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Exploring the Extent of ICT Role as a Teaching Tool in the Public Universities of Khartoum State

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Abstract: Recent affordances and advances of information technology have optimized the pedagogical implications in most of the developed countries. This encouraged other countries particularly the Republic of Sudan to use technology tools to enhance their educational institutions. This study aims at exploring to what extent Sudanese government universities are using the information communication technology tools in education. About 6011 teachers in 8 selected universities responded to the distributed questionnaire. Additionally, the data were analyzed using a statistical analysis to get frequencies and mean scores. The results of this study indicated that Sudanese government universities vary in the level of using the technology tools as well as the variance in the types of technological implications. These results reflected that Sudanese government universities still need to pay a great attention towards the use of information communication technology tools. Moreover, the government should make more efforts about providing training course for teachers to improve computer literacy.

Key words: ICT, e-Learning, SGU internet, multimedia, providing, training

INTRODUCTION

The dynamic process and rapid development of technology has a great impact on most of life aspects. Undoubtedly, it has become essential to acquire all the required skills and knowledge of technology principles to achieve the demands of the progressed globe. Information Communication Technology (ICT) as one of the technology principles has witnessed within very short time, a noticeable progress across all the aspects of life, particularly, the sector of education. For many countries, acquiring the skills and understanding the notions of ICT become indispensable to improve their educational systems. Recently, it has been noted that ICT started widely playing a key role in education such as facilitating the process of teaching. Therefore, it should be used efficiently to empower the pedagogical process. Moreover, ICT tools are used for different purposes such as timetabling, library management, electronic reporting and monitoring attendance. These tools facilitate the administration of the universities to attain the community needs (Anderson, 2005). At the same time, ICT has an ample influence on the domains of research and activities (Susan, 2011). However, teachers still need to be prepared to use the ICT in teaching successfully.

Since, the last decade, numerous number of researchers who are concerned with integrating ICT in education have been conducting different studies to examine and explore several matters related to this issue. Pelgrum (2001) distributed a worldwide survey among schools of 26 countries to examine the perceptions of educational practitioners about the challenges that extremely hinder the comprehension of ICT-related goals of schools. The findings showed that the obstacles of understanding the ICT-related goals include both material and non-material conditions and lack of computer literacy among teachers is the main obstacle. By Voogt and Pelgrum (2005) conducted a case study by involving 28 countries to investigate the changes occurred on the curriculum of 'ICT-supported' pedagogical processes. The researchers of this study concentrated on the analysis of both curriculum content and goals. The results revealed that curriculum content often was the same, however, it was delivered in various ways. Yet, several 'ICT-supported' tutorial practices attempted to comprehend new goals which are vital for the learning in the sector of information society. Moreover, both content and goals frequently overcame the traditional boundaries of the academic subjects. In Cyprus whereas ICT in education is still in the infancy

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stage (Mama and Hennessy, 2013) investigated teacher's views about the implications of ICT in the pedagogical processes. Primary teachers were involved in this multi-case study. Teachers showed a positive relation between their opinions and the practices of ICT in schools. Some of researcher suggested to use cloud computing for supporting the tools of teachers in learning methods but in fact cloud computing is suffering from many security problems, these problems effect on cloud dependability (Shakir *et al*., 2016).

A study which is based on the Theory of Planned Behavior (TPB) by Valtonen *et al.* (2015) carried out a quasi-experimental design using repeated measured t-tests to examine the effectiveness of pre-service teacher's intentions to employ ICT tools in teaching and learning processes (Hussin *et al*., 2015). The results of this study showed that there were no differences in the attitudes and intentions of the teachers regarding the applications of the ICT in both teaching and learning. Yet, the findings revealed significant changes occurred on the teacher's self-efficacy towards the use of ICT as well as clear differences between the pre and post tests between the subjective norms and the self-efficacy. A recent study performed by Bai *et al.* (2016) to discuss the learning outcomes resulted due to integrating the ICT effectively into teaching programs. 6304 fifth grade students from 127 rural schools in China were involved in this study. The findings revealed that the process of integrating ICT applications in teaching programs showed a significant effectiveness in the educational performances and on students test scores as a result.

