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The Assessment of Information and Communication Technology in Enhancing Researchers' Efficiency

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Abstract

The study aimed at investigating the role of Information and Communication Technology (ICT) tools in enhancing the researchers' efficiency among English as a foreign language (EFL) faculty members. An explanatory mixed methods design was used to collect data from a sample of 43 EFL faculty members through a closed-end online survey and a WhatsApp group. The findings showed that 75% of the participants used ICT tools in the various stages of research. The qualitative data showed that 12 ICT tools including WhatsApp, Internet search engines, Google Forms, Office programs, citation websites and programs, Adobe reader, social networking sites, smart phone cameras, quantitative analysis programs, electronic mail, online word processors and similarity check programs. The findings of this study can be utilized in designing training programs on the employment of ICT in research work in order to empower researchers with more efficiency in using ICT tools for research purposes.

K**eywords:** Assessment; efficiency; faculty members; higher education; information and communication technology; research

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Introduction

Information and Communication Technology (ICT), almost freely costless and remote assistance, is an increasingly important area in the field of research. ICT tools have become an undeniably effective player in all the steps of research process including the 'accumulation of data and documents, improvements in the precision of knowledge reproduction, innovative and more effective routines to design new products and conduct problem solving activities.' (Essays, 2018). Cuff (2014, p.75) argues that 'From elementary schooling to doctoral-level education, technology has become an integral part of the learning process in and out of the classroom.' With the assistance of ICT tools, researchers can run their research stages of discovering, gathering and organizing information in a very accurate, successful and fast way (Nakhaei et al., 2016). Technological tools have been made available to facilitate the work of people including researchers in many means such as electronic bulletin boards, databases, forums, e-mails, blogs, as well as social networking sites. Very little research has been conducted on what and how ICT tools would assist facilitating researchers' work. The significance of the study lies in shedding light on ICT tools in researching and the ways researchers use them in various stages of research in order to help facilitate researchers' work. Therefore, this study attempts to investigate the impact of ICT tools on the researchers' efficiency in terms of habits and actual use with the aim to uncover what roles ICT may have in the various steps of research conduction.

Review of Literature

Information and Communication Technologies (ICTs) are referred to as the varied collection of technological gear and resources that are made use of to communicate, generate, distribute, collect and administer information according to Sarkar (2012). Adegbenro et al. (2019, p.548) defined ICT tools as 'digital infrastructures such as; computers, laptops, desktops, data projector, software programs, printers scanners and Interactive teaching box.' ICTs consist of the hardware, software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images), as well as related services. ICTs can be divided into two components: Information and Communication Infrastructure (ICI) which refers to physical telecommunications systems and networks (cellular, broadcast, cable, satellite, postal) and the services that utilize them (Internet, voice, mail, radio and television) and Information Technology (IT) that refers to the hardware and software of information collection, storage, processing and presentation.

ICT have many benefits. In 2008, Crook and Harrison argued that ICT can contribute to the people's engagement, availability and sense of ownership. Learners, teachers and researchers are more engaged, can have access to content-related work and discussions with remote people at any time and have a chance to be assessed and thus improve themselves. ICT can help in the doing of research and facilitate the researchers' work in many aspects that relate to access to most updated resources and information, reduction of time using ICT tools that accelerate the process of information, accuracy, organization of the activities, notes and references, etc., motivation of using ICT tools that help in the reduction of the researchers' tiredness, teamwork through the use of social networks that assist in more collaboration and cooperation among researchers, durability in storing, retrieving and processing information, publication and independency from time and location that makes the conduction of research unlimited from time and place (Nakhaei et al., 2016).

ICT Affordance and Research

The affordance of ICT refers to the functions that determine how information and communication technological tools are used in terms of accessibility to information and people, diversity, communication and collaboration, synthesis, assessment, reflection, etc.

(Conole and Dyke, 2004). In educational context, ICT has the potential to increase access to education and improve its relevance and quality. In (2002), Tinio asserted that ICT has a tremendous impact on education in terms of acquisition and absorption of knowledge to both teachers and students through the promotion of active learning, collaborative and cooperative learning, creative learning, integrative learning and evaluative learning. More specifically, Sarkar (2012) highlighted four areas where ICT tools can be more powerful. These areas relate to the bandwidth and computing power to process huge amounts of data in a faster, more accurate and reliable fashion; communication links to be spread across the world; the combination of communications and digital libraries to access academic resources. In addition, Essays (2018) emphasised on the link between ICT tools and research related tasks. ICT tools can help in identifying appropriate information sources, analysing information, managing information, extending and communicating knowledge across subject fields, searching databases and electronic resources simultaneously, receiving results in a common format, linking to individual databases for more specialised searching, selecting favourite resources and e-journals, saving searches and records and setting up email alerts.

