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USES OF SMART DEVICE APPS IN CONSTRUCTION; AN EXPERIENTIAL EVIDENCE FROM CONSTUCTION INDUSTRY OF PAKISTAN

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Abstract: *Smart devices use in construction is changing the pace of construction projects. For the construction management and delivering the projects without time overrun and cost overrun use of smart devices and their application is momentous. This paper aims to develop framework for the use of smart devices and their apps in the construction industry of Pakistan. The methodologies used for finding the awareness about the apps and the exercise of the apps were based on questionnaire, which were pre tested and then the results were analyzed through a special software SPSS (Statistical Package for Social Sciences).To do this research, 120 firms working in construction projects completed full-fledged questionnaire. Smart devices apps were identified from literature review that can be used on construction sites. The findings of this research can support the construction industry in improving the project performance and the exercise of the use of smart devices apps to meet the need of construction industry. The results will help in important research regarding the awareness and exercise of smart devices and their apps and will fill the gap regarding use of smart devices in construction sector.*

Keywords*: Smart devices, Internet Packages, Smart devices apps, construction firms, construction industry, ranking apps*

I. INTRODUCTION

The construction industry all over the world is focusing on the new technologies and advancement. In this modern era of Nano technology smart device are also playing a vital role in the construction industry all over the world and especially in the construction industry of Pakistan. The construction industry is considered the basic unit through which development is achieved. In Pakistan no study has been done until yet regarding the use of smart devices and their application which can be used for construction operations, construction safety, and construction site information. Better project performance leads to better construction industry.

Construction projects performance, communication, documentation, safety measures, on time site operation and procurement are some of the important factors which lead to better performance of the project. All these above mentioned factors can be achieved via use of smart technology and smart devices apps. Being a developing country we should understand its pros and cons and implementation in the construction industry of Pakistan.

Pakistan being developing economy needs to come up with best performance especially in the construction sector in order to compete with other developing economies. According to different surveys and reports, it is clear that Pakistan is having better construction growth rates but it should be optimized more in such way that it can compete with construction industries of developed economies [1].

It leads to the need of new technology which includes the use of smart devices in construction industries. On-site construction management is a critical component for the successful execution of large-scale construction projects. Accurate and timely understanding of on-site information about work tasks and construction resources facilitates management decisions toward improving construction productivity [2].

Now lets talk about the brief history of the mobile phones which is the best smart device that can be used on construction sites. The first mobile phone can into being in 1946 at St. Louis when the AT&T started their service. At that the mobile phones were very expensive all most equal to the cost of car. Although the cost were very high but the system was not convenient but inspite of that large customers emeged. In 1960 due to more advancement in the technology Improved mobile phones have been introduced in the market. The mobile units weighed about 10 kilograms in the 1980's, twelve percent of the research and developing was totally spent over the electronic division in the country of Finland by Nokia Company. The cellular phones come to the world in 1980's. The cellular phone system was based on lowering the transmit power and increasing the frequency use in an area. The main purpose was to reuse and increase the mobility [3].

The most commonly used mobile hardware on construction sites are iPads and iPhones. Blackberry phones, Android phones and Tablets PCs also seem to be among popular choices. The top five applications are site photos, punch list preparation, existing conditions documentation, safety comments/violations recording, and scheduling/finance documentation. Other

applications include BIM coordination, project closeout documentation, preparing and managing change orders, and preparing/sending RFPs [4].

There's no question that mobile devices such as smartphones and tablets have made our lives easier. Mobile construction apps allow you to get instant access to project information in the field and communicate real-time data back to the office or your client [5].

Poor technical performance and shortage of technical staff (MIR = 3.85 for time overrun and MIR = 3.58 for cost overrun) is the second highest ranked factor among the whole factors for labor related issues. Poor technical performance and shortage of technical staff can be due to the over difficult task, low individual aptitude skill and knowledge, evidence of strong effort, despite poor performance and lack of improvement over time. This factor causes time overrun and cost overrun in the construction projects in Pakistan [6].

I. METHODOLOGY

This chapter aims to explain the methodology of this thesis; the main topics sighted in this chapter are populace, examination location, pilot study, data analysis, questionnaire and its contents, in the last statistical validity of questionnaire [7].

