-of-variance test that is less dependent on the assumption of normality than most tests (Norusis/SPSS, 1993). For each case, it computes the absolute difference between the value of that case and its cell mean and performs a one-way analysis of variance on those differences. When the Levene statistic less than or equal to 0.05 we reject the null hypothesis (that the group variances are equal). ANOVA is robust to this violation when the groups are of equal (or near equal) size.

The hypotheses of this study were tested using the ANOVA approach described as follows:

(1) The level of significance for the value of the F test in the ANOVA table for the independent variable is scrutinized.

(1.1) If the significance of the F test is greater than the 0.05 level, then we must not reject the hypothesis that the average computer usage scores are equal across the independent variable groups. Hence, we can assert that computer usage does not differ among the independent variable groups and users of different groups within the independent variable have invariant average amount of computer usage.

(1.2) If the significance of the F test is at the 0.05 level or better, then we must reject the hypothesis that average computer usage scores are equal across the independent variable. Hence, we can assert that computer usage differs among some of the independent variable groups and users of different groups within the independent variable have variant average

only 0.481. Scales alpha ranged from 0.706 to 0.933 as shown Table 3.

Table 3: Summary Statistics (N=722) and Scales Reliability Cronpach's Alpha (N=361)

Construct / Scale	# of items	Mean	Variance	Std Deviation	Alpha
Gender	1	1.18	.15	.39	—
Age	1	2.88	.66	.81	—
Education Level	1	3.41	1.06	1.03	—
Nationality	1	1.08	.07	.26	—
Attitude Towards Computers	5	30.43	23.31	4.83	0.923
Computer Self-Efficacy	4	22.20	20.59	4.54	0.745
Computer Anxiety	10	30.42	80.37	8.96	0.776
Computer Experience	5	12.45	16.72	4.09	0.831
Relative Advantage	6	38.20	27.59	5.25	0.893
Complexity	6	13.51	39.74	6.30	0.877
Compatibility	3	18.16	10.33	3.21	0.858
Observability	5	30.35	23.71	4.87	0.773
Trailability	2	9.22	9.34	3.06	0.481
Sector	1	1.31	.21	.46	—
Organizational Level	1	1.87	.27	.52	—
Organizational Support	6	34.18	81.51	9.03	0.893
Organizational Training	5	24.77	84.00	9.17	0.933
Computer Usage	4	22.68	33.01	5.75	0.706

The ANOVA Approach

The analysis of variance or ANOVA is a method of testing the null hypothesis that several group means are equal in a population, by comparing the sample variance estimated from the group means to that estimated within the groups. ANOVA procedure allows comparing every group mean against every other, a method known as pairwise multiple comparisons. Pairwise multiple comparisons method is capable to describe the nature of

Data Analysis

Summary Statistics

Summary statistics including the profile of the participants in the study and scales reliability Cronpach's Alpha of the study multiple item constructs are shown in Table 2 and Table 3.

Table 2: The profile of the participants (N= 1190)

Characteristics	Statistics
Gender	Male: 944(79.3%), Female: 246(20.7%)
Age	Mean = 38.2 Years, Range 18-58 Years
18-30	449(38%)
31-40	507(42.6%)
41-50	202(17.0%)
51 or more	28(2.4%)
Nationality (Saudi/Non-Saudi)	Saudi: 1083(91%), Non-Saudi: 107(9%)
Educational Level	
Some High School	59(5%)
High School	189(15.8%)
Some College	309(26 %)
College Graduates	540(45.4%)
Higher Studies	93(7.8%)
Organizational Level	
Operational level	268(22.5%)
Tactical level	844(70.9%)
Strategic level	78(6.6%)
Sector	
Public	851(71.5%)
Private	339(28.5%)

Scales Reliability

Scale reliability for the measurement instruments was assessed with Cronbach's alpha (Cronbach, 1951), for which a minimum value of 0.7 is generally acceptable. All multiple items scales used for this study achieved the required minimum alpha value except the trailability scale which scores

according to their gender.
H2: KWSO will differ significantly with regard to their computer usage according to their age.
H3: KWSO will differ significantly with regard to their computer usage according to their educational level.
H4: KWSO will differ significantly with regard to their computer usage according to their attitude towards computers.
H5: KWSO will differ significantly with regard to their computer usage according to their computer experience.
H6: KWSO will differ significantly with regard to their computer usage according to their computer self-efficacy.
H7: KWSO will differ significantly with regard to their computer usage according to their computer anxiety.
H8: KWSO will differ significantly with regard to their computer usage according to their nationality (Saudi or Non-Saudi)..