ICT tools can largely contribute to the research process in all of its six stages: from defining the task, strategies for seeking information, locating information, using the information, synthesizing information and finally, to evaluating the process and product (Cuff, 2014). Taking into the consideration of saving time, efforts, speed, absence of restricted location (Cuff, 2014), ICT can help researchers find a topic worth researching through the use of search engines such as YouTube (Gibson, 1997), Google, wikis and personal blogs (Rodrigo, 2013), discussion lists, forums and virtual platforms (Bahcekapili et al., 2013). Finding ways that help access information in many versions such as web pages, news articles, blogs, digitized books, videos, podcasts, transcripts, etc. through using many means such as smartphones, IPads, Tablets provided with internet network would assist researchers in their research (Cuff, 2014; Parastatidis et al., 2009). ICT tools have made information more accessible, simplified, public and faster where researchers can preview some parts of the document and decide whether it is relevant (Cuff, 2014). For example, a researcher can type keywords in Talk to Books to search for a topic and check if the sources match. Researchers can use ICT tools such as Google Documents, cloud services (Google Drive), citing applications (Endnote, Mendely) to organize, manage, access, or store the various kinds of data (files, images, videos, audios, etc.). Researchers can use word processors to help them draft their work using copy and paste organization and other processes. Due to their cheap and instant communication (Cann et al., 2011; Nicholas and Rowlands, 2011) and services that social media services may include such as social networking (e.g., Facebook, LinkedIn), microblogging (e.g., Twitter), blogging, photo sharing (e.g., Instagram, Pinterest), video sharing (e.g., You- Tube) and crowdsourcing (Jaring and Back, 2017) can help researchers receive fast feedback (Cuff, 2014) and can contact researchers with outside experts (Henderson et al., 2013).

Using collaborative programs such as Google Documents would help researchers synthesize their work after uploading any type of file to Google Drive. They can 'collaborate by discussing, comment on, or edit the file in real time.' (Cuff 2014, p.87). For almost zero cost, researchers can use technology to share their work and administer the instruments to collect data via programs such as Google Forms which allow them to create surveys. Conferencing programs (e.g. Skype) would also assist in conducting interviews with distance participants. Finally, technology can provide electronically evaluative checklists to be shared with others to judge the researcher's work. This electronic checklist would give more space to judges to respond freely and make the evaluative process more authentic and appropriate (Daniel, 2012).

One important point is that researchers need to equip with a number of issues that assist in increasing their research capacity using ICT tools. In this regard, Muinde (2009) argued four factors that researchers need to acquire to best utilize ICTs, including researchers' ICT awareness and skills and communication skills; needs and institutional e-readiness assessment; ICT tools and infrastructure; appropriate content. In order for researchers to take advantage of technology and communicate their outputs adequately, they need to have good training, be aware and have good exposure to the use of ICT. Researchers' needs are to be identified for better research outcomes and how they are ready to take place in the technological world must be assessed. ICT tools such as Internet access, computers, telephones, etc. that guarantee the success of researchers' work in ICT environments. The lack of ICT tools may discourage researchers from adopting ICT for research communication as argued by Muinde (2009). Finally, an electronic content that is appropriate and reliable must be available to assist researchers in conducting their researchers. To conclude, ICT can afford many fruitful tools that help increase the researchers' efficiency via the use of search engine to choose their research topic more conveniently; scientific databases to research findings associated to their topic; online forums and social networks to communicate with each other (Nakhaei et al., 2016).

Related Studies

Research on integrating ICT in education and learning have shown positive roles in assisting the work of learners and teachers in terms of data collection and presentations (Tondeur et al., 2015), collaboration with others to share knowledge and sources (Gertrude, 2015; Jaring and Back, 2017; Agyei and Voogt, 2012; Angeli and Valanides, 2009; Nicholas and Rowlands, 2011), communication (Al-rahmi et al., 2015; Naseem et al., 2009; Joshi et al., 2013).

Jaring and Back (2017) investigated the effectiveness of Twitter on researchers' level of collaboration between educational institutions and product or service developers in companies through an online survey and interviews. It was revealed that social media (Twitter) is a good venue of new information and contacts and can help increase awareness on research services and findings. However, some technical problems like speed and intensity were reported (Jaring and Back, 2017). Social media may have an important role in assisting the participants' cooperation and collaboration. In their review of role of social media in collaborative learning, Henderson, Snyder and Beale (2013) argued that social media had a valuable role in facilitating the cooperative or collaborative engagement of teachers, students and others in the learning process. Nicholas and Rowlands (2011) investigated the use of social media in the research workflow through administering a survey to more than 2000 researchers. The findings showed that an impact of social media tools such as collaborative authoring, conferencing and scheduling meetings as an important complementary channel on the stages of research from identifying the problem of statement to disseminating research. Al-rahmi et al. (2015) examined the role of social media on researchers' collaboration and performance among 732 postgraduates in five Malaysian public universities through a quantitative survey. The study revealed that researchers see in social media tools as easy and useful means that would enable them to accomplish tasks more quickly, thus enhancing their research skills and performance. Social media help researchers interact with other researchers, improve communication skills and allow the sharing of resources, data and knowledge.