The above studies show positive attitudes about the applications of ICT in different educational systems. However, Sudanese Governmental Universities (SGUs) and other Sudanese institutions, colleges, researches centers, Sudanese secondary and primary schools have largely benefited from the rapid changes in technology and the development of the information technology in Sudan (MHESRS., 2011). For instance, the candidates of the Sudanese secondary certificate have got their results and present for the universities by the internet. In addition, most of the students in Sudanese universities make their registration by the internet (Abdalla, 2013). Although, Sudan has many governmental universities and many other higher educational institutions and most of these institutions have different polices in education and teacher's training, also have different visions, missions and polices in the using of ICT. Yet, there remains a lack of studies examining the attitudes of Sudanese instructors and students and their practices about the ICT applications if any. This study aims to explore to what extent SGUs are using the ICT tools in education. The current study will give many results that serve the Sudanese universities and the Sudanese social community in general.

MATERIALS AND METHODS

In this study, we diagnosed thequestionnaire for determine the using information communication technology as a teaching tool in Sudanese governmental universities of Khartoum State. To fix these problems, we firstly conducted a survey to variousteachers in the (SGUs) in Khartoum State. The questionnaires were distributed to collect the required data in order to achieve the research goal. The total number of samples collected was 6011 teachers in 8 selected universities. The survey was disseminated through the website. Moreover, observation was also conducted in many universities that used the ICT such as University of Khartoum, Sudan University of Science, Omdurman Islamic University, Al-Neelain University, Bahri University and government institutions. In addition, the data were analyzed using a statistical analysis to find out the problems that the organization faces.

This study hopes to shed light on using information communication technology as a teaching tool in Sudanese governmental universities of Khartoum State. Figure 1 shows the steps of the methodology.

Participants: The participants of this study were organizations in Khartoum State. This study focused on

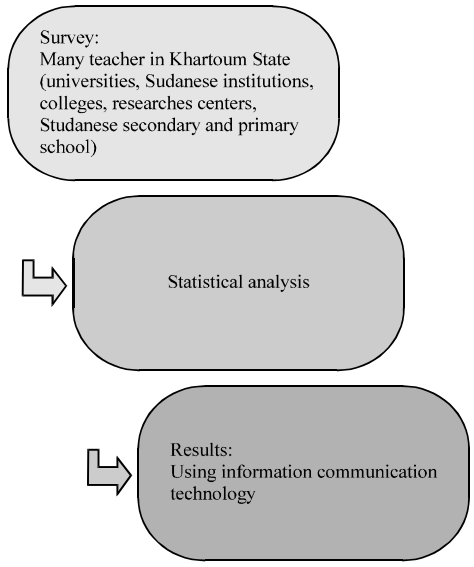

Fig. 1: Steps of methodology

Table 1: Total number of teachers and the corresponded sample of each universities in SGU

University	Total	Sample (10%)
University of Khartoum (U of K)	1240	124
Sudan University of Sciences and Technology (SUST)	1010	100
Omdurman Islamic Unniversity (OIU)	950	95
Al-Neelain University (AU)	900	90
Bahri University (BU)	700	70
Al-Ziem Al-Azhari University (AAU)	450	45
The Holy Quran University (HQIU)	400	40
The National Ribat University (NRU)	361	36
Total	6011	600

the teachers who had works in Sudanese Governmental Universities (SGUs) and other Sudanese institutions, colleges, researches centers, Sudanese secondary and primary schools. In this study, from 8 universities (Table 1) were selected to ensure a wider scope of data collection which helped to diagnose the usage that were identified. The total number of teachers in these universities was 6011 (MHESRS., 2011). According to Canelo (2012), the total number of samplewas 600 the data collected. Based on the results of this survey, it is found the level ofusing information communication technology as a teaching tool in Sudanese governmental universities of Khartoum State.