In this research quantitative approach is used to understand the perception of the people toward the exercise and awareness of the smart devices and their applications. The first phase is developing questionnaire, by distributing among the experience people to know about nature of the questionnaire whether it is fit for research or not. The second phase was field survey which included construction firms in Pakistan. The third phase software and technique were used to analyze and discussed the data. SPSS was used to perform the required analysis. The last phase is all about conclusion and recommendations. The population this research included contracting companies, consultant and clients. For data collection the firms all over the Pakistan were approached.

II. RESULTS & ANALYSIS

The empirical results of this research have been present in two forms i.e. the results of awareness level of the apps and the exercise of the applications that are in use in the construction industry of Pakistan. More over the results also contain the top twenty apps that are in use in the construction industry of Pakistan.

Applications that can be used at construction sites

The below chart and table shows the unawareness level and the importance of the apps from strongly disagree to strongly agree respectively. According to the Likert scale the value assigned to strongly disagree is 1 and to strongly agree 5 the importance of which is known from the MIR in the table below;

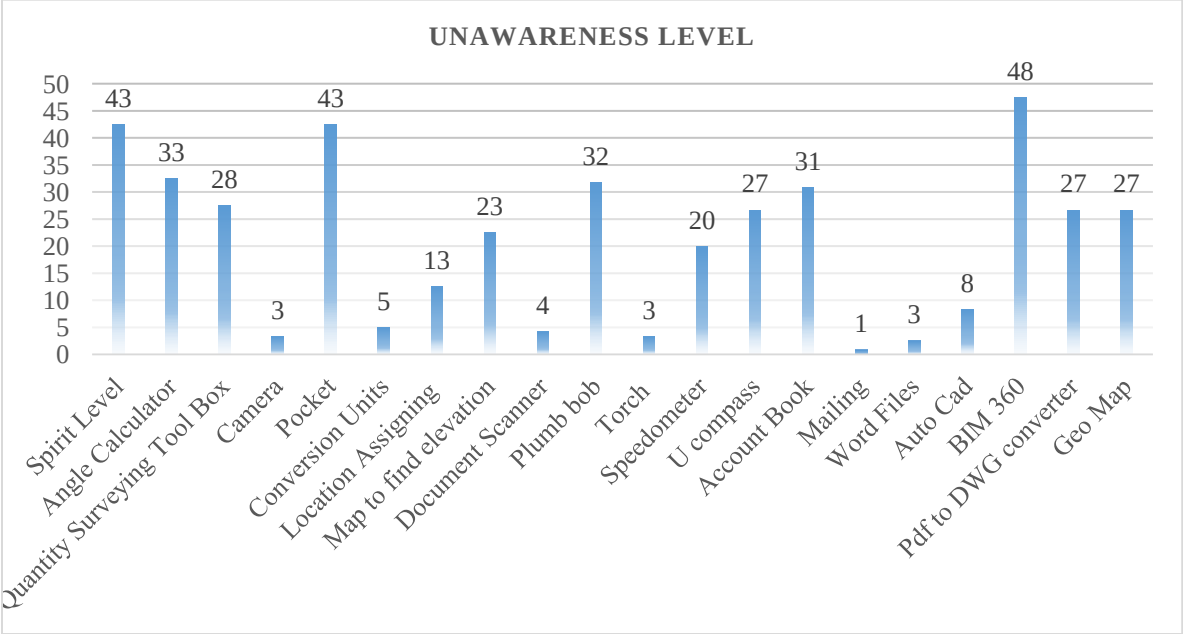

Figure 1Unawareness level of the applications that can be used at construction sites

Table 1Exercise of applications that can be used at construction sites

Applications	N	Min	Max	MIR	S.D	Rank	Remarks
Conversion Units	114	2	5	4.552	0.689	1	V Imp
Auto Cad	110	1	5	4.5	0.806	2	V Imp
Word Files	117	2	5	4.435	0.744	4	Imp
Camera	116	1	5	4.396	0.869	5	Imp
Mailing	119	1	5	4.378	0.788	6	Imp
Document Scanner	115	1	5	4.269	0.878	7	Imp
Map to find elevation	93	2	5	4.215	0.853	8	Imp
Location Assigning	105	1	5	4.161	0.885	9	Imp
Pdf to DWG converter	88	2	5	4.125	0.850	10	Imp
Spirit Level	69	2	5	4.115	0.925	11	Imp
Quantity Surveying Tool Box	87	1	5	4.103	0.884	12	Imp
Geo Map	88	1	5	4.068	0.939	13	Imp
Angle Calculator	81	1	5	4.037	0.974	14	Imp
Torch	116	1	5	4.017	0.999	15	Imp
Account Book	83	1	5	3.879	0.827	16	Imp
BIM 360	63	2	5	3.793	0.893	17	Imp
Plumb bob	82	1	5	3.792	1.067	18	Imp
U compass	88	1	5	3.761	0.953	19	Imp
Speedometer	96	1	5	3.604	0.918	20	Imp
Pocket	69	1	5	3.594	0.952	21	Imp