Naseem et al. (2009), who examined the claim that ICT can afford academics a number of facilities related to meeting scholarly responsibilities, knowledge sharing and engaging in research and academic work suggested that ICT tools such as email, Skype, Google Docs., Delicious and Moodle facilitate the participants' communication and collaboration to develop research, especially among those with diverse backgrounds, opinions

and experiences. Bahcekapili et al (2013) examined how 10 Turkish researchers of educational technology identify the statement of problem through semi-structured interviews. One interesting finding revealed that some of the participants exchange contemporary materials with their colleagues via the Internet for defining the problem through academic networks such as discussion lists, forums and virtual platforms. Joshi et al. (2013) examined the role of information and communication technology (ICT) in enhancing community outreach, academic and research collaboration and education and support services (IT-CARES) at the University of Nebraska Medical Center through an online survey among 96 participants (faculty, staff and students). The findings showed that the use of Internet would support the collaborative grant writing, Blackboard enhanced online interaction and social media were used for diverse activities for academic and research purposes. Gertrude (2015) who examined the effects of ICT-based collaborative learning among university lecturers through a questionnaire reported that social networking, email, phones, audio/video conferencing and world wide web are effective tools that assist in the Nigerian university learners' collaborative learning. Finally, Bugyei et al. (2017) assessed the impact of Information and Communication Technology (ICT) on research activities in selected institutes of the Council for Scientific and Industrial Research (CSIR) using questionnaires and semi-structured interviews and found that ICT tools have a positive impact on research activities in terms of finding needed information quickly and easily, expedition in the research process, improvement in job performance and have also helped in information access, management and communication.

Having reviewed the previous research on the use of ICT in relation to education and research, it is shown that ICT could contribute to the work of learners, faculty and researchers in terms of communication, collaboration and other related services. However, more focus is still needed on the kinds of ICT tools and aspects of usefulness that enhance and support their research work in its various stages. Therefore, this study attempts to examine the relationship between the use of ICT tools and researchers' efficiency among English as a foreign language (EFL) faculty members at four Arab universities.

Method

This study employed the explanatory mixed methods research design that first included the collection of quantitative data through an online survey about researchers' habits towards using ICT tools in various research stages and qualitative data through five researchers' interaction in a WhatsApp group on producing a book chapter in EFL context.

Population and Sample of the Study

The population of the study included two categories. Category One included 43 EFL faculty members in the Department of English at Faculty of Languages and Deanship of Preparatory Year at Najran University in Saudi Arabia. Category Two included a case study of five researchers in the field of EFL context who collaborated on producing a book chapter about the assessment of language learning strategies in ICT environments among undergraduates majoring English language in two Arab countries: Yemen and Saudi Arabia. The five researchers are assistant professors of English language, mobile-assisted language learning and computer-assisted language learning. The researchers met through the website of Researchgate and acquaintance and collaborated to produce a book chapter to be published in a well-reputable publishing company (IGI Global). The following table (Table 1) depicts the characteristics of participants.

Table 1. Characteristics of Participants

Category	Details
Gender	Male (33), Female (10)
Qualification	Bachelor (3), Master (26), Doctorate (14)
Major	English Language (25), Applied Linguistics (8), Linguistics (4), English Language Teaching (3), Teaching English as a Second Language (1), English Literature (1), Linguistics and Translation (1)
Research background	Publications (articles, books, book chapter, conference proceedings, etc.) (23); Colloquiums, symposiums, seminars, etc. (17); PhD Candidate (13)
Nationality	Saudi (3), Jordan (6), India (10), Pakistan (6), Egypt (3), Sudan (8), Yemen (7)

Data Collection and Analysis Procedures

The data collection employed two types of data: quantitative and qualitative. First, an online survey (Google Forms) was used to collect the data from 43 researchers about their frequency use of ICT tools and in what ways ICT tools facilitate their research process. The survey included a number of sections: demographic data (Name (optional), gender, position, major and research background), ICT tools and ways ICT tools facilitate various research stages (defining the task, seeking information, locating information, using the information, synthesizing information and finally, evaluating the process and product). The people who agreed to participate in the study filled an online consent form and sent back. Respondents were required to indicate their response of the frequencies of ICT tools on a five-Likert scale (1.Never, 2. Rarely, 3. Sometimes, 4.Often, 5. Always). The third part about the ways that ICT tools facilitate the conduction of various research processes was responded using a five-Likert scale (1. Strongly disagree, 2.Disagree, 3.Neutral, 4.Agree, 5.Strongly agree). The survey was developed by the researcher based on a number of studies and his research background and checked for validity through four experts in the fields of mobile-assisted language learning (MALL) and computer-assisted language learning (CALL) who are academics at two governmental universities in Saudi Arabia. Their suggestions were on the change of lecturers to faculty members, deletion of faculty and rewrite of some statements. After the improvement of the survey, it was piloted on a number of faculty members other than those who responded to the survey in the study and the internal consistency scored (.92).