Data collection instrument: This research consists of two phases of data collection. The first phase includes the background information of the participants and organizations while the second phase focuses on the cloud computing security. The data collection was conducted by distributing the questionnaire and collecting the feedback from various organizations via. email and field visits within a period of 6 months.

Table 1 shows the data collected on the background information of the participants and organizations. It shows that 124 participants from University of Khartoum, 100 of them from SUST, 95 of them from OIU, 90 of them from AU, 70 of them from BU, 45 of them from AAU , 40 of them from HQIU and 36 of them from NRU. Table 1 also presents the university, total and sample.

On the other hand, the second part of the questionnaire focuses on the using information communication technology as a teaching tool. The study uses the descriptive method in the analysis of the quantitative data with benefits from (SPSS) application such that the study used Chi-square test, to find if there are statistical significance differences or not in addition to the use of MS-Excel.

Analysis of the teachers questionnaire: The study presents and analyzes the answers obtained from the teachers in SGUs about their opinions for the questions included in the questionnaire, to validate the study hypotheses.

Table 2: Values of Chi-square-test for ICT hardware in SGU

Usage of ICT hardware	Mean	Calculated χ^2	χ^2 from table	df	Sig.	N
PC	2.4633	98.350	9.488	4	0.000	600
Lab top	2.5117	123.417	9.488	4	0.000	600
Projectors	1.9467	32.500	9.488	4	0.000	600
Digital audio	1.2100	191.950	9.488	4	0.000	600
Digital video	0.8150	469.617	9.488	4	0.000	600
Digital cameras	0.6983	696.500	9.488	4	0.000	600
Interactive whiteboard	0.3000	1417.950	9.488	4	0.000	600

Table 3: Percentages of the usage of ICT hardware in SGU according to the Chi-square means

Mean ranges	Selections	No. of means	Percentages
0-0.8	Never used	2	28.6
0.8-1.6	Rarely used	2	28.6
1.6-2.4	Middle used	1	14.2
2.4-3.2	Most used	2	28.6
3.2-4	Full used	-	-
Total		7	100.0

Testing the use of ICT hardware in SGU: According to the first question in the questionnaire which is: (please can you estimate the usage level of the following ICT hardware in your college)? The researcher makes this question to validate the first hypothesiswhich is: (there is no usage of ICT hardware in SGU). The following table shows the meansof the respondent's teachers about the use of the ICT hardware in SGU.

From Table 2, the probability values for all questions are 0.000 and these values are less than the significance level which is 0.05. Also, the critical value of Chi-square which is 9.488) is less than the calculated values of Chi-square. These two statistic inferences indicate that there are statistic significant differences in the usage of ICT hardware in SGU and all the statements in Table 2 are statistic significant at the level 0.05.

The results of usage the ICT Hardware in SGU refers to the lab tops results was 2.5177, PC (2.4633), projectors 1.9467, digital audio 1.21, digital video 0.815, digital camera 0.6983 and interactive whiteboard 0.3 as shows in Fig. 2.

From Table 3, the ICT hardware is most used by 28.6%) middle used by 14.2%, rarely used by 28.6% and never used by 28.6%. These percentages indicate that the first hypothesis of the study (there is no usage of ICT hardware in SGU is not typical. According to these results, there is a gradient distribution in the level usage of ICT) hardware in SGU begins from the high-level usage of the lab top and personal computers which are most used by 28.6%, respectively ended by the low

