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Empirical Investigation of the Factors Influencing the Usage Mobile Government Services: Case Study of Saudi Arabia

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Abstract

Mobile Government or mGovernment evolves recently as another platform for eGovernment system on mobile devices or smart mobile devices. This paper investigates the factors that influence the use of Kingdom of Saudi Arabia (KSA) mGovernment services. The motivation of this study dwells on the inability of SAUDI National e-Government portal to elucidate the facet of mobile apps and its related services under the Government services link in their portal. Furthermore, the use of mobile devices for many government services in KSA remains tacit. It is unclear if the services suit for mobile devices or not. There are no specifications on the mobile platform for the use of mobile applications for many government services. In regards to these drawbacks, this research formulated some hypotheses in order to test our claim that the factors that will influence the use of KSA government services on mobile device are yet to be in public domain. Quantitative survey research method is used; random sampling of 240 respondents who are using some KSA government services on mobile devices participated voluntarily in this study. Statistical analyses were used for the hypothesis testing. The results reveal those factors necessary for using government services on mobile devices for KSA.

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Introduction:-

mGovernment is implemented by government to provide information and services to its citizens, employees and organizations through mobile devices [1]. It involves a strategic implementation of utilization of all kinds of wireless and mobile technologies, services, applications and devices for providing benefits to the parties involved [2]. There are many that organizations have adopted mGovernment, such as mCommerce, mBanks, and mBusiness [3]. However, it is still in the early stages of implementation [4]. In addition, there is lack of study that highlights the factors that influence its uses. It is unclear if its usage is subject to mobile device specification or user centered specifications.

mGovernment is not different from eGovernment in terms of content, the only different is that the former is on mobile devices, however both are providing services. In terms of research, there is no general consensus on the framework of mGovernment. This is mostly because different have government provide different services to its citizens. Furthermore, in terms of developing mobile application or any other entity on mobile device, there are different levels of acceptances of some key performance indicators such as "information quality", "User Interface Design" "Content" and Context. The key performance metric that still remain a huge problem is the evaluation of information quality on mobile interface design. It is still unclear with regards to the convenience of users. Moreover, there is no available guideline to assess information quality of mobile interface design. Owing to this loophole, this study intends to point out some guideline to a researcher, developer, and designer the impact of interface design on information quality. Furthermore, we will try to extract the key attributes within information quality and interface design the will influence

the use of KSA government services on mobile device. This could be achieved by relying on theories in order to have grounds on the role mGovernment among users of smartphone in Saudi Arabia. Consequently, a subjective evaluation of three KSA ministries services on mobile device aims at unveiling the entire relationships between those services and the mobile device with the users will be examined. The key expected outcome of this research is to clarify the user satisfactions on the mGovernment if the factors that influence them to use are uncovered. Therefore, research question sets involves *“to what extent the mobile interface design and information quality of mGovernment meet user satisfaction?”* In order to answer this research question some hypotheses are formulated and tested. Random sampling technique was applied with the population KSA citizens from Saudi's universities, information technology, computer science, and information system communities. Many respondents participate in the study; usable responses of 240 participants were used. Among the respondents, some are used for multiple-cases approach for the evaluation of the interface design by undertaken tour in the mGovernment first to make sure they shared some experience before answer the survey questionnaires. This approach is describes as the quantitative survey research methodology. We use it for hypotheses testing, aims at generalizing the result to KSA community.

This paper is organized in seven sections. Following the Introduction section is section 2, 3 and 4 which cover the presentation of theories and conceptual frameworks. Section 5 discusses the research method and section 6 provides the results of the analysis. Finally section 7 describes the conclusion.

Related work:-

Mobile has the uniqueness environment which is difficult to design simple to use. Mobile is different from desktop for many reasons, as such capabilities, size, memory, and interaction techniques [5]. Main design concern form a mobile are : small screen , awkward input especially for typing , download delays, and miss-designed site. As a result, managing interaction design complexity on mobile has been addressed by icons and buttons. Buttons also have confusion users such as back button has many different interpretations , sometime its mean back one step and sometime mean back to idle screen and so on [5].