Second, the interaction of five researchers on the production of a book chapter in WhatsApp group was analyzed using content analysis. They had a WhatsApp group where they communicated, collaborated, shared files, chatted, etc. Their interaction in various means was content analyzed in connection with the use of ICT tools and research stages to illustrate how those researchers employed ICT to assist them in their research. Accordingly, a WhatsApp group named 'ICT-Based' was created and included five researchers from two nationalities; 4 from Yemen and 1 from Jordan, who are assistant professors of English. Three of them are working in Saudi Arabia in two universities; Najran University and Bisha University and the other two are faculty members at Hadramout University and Taiz university in Yemen.

Results

The Analysis Results of Survey

Table 2 displays the faculty members' responses to the frequency use of ICT tools in their research work in terms of descriptive statistics: means (M), standard deviations (SD) and percentages.

Table 2. Frequency Use of ICT Tools

ICT Tools	M	SD	Percentage
Electronic devices such as computers, laptops, smartphones, iPads, tablets, etc.	4.36	0.72	87%
Internet-based search engines (e.g., Google, Yahoo, YouTube, Talk to Books, etc.)	4.34	0.78	87%
Social media (e.g., Facebook, Twitter, Instagram, etc.)	3.19	1.21	64%
Academic social networks (e.g., Researchgate, Academia, LinkedIn, etc.)	3.73	1.01	75%
Chat applications (e.g., WhatsApp, Telegram, etc.)	3.58	1.10	72%
Audio and Video applications and websites (e.g., Imo, Skype, Ted, etc.)	3.09	1.03	62%
Internet-based surveys (e.g., Google Forms, SurveyMonkey, etc.)	3.44	1.06	69%
Scholarly applications and websites (e.g., Endnote, Google Scholar, Mendeley, etc.)	3.53	1.04	71%
Cloud computing (e.g., Google Drive, Google Docs., One Drive, Dropbox, etc.)	3.34	1.18	67%
Analysis programs (e.g., SPSS, AMOS, NVivo, Atlas, STATA, etc.)	2.69	1.33	54%
Typesetting and processing programs (e.g., LaTex, Word, Excel, PowerPoint presentation, etc.	4.08	0.95	82%
Emails (e.g., Gmail, Hotmail, yahoomail, etc.)	4.34	0.98	87%
Online Translation and e-dictionaries (e.g., Google translate, Merriam Webster, Oxford Dictionary, etc.)	3.93	0.84	79%
Digital libraries (e.g. Saudi Digital Library, World Digital Library, etc.)	3.47	1.01	70%
Databases (e.g., Scopus, Web of Science, ScienceDirect, ProQuest, EBSCO, etc.)	3.17	1.21	64%
Note applications such as Evernote, OneNote, Google Keep, etc.	2.61	1.19	52%
E/M- calendars such as Google Calendar, Windows calendar, etc.	2.69	1.26	54%
Total	3.50	0.168	70%

The table above shows that 70 % of the participants often use various ICT tools for research purposes (M=3.50, SD=.168). The use of electronic devices such as computers, laptops, smartphones, iPads, tablets, etc. (M=4.36, SD=.72), Internet-based search engines (e.g., Google, Yahoo, YouTube, Talk to Books, etc.) (M=4.34, SD=.78) and emails (e.g., Gmail, Hotmail, yahoomail, etc.) (M=4.34, SD=.98) scored high percentages (87%) which means that faculty members always use these assistant ICT tools for research purposes. The use of typesetting and processing programs (e.g., LaTex, Word, Excel, PowerPoint presentation, etc. followed them (M=4.08, SD= .95) with a percentage of 82%. However, Analysis programs (e.g., SPSS, AMOS, NVivo, Atlas, STATA, etc.)(M=2.69, SD=1.33), Note applications such as Evernote, OneNote, Google Keep, etc., (M=2.61, SD=1.19) E/M-calendars such as Google Calendar, Windows calendar, etc. (M=2.69, SD=1.26) were the

least to be used by faculty members for research purposes. In other words, faculty members who participated in the study sometimes use note applications (52%), E/M calendars (54%) and analysis programs (54%) for research purposes. The rest of ICT tools fall in the middle category that means that faculty members often use these tools while doing their research.

Table 3 depicts the results of descriptive analysis of the ways that ICT tools are used for research purposes with reference to the research various stages illustrated in the review of literature.