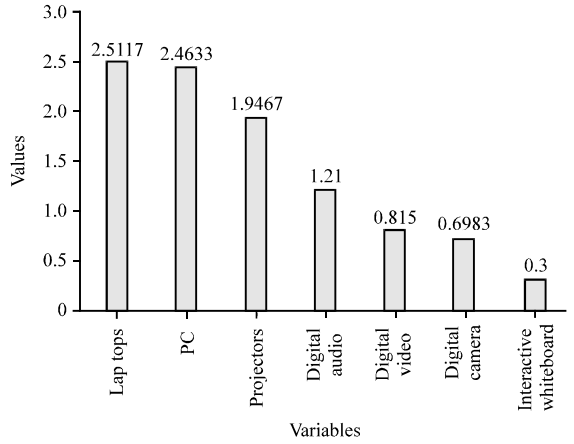

Fig. 2: Usage hardware in SGU

Table 4: Values of Chi-square test for the ICT Software in SGU

Usage of ICT Software	Mean	Calculated χ^2	χ^2 from table	df	Sig.	N
Office suite	2.6567	1.49417	9.488	4	0.000	600
Internet software	2.0133	54.88300	9.488	4	0.000	600
Graphical software	1.8417	20.88300	9.488	4	0.000	600
Databases	1.7217	62.23300	9.488	4	0.000	600
Multimedia software	1.6150	58.95000	9.488	4	0.000	600
Encyclopedias cameras	1.175	246.11400	9.488	4	0.000	600
Simulation software	1.0600	301.33300	9.488	4	0.000	600

level usage of video devices which are rarely used by 28.6%. In addition, digital cameras and interactive whiteboards devices are not used in SGU by 55%. Figure 2 shows the level usage of ICT hardware in SGU according to the means of the teacher's questionnaire.

Testing the use of ICT Software in SGU: According to the second question in the questionnaire which is (please can you estimate the usage level of the following ICT Software in your college?). The researcher makes this question to validate the second research hypothesis which is: (there is no usage of ICT Software in SGU. Table 4 shows the means of the respondents about the use of the ICT Software in SGU.

From Table 4, the probability values for all questions are 0.000 and these values are less than the significance level which is 0.05. Also, the critical value of Chi-square which is 9.488 is less than the calculated values of Chi-square. These two statistic inferences indicate that there are statistic significant differences in the usage of ICT Software in SGU and all the statements in Table 4 are statistic significant at the level 0.05.

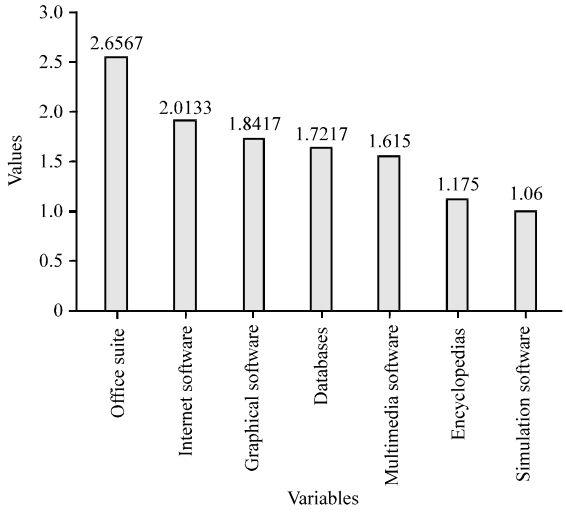

Fig. 3: Software in SGU

Table 5: Percentages of the usage of ICT Software in SGU according to Chi-square means

Mean ranges	Selections	No. of means	Percentages
0-0.8	Never used	-	-
0.8-1.6	Rarely used	2	29
1.6-2.4	Middle used	4	57
2.4-3.2	Most used	1	14
3.2-4	Full used	-	-
Total		7	100

The results of usage the ICT Software in SGU refers to the result was office suite (2.6567) internet software (2.0133), graphical software (1.8417), database (1.7217), multimedia software (1.615), encyclopedias (1.175) and simulation software (1.06) as shows in Fig. 3.

From Table 5, the ICT Software is most used by 14%, middle used by 57% and rarely used by 29%. These percentages values indicate that the second hypothesis of the study (there is no usage of ICT Software in SGU is not typical. These results indicate that there is a gradient distribution in the level usage of ICT Software in SGU, begins from the high-level usage of the office suite which is most used by 14% ended by the low-level usage of simulation software which is rarely used by 29%. Figure 3 shows the level usage of ICT Software in SGU according to the means of the teacher's questionnaire.