Note: means<1.49=unimportant; 1.5-2.49= less Important; 2.5-3.49= moderately important; 3.5-4.49= Important; 4.5-5.0= very important

The above chart shows the unawareness level that how much respondents were unaware of the applications that can be used in the construction industry of Pakistan. The values of the table are in percentages. The BIM 360 was ranked as highly unaware application among all the applications. The mailing was ranked as low unaware application among all the applications. The table which is self-explanatory the first column shows the number of the response out of 120, second column shows the minimum value which are strongly disagree=1, disagree=2, neutral=3, agree=4 and strongly agree=5. The second column and third column shows Mean Important Rank (MIR) and standard deviation and the last columns shows the remarks.

Applications that can be used for better communication at construction sites

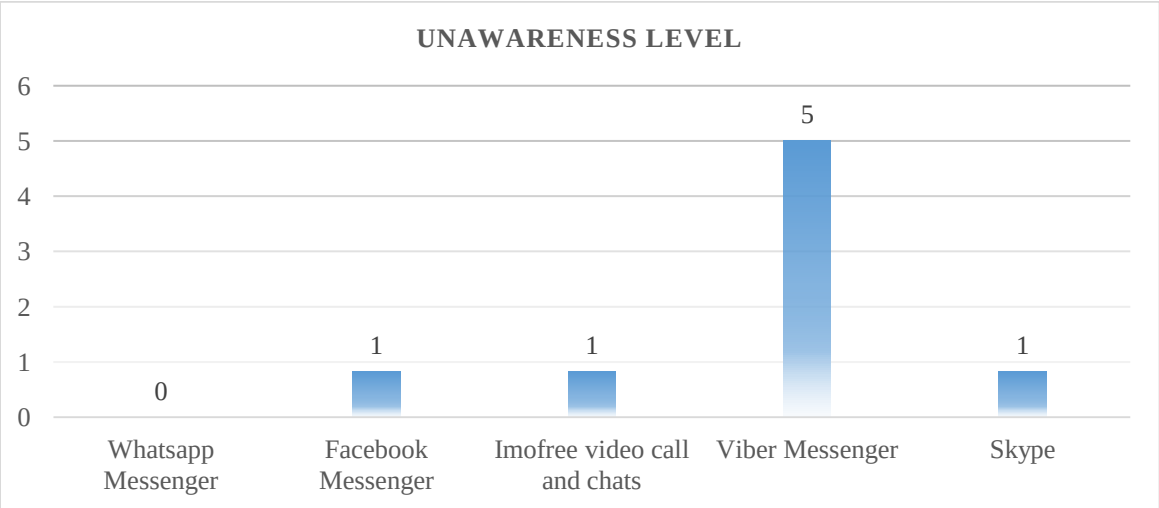

Figure 2 Unawareness level of the applications that can be used for communication at construction sites

Table 2Exercise of applications that can be used for communication at construction sites

Applications	N	Min	Max	MIR	S.D	Rank	Remarks
Whatsapp Messenger	120	1	5	4.608	0.713	1	V Imp
Facebook Messenger	119	1	5	4.033	0.938	2	Imp
Imofree video call and chats	119	1	5	3.672	0.983	3	Imp
Viber Messenger	119	1	5	3.596	1.076	4	Imp
Skype	114	1	5	3.315	1.015	5	Mod. Imp