Table 3. ICT research-based Utilization

ICT research-based Utilization	M	SD	Percentage
I use WhatsApp, Imo., Skype, etc. to communicate with other researchers for certain issues related to the research stages such as review of literature, data collection and analysis.	3.93	0.87	79%
I use Google Forms, SurveyMonkey, etc. to collect data.	3.93	0.71	79%
I use academic social networks such as Researchgate, Academia, etc. to connect and interact with researchers for research-related topics, discussions, file exchange, etc.	3.83	0.82	77%
I use search engines such as YouTube, Google, Yahoo, wikis, forums and virtual platforms, etc. to find a topic worth researching.	4.02	0.90	80%
I use electronic devices such as computers, laptops, smartphones, iPads, tablets to store and process data.	4.56	0.66	91%
I use 'Talk to Books' to ask and get most appropriate responses from Google books database.	3.40	1.08	68%
I use Google Documents, cloud services (Google Drive) to organize, manage, access, store the various kinds of data (e.g., files, images, videos, audios, etc.).	3.83	1.03	77%
I use scholarly applications (e.g., Endnote, Mendeley) to manage and exchange research papers and references.	3.40	0.88	68%
I use ICT tools such as word processors (Office programs) to draft work through typing, formatting, copy and paste features and other processes.	4.30	0.77	86%
I use social media services such as Facebook, LinkedIn, Twitter, Instagram, etc. to receive fast feedback and contact outside experts.	3.56	1.04	71%
I use analysis applications such as SPSS, AMOS, STATA, etc. to analyze quantitative data.	3.66	1.03	73%
I use analysis applications such as, NVivo, Atlas, etc. to analyze qualitative data.	3.20	0.94	64%
I use ICT tools such as Paint, Photoshop, etc. to edit photos.	3.54	1.04	71%
I use audio/video recorders such as VIvaVideo, Audio Recorder and Editor to record and edit audio/ video files.	3.66	1.03	73%
I use PowerPoint presentation, projectors, etc. to produce and present files.	4.15	0.90	83%

I search databases such as Scopus, Web of Science, etc. to find a suitable journal to publish my work.	3.88	0.91	78%
I use databases such as Elsevier, Eric, EBSCO, ProQuest, etc.to find related formation such as journals, papers, theses, books, etc., to my research topic.	3.88	0.91	78%
I use note applications to store important information in an easy, convenient way in form of text, pictures, files, audio and clip pages.	3.59	0.85	72%
I use E/M- calendars such as Google Calendar, Windows Calendar, etc. to organize my time and schedule events and tasks in order to have more control over my research.	3.40	1.00	68%
Total	3.77	0.117	75%

According to the table (Table 3), it is shown that 75% of the participants agree that they often use information and communication technology (ICT) tools in the various stages of their research work (M=3.77, SD=.177). To illustrate, 91 % of the respondents use the electronic devices (e.g., computers, laptops, smartphones, iPads, tablets) to store and process data (M=4.56, SD=.66). Also, 86% of them utilize word processors (e.g., Office programs) to draft work through the means of typing, formatting, copying and pasting features and other processes (M=4.30, SD=.77). In addition, 83% of respondent researchers use the tools of PowerPoint presentation, projectors, etc. to produce and present files. Moreover, the 'always' category also includes the use of various search engines such as YouTube, Google, Yahoo, wikis, forums and virtual platforms, etc. to find a topic worth researching (M=4.02, SD=.90, 80%). The rest of ICT tools and their research usage fall in the 'often' category. The least use of ICT tools for research purposes was recorded in audio and video applications and websites (e.g., Imo, Skype, Ted, etc.) (M=3.09, SD=1.03, 62%), preceded by social media (e.g., Facebook, Twitter, Instagram, etc.) (M=3.19, SD=1.21, 64%) and analysis programs such as, NVivo, Atlas, etc. to analyze qualitative data (M=3.20, SD=.94, 64%).

The Results of Content Analysis of Case Study

Five researchers' interaction on producing a book chapter was content-analyzed and a number of results relating to the use of ICT tools in doing research have revealed accordingly.