Testing the use of ICT tools (computers or internet) in SGU systems: According to the third question in the teacher's questionnaire which is: (please can you estimate the usage level of computer or internet in the following systems in your college)? The researcher makes this question to validate the third research hypothesis which

Table 6: Values of Chi-square-test for ICT tools (computers or internet) in SGU systems

Usage of tools (computers or internet) in SGU system	Mean	Calculated χ^2	χ^2 from table	df	Sig.	N
Registration system	3.1317	486.317	9.488	4	0.000	600
Results system	3.1000	448.717	9.488	4	0.000	600
Management system	2.3983	58.417	9.488	4	0.000	600
Accounting system	2.2850	71.700	9.488	4	0.000	600
e-Learning system	1.5833	54.7	9.488	4	0.000	600
Video conferencing system	1.4617	90.217	9.488	4	0.000	600
Virtual meeting system	1.3900	114.267	9.488	4	0.000	600
Planning students course	1.3450	176.533	9.488	4	0.000	600
Preparing students examination	1.3200	145.283	9.488	4	0.000	600
Preparing lectures in presentation software	1.0117	323.833	9.488	4	0.000	600
Giving students assignments to be presented by computer	0.8650	473.150	9.488	4	0.000	600

Table 7: Percentages the usage of ICT tools (computers or internet) in SGU according to the Chi-square means

Mean ranges	Selections	No. of means	Percentages
0-0.8	Never used	-	-
0.8-1.6	Rarely used	1	12.5
1.6-2.4	Middle used	4	50.0
2.4-3.2	Most used	3	37.5
3.2-4	Full used	-	-
Total		8	100.0

is: (there is no usage of ICT tools (computer or internet) in SGU systems). The following table shows the means of the respondent's teachers about the usage of ICT tools (computers or internet) in SGU systems.

From Table 6, the probability values for all questions are 0.000 and these values are less than the significance level which is 0.05. Also, the critical value of Chi-square which is 9.488 is less than the calculated values of Chi-square. These two statistic inferences indicate that there are statistic significant differences in the usage of ICT tools (computers or internet) in SGU systems and all the statements in Table 6 are statistic significant at the level (0.05).

From Table 7, the ICT tools (computers or internet) are most used by 27%, middle used by 18% and rarely used by 55%. These percentages values indicate that the third hypothesis of the study (there is no usage of ICT tools (computers or internet) in SGU systems) isnot typical.

Table 8: Values of Chi-square-test for the usage the internet in SGU

Mean ranges	Selections	No. of means	Percentages
0-0.8	Never used	-	-
0.8-1.6	Rarely used	6	55
1.6-2.4	Middle used	2	18
2.4-3.2	Most used	3	27
3.2-4	Full used	-	-
Total		11	100

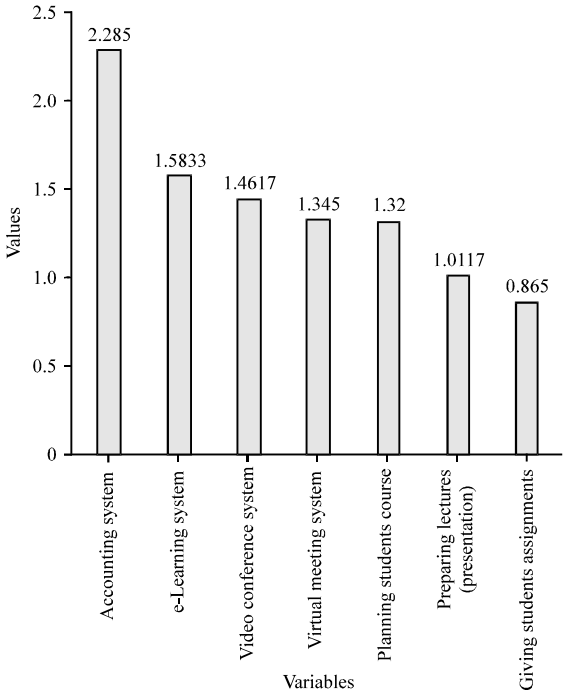

Fig. 4: Usage of ICT tools (computers or internet) in SGU systems

According to the above results, there is a gradient distribution in the usage level of ICT tools (computers or internet) in SGU systems, begins from the high level usage of the registration system which is most used by 18%, ended by the low level usage of giving students assignments to be solved by computers which is rarely used by 55% in SGU systems. Figure 4 shows the level usage of ICT tools (computers or internet) in SGU systems according to the means of the teacher's questionnaire.