Top 20 applications that are used in the construction industry of Pakistan

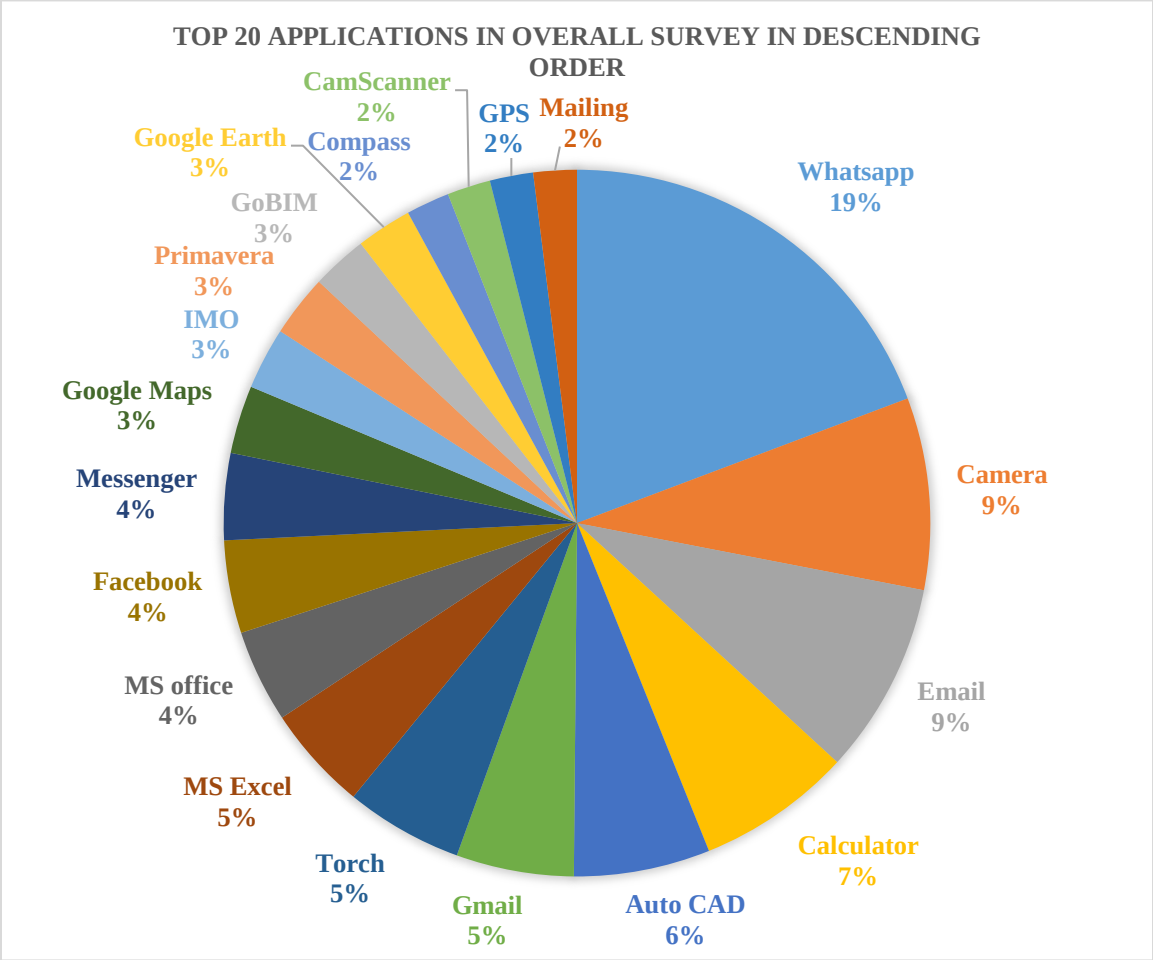

Figure 3 Top 20 application that are used in the construction industry of Pakistan

III. CONCLUSION & RECOMMENDATION

We have concluded that the unawareness level of the applications were low as compared to the exercise of the applications. All most all the respondent were using smart devices on the construction sites for different purposes. We have also concluded that all of the respondent considered internet facility to be the core of the smart devices. BIM 360, Pocket, Spirit level and Viber messenger were the top unaware applications among the application that can be used at construction sites. Conversion Units, AutoCAD, Word file and What Sapp were ranked as most important and highly needed applications. Moreover we have also concluded that SPSS is the best software for descriptive analysis and can be relying.

The findings of the study should be viewed in the limitation that only one country from the developing countries; Pakistan has been taken into account and also the sample represent only one sector i.e. construction industry of Pakistan. The results are valuable for all developing countries. Furthermore, detail studies can be done in order to evaluate the effect of different application on project performance.

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