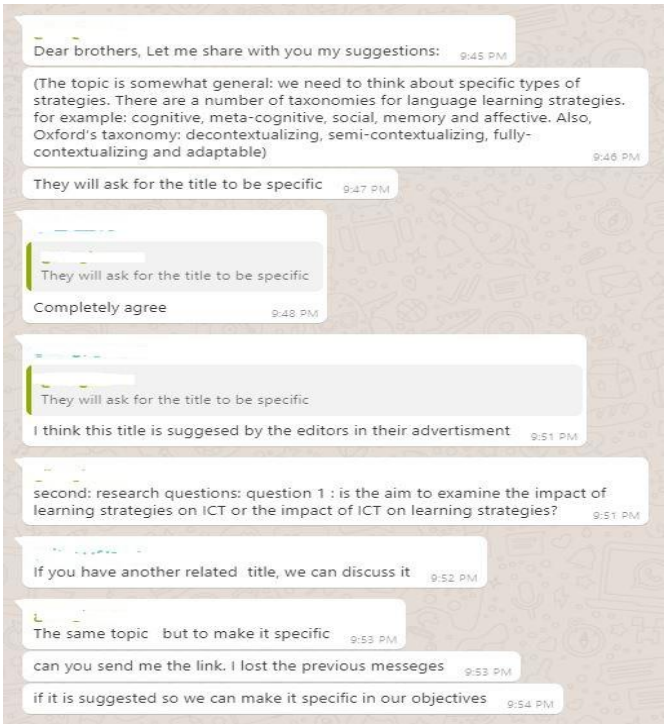
Regarding the ICT tools that were actually used in facilitating the work of the five researchers, it must be noted that the five researchers utilized around 12 ICT tools during the production of their book chapter over the various stages of research. Those ICT tools and stages of research were as shown in the following table (Table 4).

Table 4. ICT tools and research stages

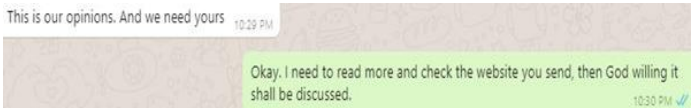
N	ICT tools	Actual tools	Research stages
1	WhatsApp	WhatsApp group	Evaluating the research process and product
2	Internet search engines	Google search engines, Saudi Digital Library,	Defining the topic, locating and accessing information.
3	Google Forms	Online questionnaire	Collecting data
4	Office programs	Word Doc., Excel.	Synthesizing information
5	Citation programs	Google Scholar, Endnote	Using information to organize the work of

			citation and references accordingly
6	Adobe program	Pdf.	Using information
7	Social networking sites	Researchgate	Accessing information, finding collaborators
8	Camera	Screen shots	Using information
9	Quantitative analysis programs	SPSS	Analysis of quantitative data
10	E-mail	Gmail	Evaluating the research process and product
11	Online word processors	Google documents	Synthesizing information
12	Similarity Check programs	Ithenticate	Evaluating the research process and product

In relation to the research stages discussed in the review of literature, the researchers' interactions, participations and communications were analyzed, classified and categorized under merged themes. Six themes have emerged: finding a topic, discovery of the topic, locating and accessing information, using information, synthesizing information and evaluating the research process and product. The stage of finding a suitable topic for the book chapter included the discussion of the themes of the book chapter suggested by the publishing company and the title of the chapter after a through discussion as shown in the following excerpt by the researchers (R3, R4, R5):

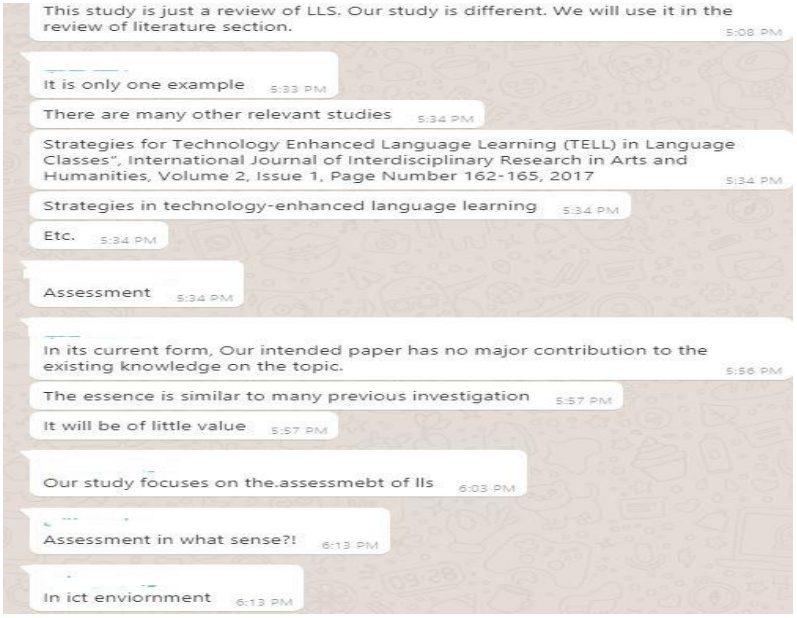


The second stage of discovering the topic included a number of tasks on reading more about the topic, checking the latest articles using internet search engines and digital libraries as suggested by the researchers (R2 and R3):