Innovational Characteristics

H9: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer relative advantage.
H10: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer complexity.
H11: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer compatibility with their work requirements.
H12: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer observability.
H13: KWSO will differ significantly with regard to their computer usage according to their perceptions of computer trailability.

Organizational Variables

H14: KWSO will differ significantly with regard to their computer usage according to the sector (public or private) they belong to.
H15: KWSO will differ significantly with regard to their computer usage according to their organizational level.
H16: KWSO will differ significantly with regard to their computer usage according to the organizational support offered to them.
H17: KWSO will differ significantly with regard to their computer usage according to the organizational training offered to them.

seven-point Likert-type scale, range from (1) strongly disagree to (7) strongly agree.

Research Hypotheses

Both individual characteristics and tendency towards computers are known to influence individual behavior; these hypotheses test the relative potency of individual characteristics and computer usage. The test is suggested by the observation that social receptivity (of innovations) has consistently been more determinative of the directions taken by technological trends than have the properties or developments inherent in the technology itself (Harris and Davison, 1999). However, the properties or characteristics of the technology as perceived by individuals are also investigated in this study. Rogers' five innovation characteristics are known as attributes perceived by individuals to influence their behavior with regard to the innovation (computers) per se. Moreover, organizational characteristics reflect the work environment where knowledge workers interact with the technology are also known to influence individual behavior with regard to the technology.

In order to test for the existence of a difference between the propensities which the study subjects held towards computers, the research took the form of 17 hypotheses as presented in Table 1 with regard to knowledge workers in Saudi organization (KWSO).

Table 1: Research hypotheses

Hypotheses
The three main sets of potential influencing variables (individual, innovational or technological, and organizational) and each specific hypothesis related to computer utilization.
Individual characteristics
H1: KWSO will differ significantly with regard to their computer usage

them as follows:

Relative advantage: the degree to which an innovation is perceived as being better than its precursor;

Complexity: the degree to which an innovation is perceived as being difficult to use;

Compatibility: the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters;

Observability: the degree to which the results of an innovation are observable to others; and Trialability: the degree to which an innovation may be experimented with before adoption.

The items for the five attributes scales were borrowed from Davis (1989) and Moore and Benbasat (1991). Relative advantage and complexity were measured using six items each. Three items were used to measure compatibility, five items for observability, and two items for trailability. Each item response options was anchored on a seven-point Likert-type scale ranging from (1) strongly disagree to (7) strongly agree.

Organizational variables were single and multiple item constructs. The organizational level of the respondent was measured using a single item question. The type of sector private/public the organization belongs to was measured using a single item question. Organizational support provided to computer users was measured using a six-item scale adapted from Mirani and King (1994). Computer training programs provided by the organization was measured using a five-item scale adapted from Igbaria (1993). Both constructs were measured using scales with response options, anchored on a

beneficial/harmful, positive/negative).

Self-efficacy is a belief in one's capability to execute required action and outcome for a defined task, it has been found to be a predictor of performance across tasks of varying complexity (Bandura, 1997). *Computer self-efficacy*, then, refers to a judgment of one's capability to use a computer (Compeau and Higgins, 1995). Computer self-efficacy was measured using a four-item scale adapted from Taylor and Todd (1995) and Compeau and Higgins (1995). Individuals with high computer self-efficacy are expected to perceive themselves being able to accomplish more difficult computing tasks than those with lower judgments of self-efficacy.

Computer experience reflects the individual general background experience with computers. This study used a five-item scale to measure the respondent computer experience that deals with number of years using computers, software applications, computer skills, programming languages and type of computer user in the Rochart-Flannery (1983) typology.