Testing the use of the internet in SGU: According to the fourth question in the teacher's questionnaire which is: (please can you estimate the usage level of the internet in your college)? The researcher makes this question to validate the fourth research hypothesis which is: (there is no usage of the internet in SGU). Table 8 shows the means of the respondent's teachers about the usage of the internet in SGU.

From Table 8, the probability values for all questions are 0.000 and these values are less than the significance

Table 9: Percentages of usage internet in (SGU) according to the Chi-square means

Usage the internet for	Mean	Calculated χ^2	χ^2 from table	df	Sig.	N
Searching information	3.1150	433.617	9.488	4	0.000	600
Intracting with my colleges	2.4817	154.767	9.488	4	0.000	600
Following students projects, thisis and researches	2.3850	95.133	9.488	4	0.000	600
Browsing the university web site	2.0233	46.317	9.488	4	0.000	600
Interacting with administrators	1.8850	39.350	9.488	4	0.000	600
Writing educational materials	1.7050	80.683	9.488	4	0.000	600
Solving academic assignments	1.5717	77.483	9.488	4	0.000	600
Downloading academic materials	1.1733	210.917	9.488	4	0.000	600

level which is 0.05. Also, the critical value of Chi-square which is 9.488 is less than the calculated values of Chi-square. These two statistic inferences indicate that there are statistic significant differences in the usage of the internet in SGU and all the statements in Table 8 are statistic significant at the level (0.05).

From Table 9, the internet is most used by 37.5%, middle used by 50% and rarely used (12.5%). These percentages indicate that the fourth hypothesis of the study which is (there is no usage of the internet in SGU) isnot typical. According to these results, there is a gradient distribution in the level usage of the internet in (SGU), begins from the high level usage of the internet in searching which is most used by 37.5% ended by the low level usage of the internet in downloading academic materials which is rarely used by 12.5%. Figure 5 shows the level usage of the internet in SGU according to the means of the teacher's questionnaire.

Testing of the ICT teacher's training in SGU X: According to the five question in the teacher's questionnaire which is: (are you get any ICT teachers training in the following (ICT) tools from your university)? The researcher makes this question to validate the fives research hypothesiswhich is: (there are no (ICT) teachers training in SGU). The following table shows the meansof the respondent's teachers about the ICT teacher's training in SGU.

From Table 10, the probability values for all questions are 0.000 and these values are less than the significance level which is 0.05. Also, the critical value of Chi-square which is 7.815 is less than the calculated values of Chi-square. These two statistic inferences indicate that there are statistic significant differences in the ICT teacher's training in SGU and all the statements in Table 10 are statistic significant at the level (0.05).