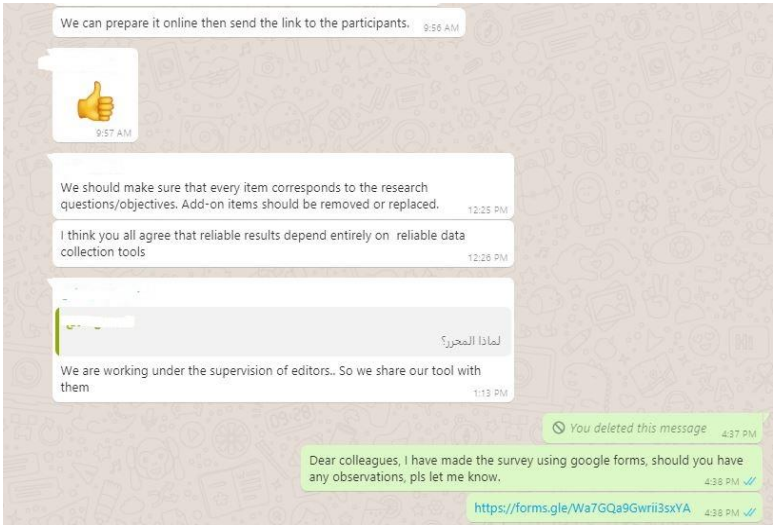
In the third stage, the participating researchers divided the tasks of the book chapter and started locating and accessing related information such as references, articles and other important sources to have been shared in the WhatsApp group as seen in the following excerpt by the researchers (R1 and R3):

The stage of using information included going through the downloaded articles, notes, discussions in the WhatsApp group so as to make use of them in writing the book chapter. This stage has had information related the use of information to write a suitable title, build the instruments for data collection, synthesize the chapter and add references. The following WhatsApp excerpt shows the use of the questionnaire instrument form another study by the researchers (R1, R3, R5):

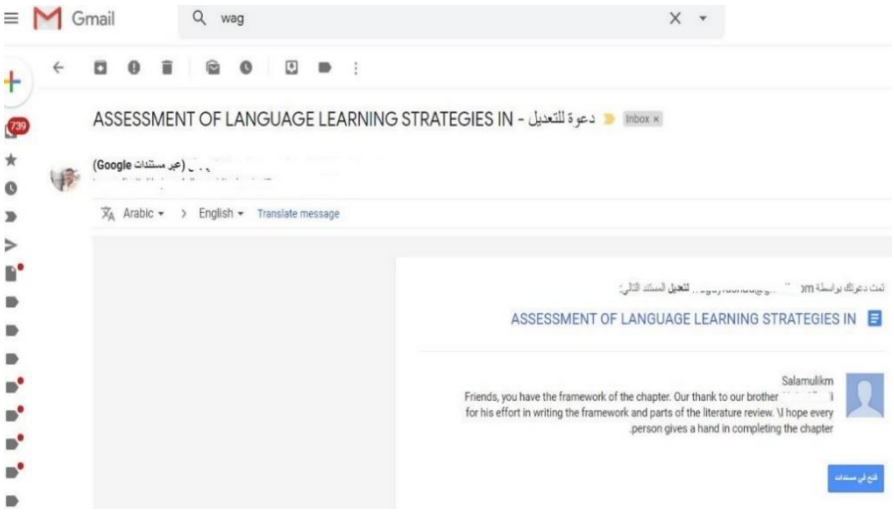


The stage of using information has also included the collection of data that has had a very big share of the researchers' postings and interactions in the WhatsApp group. The researchers discussed thoroughly the data collection that included the use of suitable instruments, adaptation, application, validity and reliability, analysis of data, etc. This stage included the use of some ICT instruments such as Google forms, SPSS, Office Word, Excel,

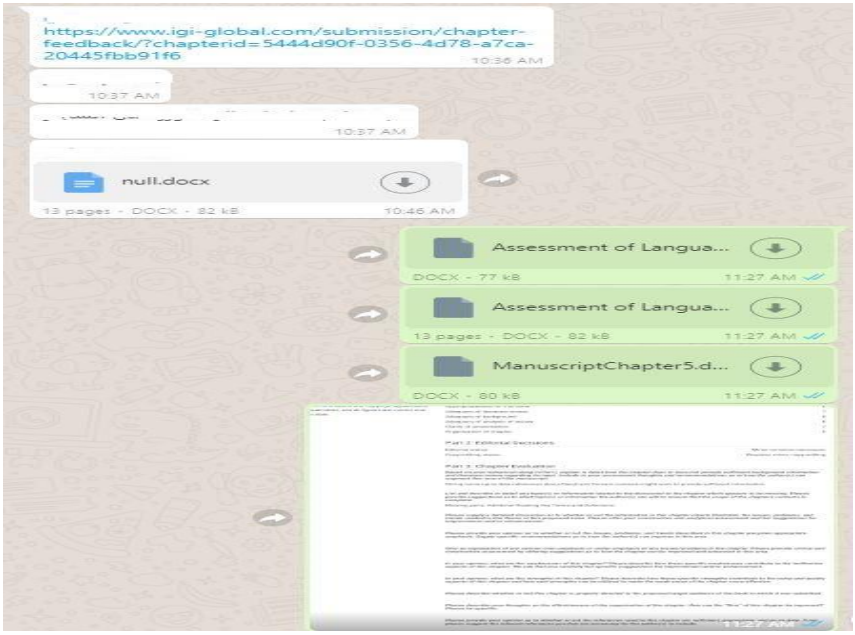
etc. as seen in the following excerpt by the researchers (R1,R2,R3,R4,R5):