Rayport and Jaworski[6] conducted a study on the design elements of customer interface design element, while it has been used as a background by many research and interface designer [7]. They highlighted seven (7) factors that could evaluate the interface of electronic services in e-commerce and named these factors the “7Cs”: context, content, community, customisation, communication, connection, and commerce. The 7C customer interface framework defines the user interface with respect to human-computer interaction. Information is an important asset to any organisation. According to DeLone and McLean [8], information quality refers to the quality of the information the system produces. Bailey and Pearson [9] define the information quality as information that is output from a system that is current, accurate, relevant, precise, timely, reliable, complete, concise, and in a preferred format. In addition, information quality is understood to be a multi-dimensional concept that encompasses critical relationships among multiple attributes.

Zeist & Hendriks[10] provided an extended ISO model focus on Functionality, Reliability, Efficiency, Usability, Maintainability, and Portability. Various dimension were used for meaning each factors outline. For functionality the following dimensions were used Accuracy, compliance, security, traceability, interoperability, suitability. For Reliability the following dimension were used Maturity, recoverability, availability, degradability, fault tolerance. For Efficiency the following dimension was used Time behavior, resource behavior. For Usability the following dimension were used Understandability, learnability, operability, luxury, clarity, helpfulness, explicitness, customizability, user- friendliness. For Maintainability the following dimension were used Analyzability, changeability, stability, testability, manageability, reusability. For portability the following dimensions were used Adaptability, conformance, replaceability, installability. In [11] model is provided for information quality measurement metrics for User perceived service quality of information presenting web portals with mobile platform. The factors that will be used to measure are Usefulness of content Adequacy of information. Hence for each factor some dimensions were used under it. For Usefulness of content the following dimension were used Value, reliability, currency, accuracy. For Adequacy of information, the following dimensions were used Completeness, understandability, relevant. A model of online customer health information quality was developed by Stvilia, Mon, Yi [12]. The researcher uses the following factors to build up the model; Accuracy, Completeness, Authority, Usefulness, and Accessibility. Each factor has some dimensions. Accuracy contains the following dimensions; Accuracy, credibility, reliability. Completeness contains the following dimensions; Completeness and clarity.

Authority as a factor is measure by a single dimension authority. Usefulness contains the following dimensions Ease of use, objectivity, utility. Finally accessibility contains the following dimensions Accuracy, precision, timeliness, completeness, relevant, format or report.

Research methodology:-

A. Research design:-

This study dwells on multiple- case approach; involving evaluation of three KSA government ministries services and responsiveness of experience users of KSA mGovernment services. The evaluation is a case study approach. According to Pare [13] case study research has been enjoying increasing acceptance in IS discipline for the last two decades. Yin [14] defines a case of study as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. Thereafter a quantitative survey method, whereby instruments are developed, data are collected and hypotheses are tested based on emergent theory is utilized.

The first step taken in this research is literature review. Sekaran[15] noted that the literature review provides the basis or foundation for developing a conceptual framework for looking at the problem in a more useful and creative way. Based on the information obtained from the literature, a research problem was identified coupled with the research questions and research objectives. Blaikie[16] noted that in order to address a research problem, research questions have to be stated and research objectives defined; together they turn a research problem into something that can be investigated. Having completed defining the research problem and objectives, the researcher developed the theoretical framework of the research. Nachmias and Nachmias[17] defined theoretical framework as representation of reality; it delineates those aspects (variables) of the real world the scientist considers to be relevant to the problem investigated, it makes explicit the significant relationship among those variables and it enables the researcher to formulate empirically testable hypotheses regarding the nature of these relationships. Based on the developed theoretical framework, research hypotheses were then generated and undertake a preliminary study. The findings obtained from the preliminary study helped the researcher to refine the definitions of research problems, research objectives, theoretical framework and generation of research hypotheses. In addition, the preliminary study also helped placed this research in perspective. The next stage of the study involved setting questionnaire, followed by data collection. A total of 300 questionnaires were randomly distributed. After obtaining a valid and satisfactory number of returned questionnaires, the researcher embarked on data analysis and interpretation stage. From the results of data analysis and interpretation, deductions were finally made.

B. Pre Testing the Instrument:-

To ensure that the respondents understood the instrument, a pre-testing of the questionnaire was conducted with two professor, two associate professors, and two assistant professors from the Faculty of Information and communication technology, IIUM international Islamic university Malaysia. Consequently, the questionnaire was also pre-tested with a group of six Phd students at the same faculty. These academician were consulted as they were very experienced researchers in the IS and HCI field. On top of that, they were also mobile government users in their daily life. Realizing the importance and significant contribution of prospective respondents in appraising the questionnaire, fifteen individuals citizen from Saudi Arabia were also engaged in the pre-testing exercise. They were also encouraged to comments and criticize constructively.