Table 10: Values of Chi-square for the ICT teacher's training in SGU

Are you getting a teacher training in the following of the ICT tools from your university?	Mean	Calculated χ^2	χ^2 from table	df	Sig.	N
Office suit	0.5450	626.520	7.815	3	0.000	600
Graphil software	0.5350	626.520	7.815	3	0.000	600
Smart phone	0.4783	554.227	7.815	3	0.000	600
Personal computers	0.3433	1029.813	7.815	3	0.000	600
Internet and networks	0.3300	1005.520	7.815	3	0.000	600
Lap tops	0.31500	1091.347	7.815	3	0.000	600
Databases	0.3033	971.893	7.815	3	0.000	600
Multimedia software	0.2800	1006.013	7.815	3	0.000	600
Multimedia projects	0.2600	1186.160	7.815	3	0.000	600
Internet services	0.2300	1237.773	7.815	3	0.000	600
Examinations system	0.2267	1189.360	7.815	3	0.000	600
Encyclopedias CDs	0.2217	1195.613	7.815	3	0.000	600
Registering systems	0.2100	1253.360	7.815	3	0.000	600
e-Learning systems	0.2000	1286.173	7.815	3	0.000	600
Simulation software	0.1867	1254.813	7.815	3	0.000	600
Network connectivity	0.1583	1388.040	7.815	3	0.000	600
e-Library systems	0.1583	1374.333	7.815	3	0.000	600
Digital audio devices	0.1533	1401.840	7.815	3	0.000	600
Maintenance	0.1433	1423.627	7.815	3	0.000	600
Interactive whiteboards	0.1267	1480.053	7.815	3	0.000	600
Image digital cameras	0.1200	1466.133	7.815	3	0.000	600
Digital video devices	0.1083	1480.893	7.815	3	0.000	600

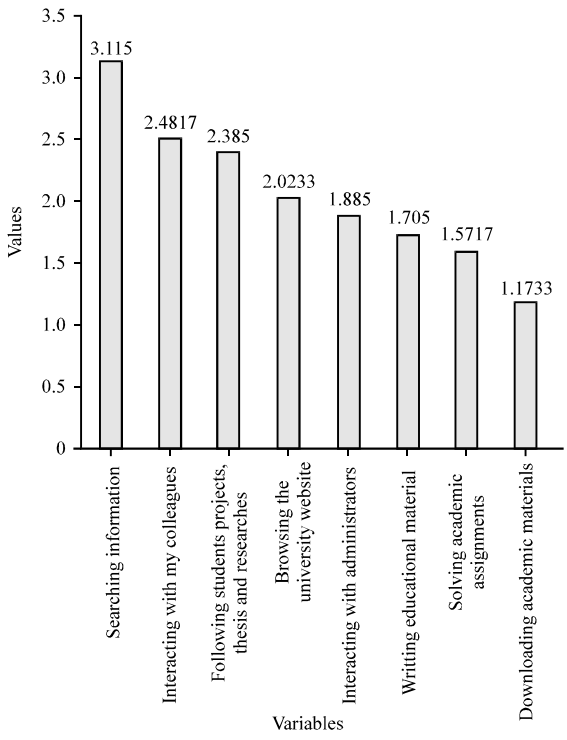

Fig. 5: Usage the internet in SGU

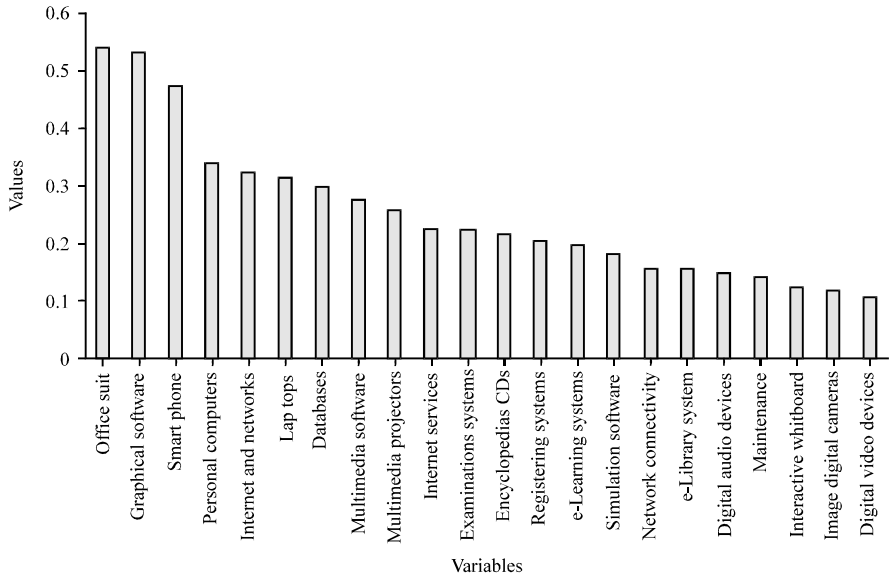

Fig. 6: ICT teacher's training in SGU

Table 11: Percentages for teacher's training in SGU according to the Chi-square means