Computer anxiety reflects the general anxiety about using computers and was measured using a ten-item scale developed by Igbaria (1993). The instrument asks individuals to indicate their agreement or disagreement with 10 statements reflecting anxiety, apprehension, confusion, hesitation, etc., related to their use of computers. Response options, anchored on a seven-point Likert-type scale, range from (1) strongly disagree to (7) strongly agree.

The five computer technology attributes, reported in the innovation diffusion research (Rogers, 1983 and 1995), are relative advantage, compatibility, complexity, observability, and trialability. Rogers defined

voluntary usage. Next, this sample was split into two halves, S1 and S2. S1 was used to test the scales reliabilities while S2 was used for the ANOVA analysis.

Research Variables

Computer utilization is the dependent variable in this study – a multidimensional construct comprising all the processes of hands-on computing. It was measured using self-reported measures centered on four measures borrowed from Igbaria et al (1997): (1) Amount of time spent using computers,

(2) Frequency of computer usage sessions,

(3) Diversity of computer application systems, and

(4) Total number of tasks accomplished by these computer application systems.

Single item questions were used to ascertain respondents, gender, age, education, and nationality. Gender of respondents was coded (1) for men and (2) for women. Age was reported in years. Education consisted of five levels ranging from (1) some high school to (5) higher studies. Nationality was measured as dichotomous whether the respondent is (1) for Saudi nationals and (2) for non-Saudi.

Attitudes toward using computers refer to the person's general feeling about using the technology as being favourable or unfavourable. Davis (1993) developed a short scale for attitudes toward using the system. The Davis' five-item scale was used with minor adjustments to make it relevant to the current study. Response options used a seven-point semantic differential scale anchored with (bad/good, foolish/wise, favorable/unfavorable,

Methodology

Sample and Procedure

Participants in this study were end users from fifty six private and public organizations in Saudi Arabia. The participating organizations are distributed throughout the country and represented various types of institutions; banking, merchandising, manufacturing, petroleum industries, educational, health, and public services.

This sample included essentially any hands-on use of computers for the purpose of their work. Basically, this study is a part of a financed project by the Saudi government to build a model of antecedents, mediating, and outcome factors affecting the adoption and acceptance of computers in Saudi Arabia. A list of governmental ministries with their branches and major companies in the main four provinces in the country was collected with the help of the chamber of commerce in each region. A letter signed by the vice president of the university where the researcher is affiliated to, was sent to 136 private and public organizations across the country seeking their participation in the study. Those organizations accepted to participate were asked to nominate a contact person to liaise with the researcher in distributing and collecting the survey questionnaires. Through that procedure, from 1900 end users surveyed 1190 were usable responses thus achieving a response rate of 62.63 %.

Recalling that system usage should be voluntary in order to be pertinent (DeLone and McLean, 1992; Adams et al., 1992), the sample would need to be pruned leaving out those who strictly declare that their use of computers was mandatory. This trim down reduced the sample to 722 respondents of

behind the success and failure of IT adoption and use. Those studies were concerned with different group of variables. One line of research has studied users' characteristics that influence acceptance and usage behavior (Davis et al, 1989; Al-Khaldi and Wallace, 1999). A second line of research has tried to develop an understanding of the impact of the system's technical design attributes and the influence of organizational characteristics on users' acceptance and usage behavior (Abdul-Gader, 1990; Cheney et al., 1986; Ein-Dor and Segev, 1982; Igbaria et al, 1997)). A third line of research has suggested a framework for the adoption and diffusion of innovations centered around the diffusion theory (Tornatzky & Klein, 1982; Rogers, 1983 and 1995; Moore & Benbasat, 1991) that emphasizes five characteristics as the most common technological attributes able to explain up to 87% of the innovation rate of adoption (Rogers, 1995).