C. Pilot Study:-

Babbie[18] defines pilot study as a miniature running-through of a study for the purpose of testing all aspects of the study design. In an attempt of accomplishing the objectives of pilot study a total of 30 respondents participated. However, one questionnaire was found to be unusable as it was incomplete. Based on the usable questionnaires of the pilot study, an analysis using The Statistical Package for Social Science (SPSS) version 16.0 was performed to test on the reliability of the instrument. To this end, a Cronbach's alpha technique was adopted. Except perceived ease of use and perceived accessibility, all other measures recorded Cronbach's Alpha value greater than 0.80, suggesting that the measures are highly reliable. However, a slightly low Cronbach's alpha for perceived ease of use, i.e. 0.693 which is just close to 0.70, and perceived accessibility is 0.706 still acceptable in the context of user study [19].

D. Data Collection Strategy:-

The data were collected mostly in universities. The universities are namely Umm-alQuraa University, King Abdul Aziz University, and Yanbu Industrial College. Umm Al-Quraa University located in Makkah city, while King Abdul Aziz collated in Jeddah, and Yanbu industrial college in Al-Madina. We used the advantages of using tasks to do before start evolution, to help users to have equal an experience before starting evaluation, while its help them to have better understanding of the mGovernment with functions and layout. In addition, located despondence to gather as a group to perform the tasks and answer the questions and make structured interview with them. After considering the nature of the study, user study method was regarded to be the most appropriate. Collecting data has many stage the responders should go thought which are (1) browse the mGovenment over pages for 10 mints, (2) the despondence should start with the task questions, its ask to find out some particular information for 5 mints, (3) the researcher would ask the responders about the overall site quality , structured interview for 10 mints, (4) the despondence would go through the questionnaire to answer the question, and (5) after finish the desponding to all question the researcherask the respondents again about any comments.

In context of Saudi Arabia government universities they have separate branch for female and others for male. As a result, the researcher collects the data by herself from the female branch, while she used her male friend who is also a Phd candidate to do so with male branch.

E. Data Analysis Strategy:

Upon completion of the data collection, the researcher embarked on the data analysis. However, prior to conducting the actual data analysis, data preparatory procedures were undertaken as suggested by Fowler (1993). The procedure involved five phases of activities as follows: (i) deciding on a format, i.e., the way the data will be organized in a file, (ii) designing the code, i.e., assigning appropriate values to responses, (iii) coding, i.e., forming categories for responses where applicable, (iv) data entry, i.e., keying in data in appropriate storage medium, and (v) data cleaning or editing i.e. final checking on the data file to ensure accuracy, completeness and consistency.

Following the data preparatory procedures, data analysis exercises were undertaken. According to Sekaran[15] data analysis aims to accomplish three objectives which are getting a feel of data, testing the goodness of data and testing the hypotheses developed for the research. To acquire the feel of data, descriptive statistics were applied involving the analyses of (i) the frequency distributions for demographic variables, and (ii) the mean, standard deviation, range and variance of research variables. To test the goodness of data, factor analysis and reliability measures were gauged.

Subsequently, hypothesis testing exercises were performed on the collected data in order to test the degree and significance between two continuous variables from interval or ratio scales, the appropriate technique is either correlation or regression analysis. Hence, to measure the degree and direction of influence of the independent variable on the dependent variable, the regression analysis was also applied in this study

F. Response Rate:-

Based on 300 questionnaires distributed to the selected responses in three sites individuals and groups, total of 254 questionnaires were used. The totals of 46 questionnaires were removed because of the bias in the answers. The bias were coming from the unified of answers, did not answer all the questions, or the Hugh varies between answers. The response rate was considered high compared to other experiment and user study studies by involving users. This could be attributed to the following reasons: (i) all targeted respondents used their own phone which made it as easy job to do; (ii) The individual and small group supervised and interviewed by the research makes the session more shoofly going, (iii) the strong cooperation from the responses to do the evaluation. As exhibited in Table 1, the highest response rate was from MOHE (33.9% of 86), followed by same number for MOH and MOMRA (33.1% of 84).