Mean ranges	Selections	No. of means	Percentages
0-0.75	Never get	22	100
0.75-1.5	One time get	-	-
1.5-2.25	Two time get	-	-
2.25-3	More than tow time get	-	-
Total		22	100

From Table 11, all teachers in SGU are never get any ICT teacher's training. This result indicates that the fives hypothesis of the study (there are no (ICT) teachers training in SGU istypical. These results reflect that there is no (ICT) teacher's training in SGU because their means are <0.75 as it shown in Fig. 6.

RESULTS AND DISCUSSION

From the previous presentation and analysis, the study founded that computersare mostly used (ICT) hardware in SGU. This result indicates that SGU uses the computers properly. The multimedia projectors devices are middle used and this result reflect that the SGU need more concern with this type of ICT hardware because of the effective functions of the projectors devices in the university life. The digital audio devices are rarely used, this result indicate that: (SGU) need to increase their (ICT) hardware needs, especially, the digital audio devices because are necessary for the big lectures rooms to help the teachers in teaching. Digital cameras and interactive whiteboards are never used in SGU. It is important for SGU to include the interactive whiteboards in their (ICT) hardware to cope wrath the international universities. Also, SGU need to draw the attention to digital literacy especially, the ICT and visual literacy for interactive whiteboards as during the data collection stage by the questionnaires, the researcher founded that there is a lack of knowledge about the interactive whiteboards devices, so, most of the teachers ask about the roles of this device. This fact need from SGU to make (teachers and students) training courses for this ICT hardware.

CONCLUSION

The study found thatoffice suite is mostly used in SGU. But according to the importance of the office suite for teachers, (SUG) need more concern with the usage of it because of the different functions of it, specially, (PowerPoint) application in the presentation of the lectures. The (data base, graphical internet applications, simulation) software are middle and rarely used in SGU. These results reflect that there is a need to concern with this ICT Software from SGU. The study stated thatcomputer and internet are mostly used in the registration and results systems. These results reflect that the registration of students in most (SGU) is done by computers or internet but (SGU) need more activation for these (ICT) tools to enable all students to register by the internet and to get their examinations results. In addition, to the mostly use of (computer and internet) in accounting system, the study indicated that these tools are middle used in the e-Learning system. Moreover, the results reflect that (SGU) need to concern with this type of

learning methods because importance of e-Learning system, especially, some previous studies recommended (SGU) to use this system such as: the study conducted by Hala (2012) about e-Learning in SGU. The ICT tools (computers or internet) are rarely used in the: [video conferencing system, virtual meeting system, planning student's courses, preparing students courses, preparing lectures in presentation software and giving students assignments to be presented by computers. SGU need to train and motivate the teachers in the implementations of these systems because all teachers in SGU have some positive opinions towards (ICT) tools in teaching, so, (91%) of the teachers believe that ICT tools can develop both teachers and students 8. These results showed that (SGU) need more concerning with the usage of ICT tools.

Furthermore, findings of the current study reported that the internet is mostly used in searching for information interacting of teachers with their colleagues, follows up of the student's researches, projects and theses. These results indicate that the internet is used properly in the above activities in SGU. In addition, the internet is middle used in browsing the university web site and in writing academic materials but it is rarely used in downloading academic materials. The rarely usage of the internet in downloading maybe due to the low level of the speed of the networks in SGU. This postulate that (SGU) need to improve and increase the internet speed to help teachers and students in downloading for the academic materials. Finally, this study also reported that there is no teacher's training in SGU and most of teachers trained themselves outside the university. It has been declared that teacher's training is only in their plans and objectives but in reality, there are no implementations of these plans in the teachers training. Actually, training needs financial support from the government and maybe there is a lack of financial support from the government ormaybe other fields take a priority in supporting than the educational field in SGU.

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