The framework of this study emerged from a combination of the above mentioned approaches. Three groups of factors are centered on potential individual, technological, and organizational variables to influence and explain computer utilization. Accordingly, this study is set to empirically investigating several potential factors within these three main categories commonly identified and reported as major predictors of computer adoption and use in developed societies. Hence, the purpose of this study is to empirically explore the variations of several individual, technological, and organizational influential factors dealing with computer utilization usually addressed in prior research and felt important in the Saudi environment. Seventeen potential success factors suggested by the literature are investigated in relation to computer utilization in Saudi organizations.

present in 90% of Bank's lending operations (Harris & Davison, 1999). While the provision of the technology is a necessary condition to achieve the benefits that IT can bring, there is an escalating evidence to suggest that this is not sufficient in itself. Understanding changes in the behavior of individuals and organizations are also required in order to introduce the proper alignment with new technologies (Nelson, 1990).

Utilization of computer information systems is becoming quite important and it is frequently measured as the conduit through which IT can affect performance (DeLone and McLean, 1992; Igbaria et al, 1997; Trice and Trecy, 1988). Researchers have been occupied for a long time to measure information systems (IS) success. DeLone and McLean (1992) reviewed 27 empirical studies which were found to employ system use as at least one of their measures of success. Of all the measures identified, the system use variable is probably the most objective and easiest to quantify, at least conceptually. Therefore, computer utilization is an underlying objective indicator of IT success. However, system usage is only pertinent when such use is voluntary (DeLone and McLean, 1992; Adams et al., 1992). Adams et al (1992) note that measures of actual usage compared to self-reported measures is an important step to further define the relationships between usage as a dependent variable and its potential antecedents. Along with this direction, several researchers in the field used self-reported measures to empirically measure system usage. To name but few, Thompson et al (1991), Igbaria et al (1997), Davis (1993), Davis et al (1989), Venkatesh, and Davis (2000) and Venkatesh et al (2003).

Many studies have been conducted to identify those influential factors

technologies (IT) as a strategic objective. Previous research shows that IT has a perceived impact on the work, the individual, and the organization. Computers can have an important role in leveraging productivity and efficiency in government and private organizations alike. Organizations with successful IT adoption and implementation processes would generate significant performance gains and competitive advantages (Cash et al., 1992; Hirschheim, 1986; Mahmood & Mann, 2000). In a survey of empirical studies that investigated productivity levels prior to and after IT implementation, Hirschheim for instance, found that productivity gains were between 15% and 340%.

Computer systems cannot improve organizational performance if they are not used (Davis et al., 1989). Davis et al, added that, unfortunately, resistance to computer systems by managers and professionals is a wide spread problem. Thus, for computers to achieve its objectives, they should be enormously and effectively utilized for work purposes in organizations. Nickerson (1981), a long time ago, questioned "why interactive computer systems are sometimes not used by people who might benefit from them?" Therefore, to better predict, explain and increase user acceptance, we need to better understand why people accept or reject computers (Davis et al., 1989; Venkatesh, and Davis, 2000; Venkatesh et al, 2003).

Developing countries are increasingly deploying IT in recognition of its vital role to solve their developmental problems, however, studies show that many systems in these countries are underutilized (Anandarajan et al., 2002). Financial loans for IT by the World Bank were in harmony with this direction achieving six times the growth rate of total Bank lending, and is

Computer Utilization in Saudi Organizations: An ANOVA Approach

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Abstract
This study was set to empirically investigate the variations of seventeen individual, technological and organizational variables with regard to computer utilizations in Saudi organizations. A sample of 722 voluntary computer users in organizational setting, from different regions of Saudi Arabia and different industries, was considered in this study. The variance in computer utilization explained by individual variables was 54.8%, 14.3% by technological variables and 12.3% by organizational variables. Saudi nationals apart from specific age as knowledge workers demonstrate to compete with foreign workers in terms of computer utilization. However, women, high school holders, low-level workers and public sector organizations are experiencing computer underutilization. Rogers' five characteristics of innovations diffusion prove to have significant variations on computer utilization in developing nations. Computer complexity and computer anxiety tend to inhibit computer utilization, while favorable attitudes toward computers, computer experience and organizational support and training tend to promote it. These findings are expected to help decision makers and practitioners in Saudi Arabia to encourage promoting factors to sustain computer utilization for work purposes while trying to restrain the effects of the discouraging factors.

Introduction

Computer technology can be viewed to be one of the greatest revolutions in the past century. Modern organizations are keen for substantial and rapid mechanization via computerization and other related information