Table 1Response Rate in Each Site

		Total distributed	Total usable	Total unusable	Percent	
Valid	MOH	100	84	16	33.1	
	MOHE	100	86	14	33.9	
	MOMRA	100	84	16	33.1	
	Total	300	254	46	100.0	

G. Reliability Analysis:-

Reliability test using Cronbach's alpha was repeated. Table 2 presents the values of Cronbach's alpha for all the variables, and there all above 0.8. The highest Cronbach's alpha was for user satisfaction variable which recorded a value of 0.943. this means that the instrument employed in this study is highly reliable.

Table 2. Reliability of Instrument Measures

	Measures	No of items	Cronbach's Alpha
Information quality	Perceived usefulness	6	.838
	Perceived ease of use	6	.876
	Perceived accessibility	5	.795
Mobile context	Menu structure	5	.881
	Navigation structure	5	.820
	Eastithcs	7	.888
Mobile content	Title area	3	.851
	Content area	3	.860
Mobile customization	Screen	4	.799
	Customize	4	.833
User satisfaction	Satisfaction	8	.943
Total		56	9.76

H. Respondent Demographic Profiles:-

Table 3 presents the profiles of respondents' gender. The total number of male respondents was 131 or 54.9 % of the entire sample. In contrast, the female respondents contributed were 123 or 45.1% of the whole research sample. Across sites, the number of male a bit more than the female respondents. However, that is small different which couldn't be highly impact the sample.

Table 3. Respondents' Gender

	male	female	
MOH	29	55	84
MOHE	42	44	86
MOMRA	60	24	84
Total	131	123	254

With regard to respondents' age, the pattern of age distribution looked almost identical across sites. As shown in Table 4 the majority of the respondents (78.3%) were between 20 and 25, followed by those between 36 and 40 (5.9%) . In fact, the two group of age between 31 and 35 and between 40-45 were present (5.1%) for each. The least number of respondents came from the age group between 26-30 (4.7%).

Table 4. Respondents' Age

	Below 20	20-25	26-30	31-35	36-40	40-45	
MOH	1	58	6	6	8	5	84
MOHE	1	71	3	3	4	4	86
MOMRA	0	70	3	4	3	4	84
Total	2	199	12	13	15	13	254

Table 5 presents respondents' using Smartphone period. 47.6% respondents indicated that they using Smartphone for more than 3 years, 41.7% respondents using Smartphone between 1-3 years. Respondents with less than one ear experience using Smartphone were 10.6%. Perhaps, the majority of the respondents are familiar with Smartphone function and usage.

Table 5. Respondents' Using Smartphone Period

	less than 1yr	1-3 yr	more than 3 yr	Total
MOH	5	35	44	84
MOHE	12	39	35	86
MOMRA	10	32	42	84
Total	27	106	121	254

The degree of Variation of Research Variables :-

Prior to conducting further analysis, it is imperative to investigate whether there were significant differences on variables. To this end, a two tailed test of 95% confidence interval employing ANOVA was used to detect the differences. The threshold is that if the p value is less than 0.05 then it can be concluded that there exist significant differences. The p values for all variables were well above 0.05 indicating that there were no significant differences across sites. However, upon further scrutiny, significant differences could only be observed on one item measuring only satisfaction factor was $0.02 < 0.05$.

Nevertheless, as the p value was quite close to 0.05, a post hoc analysis employing Scheffe's test was done. The test was considered the most conservative in the sense that it is the least likely to show significant difference. Apparently, the result of the test revealed that $p = 0.076$, which means that there was also no significant difference.

Analysis and presentation result:-

In determining the most influential regression analysis is used. The predictors of perceived usefulness, from all the variables from the mobile context, mobile content and mobile customization were entered into the model as independent variables. Out of the eleven predictors, three turned out to be the most influential, namely navigation structure, menu structure and content area. The three predictors accounted for about 68.4% of the variation in perceived usefulness. The first strongest predictor of perceived usefulness is Navigation structure (i.eContext.N) with (beta = 0.755). Navigation structure is performing structure to do a task or play with the site. Form this finding the stronger predictor for perceived usefulness of information is the navigate structure. The second highest is content area (i.eContext.C) (beta = 0.462). Content area is the area that content or the body of knowledge and information located in amGovernment. The finding approved that the content or body of information within a site it's one of the strong predictor for perceived usefulness of information.

Normally, user can't be fully beneficial form such information without easy to use it. To know which variable has highest predictor on perceived ease of use, the stepwise multiple regressions was used All the hypothesized determinants were found to be influential in determining quality for perceived ease of use. However, upon conducting multiple regressions found only one variable has highest predictor. The Menu structure (i.eContext.M) was found as highest predictor for perceived ease of use with $r = .885$, while the menu structure predictor (beta = 885) which is high coefficients. As known, the information with mobile sites usually arrange within menus. Hence, this finding suggests that a higher degree of menu structure positively related with a higher degree of perceived ease of use for information quality.