The synthesizing stage of information has included a number of steps from drafting the first proposal of the book chapter in Word document shared in the WhatsApp group to writing the book chapter shared in a Google document where researchers worked on the same file at the same. The thing that eased the work of the researchers and kept them away from getting confused. The synthesis stage included the writing of the abstract, introduction, review of literature, method, results, finding and discussion based on the stages of using information as evident in the researcher's (R3) following excerpt:



Finally, the evaluation stage of research process and product has had a number of issues such as review of the book chapter, proofreading, publication stage, format and similarity check. The stage engaged a number of ICT tools such as WhatsApp, Google Documents, Ithenticate and Email. The researcher (R3) shared the link of the publishing company and comments made by reviewers in the form of screen shots in the WhatsApp group. The researchers discussed the steps to address those comments through distributing the work as shown in the following excerpt:



Discussion

The study found that 75% of the respondents use information and communication technology (ICT) tools during their research work. The respondents used the electronic devices to store and process data and utilized word processors to draft their work through the means of typing, formatting, copying and pasting features and other processes. In addition, they used the tools of PowerPoint presentation, projectors, etc. to produce and present files and various search engines such as YouTube, Google, Yahoo, wikis, forums and virtual platforms, etc. to find a topic worth researching. However, they least used audio and video applications and websites, social media and qualitative analysis applications. The analysis of the qualitative data showed that 12 ICT tools, being used in the various stages of research, included WhatsApp, Internet search engines, Google Forms, Office programs, citation websites and programs, Adobe reader, social networking sites, smart phone cameras, quantitative analysis programs, E-mail, online word processors and similarity check programs.

In general, these findings are supported by Cuff's (2014) claim that technology programs and tools assist the research process and increase the efficiency of each step and effectiveness of the finished product. Partially, the findings reported in the current study are in accord with recent studies highlighting the effectiveness of collaborative programs such as Researchgate, Academia, LinkedIn and social media. They are in consistency with that of Jaring and Back (2017) who highlighted the role of social media (Twitter) as a good venue of new information and contacts and can help increase awareness on research services and findings. They are also accord with Henderson et al.'s (2013) views on social media as a valuable role in facilitating the cooperative or collaborative engagement of teachers, students and others in the learning process. Similarly, they are in agreement with the data obtained by Nicholas and Rowlands (2011) who spotted the role of social media in being effective tools for collaborative authoring, conferencing and scheduling meetings that act as an important complementary channel on the stages of research from identifying the problem of statement to disseminating research. Further, they corroborate with the ideas of Al-rahmi et al. (2015), who suggested that researchers see in social media tools as easy and useful means that would enable them to accomplish tasks more quickly, thus enhancing their research skills and performance. Social media help researchers interact with other researchers and improve communication skills, allow the sharing of resources, data and knowledge.

In addition, the findings of the current study are line with those by Naseem et al.'s (2009) study who suggested that ICT tools such as email, Skype, Google Docs., Delicious and Moodle can facilitate the researchers' communication and collaboration to develop research, especially among those with diverse backgrounds, opinions and experiences. Also, the findings are supported by Joshi et al. (2013) who showed that the use of Internet would support the collaborative grant writing, Blackboard enhanced online interaction and social media that was used for diverse activities for academic and research purposes. The findings further support the idea by Gertrude (2015) who reported that social networking, email, phones, audio/video conferencing and world wide web are effective tools that assist in the Nigerian university learners' collaborative learning. Finally, the findings agree with those by Bugyei et al. (2017) who found that ICT tools have a positive impact on research activities in terms of finding needed information quickly and easily, expedition in the research process, improvement in job performance and can also help in information access, management and communication.

Conclusion

The main aim of the current study was to assess the role of information and communication technology (ICT) tools in enhancing the researchers' efficiency in research work. This study has shown that researchers often use various information and communication technology (ICT) tools to find a topic worth researching, to store and process data, to utilize word processors to draft their work and to produce and present files. Therefore, the current study stresses the importance of ICT in enhancing the work of research. This study contributes to the existing knowledge by providing a comprehensive assessment of using ICT for research purposes and a basis for researchers in assisting them employ suitable ICT tools to improve their work. Further research is required to verify the findings of the current study and thus establish a greater degree on this matter. The findings of this study can be used in the establishment of training programs on the utilization of ICT in research work so as to empower researchers with more efficiency in using ICT tools for research purposes.

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