Perceived accessibility of information it's more about the access information everywhere anywhere. Upon further analysis using multiple regressions, among the aforementioned factors to highlight the most predictor for perceived accessibility of information. Two variables turned out to be among the strongest predictors. These factors are personalization (i.eCustomisation.P) and title areas (i.eContent.T). The first predictor was personalization (i.eCustomisation.P) with (beta = .752). Accessibility it's about how the user can access the information from the site when he/she need it. Personalization is the degree of tailoring a site with a user setting. Because of that, Personalization has positive relation with perceived accessibility.

The second predictor was title area (i.eContent.T) with (beta = .418). Titles with consist presentation over a site make a user feel that he/she going in the right side. In addition, Title area consist format, look and feel make user positively engagement with the site. Depending on, having high predict of perceived accessibility positively relation with having high title area classification. The perceived usefulness predictors accounted for about 50.7% variation in user satisfaction. Perceived usefulness of information has the highest predictor for the user satisfaction (beta = 712). Of course, the useful of information by meet user need, give complete information that user is looking for. It predict user satisfaction from mobile sites, because of this positive relation between perceived usefulness and user satisfaction the finding suggest that having high predict of usefulness of information make user more satisfied.

Navigation structure (i.e context. N) Predictors explained about 52.9% variation in user satisfaction. Mobile Navigation structure has the highest predictor for the user satisfaction (beta = .727). As a result shows that make user be more satisfied positively related with how much the site easy to perform and play with. In addition, because of this positive relation between navigation structure and user satisfaction the finding suggest that having high predict of navigation of a site make user more satisfied. The stepwise multiple regressions as of the variables title area (i.econtent.T) and content area (i.econtent.C) Predictors explained about 63.1% variation in user satisfaction. The first highest predictors was content area with (beta = .774).This clearly content area on the screen make user more satisfied. In fact, this positive relation is evidence to predict user satisfaction by predict of content area. For more title area as the second predictor by (beta = .392) it also shows that consist format, area, look, and feel of title make user more satisfied. Personalization (i.ecustomization.P) Predictors explained about 56.0% variations in user satisfaction. Personalization has the highest predictor for the user satisfaction (beta = .749). As a result, User will be more satisfied with how much the site tailoring itself in the user setting. In addition, because of this positive relation between personalization and user satisfaction the finding suggest that having high predict of personalize of a site will make user more satisfied.

Conclusion:-

Mobile government (mGovernment) is the mobile version of eGovernment where government services and transactions are delivered through mobile platforms via wireless internet infrastructure. Previous research findings on mGovernment interface design do not provide definitive consensus regarding optimal mGovernment interface design. Crucial to optimal design are the unique needs of different countries for the diverse transactions they provide to their citizens. The major aim of this study is to assess the information quality of mobile interface design on Saudi Arabia mGovernment. This aim is accomplished by investigation of the determinants of information quality, interface design, and user satisfaction. This research utilized a multiple-case research design approach through a quantitative research method, examines the relationship between interface design, information quality, user satisfaction, and their determinants. Three mobile KSA mGovernment were involved in the study, namely the Ministry of Higher Education, Ministry of Health, and Ministry of Rural Municipalities. Review of the literature was done. Preliminary studies consisting of interviews of were conducted. Research variables were derived from those interview studies. Research instruments were developed and validated. . Data were collected and analyzed. The results suggest that all variables from the three groups of determinants were strong predictors of information quality and user satisfaction. The major contribution of the study relies on the three perspectives: theoretical, methodological and practical. From the theoretical viewpoint, this study has developed an empirically-based framework that represents the phenomenon of information quality in the context of mGovernment and its corresponding determinants in the context of Saudi's m-government users. The methodological contributions of this study are the development of a guideline to measure the information quality of mobile interface design, as well as instruments which can be used in future studies. From the practical viewpoint, the developed instruments can be utilized to evaluate information quality of mobile government sites. Despite the success of this study in achieving its aim, this study is subject to several limitations, specifically, the number of variables investigated, the number of respondents and the subjectivity of perceptual measures. Implications for future research include investigation of other variables, such as culturally determined factors.

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