

21st-Century Digital Skills Required in Workplaces: A Case from Saudi Arabia

Jawaher Alghamdi¹, Samah Z. Ahmad², Samia M. Shahpo^{3,*}, Fatma M. Essa³, Seham M. Alzahrani⁴, and Gehan A. Alshafey⁵

¹Educational Technology Department, College of Education, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

²English Department, College of Sciences and Humanities Studies, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

³Early Childhood Department, College of Sciences and Humanities Studies, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

⁴Ministry of Education in Mecca, Mecca, Saudi Arabia

⁵Curriculum and Methodology Department, College of Education, Helwan University, Helwan, Egypt

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Abstract: This descriptive study explores type of digital technologies are used in Saudi workplaces, types and level of digital skills and the impacts of such skills gaps on work performance in the Kingdom of Saudi Arabia (KSA). A total of 300 workplaces in the Eastern Province of KSA participated in this study. The results revealed that Saudi workplaces are now using various digital technologies. It also identified a set of 25 digital skills that are highly important for workers. Further, the results indicate that the digital skills gap has a major impact in Saudi workplaces. Consequently, the study suggests a conceptual framework that includes definitions and classifications of digital skills. It recommends using this framework as a guide to improve educational programs and to include digital skills as core competencies in all levels of education. It also recommends improving teaching practices and supporting teachers and trainers to use technologies in daily teaching and learning practices.

Keywords: Digital skills, Saudi Arabia, Workplace, digital technology framework.

1 Introduction

As the current job market is largely dependent on the knowledge economy. knowledge economy can be seen that the centre of economic growth and development is knowledge and information. To cope with the knowledge economy era, competencies such as communication skills, solving problem skills, teamwork skills and Information and Communication Technology (ICT) skills are needed [1]. Such skills can be defined as 21st- century skills.

Globalization and technology have increased the demand for specific competencies such as the use of ICT to work in team and to solve problems. These can be defined as 21st-century digital skills. According to [2], they refer to using digital tools, communication software, and information to be able to create content, collaborate, and solve problems in learning, work, and other social activities. [3] view them as the management of information, communication, collaboration, creativity, critical thinking, and problem solving, all within the framework of digital technologies. [4] argue that digital skills are a combination of a digital mind-set, knowledge, competence, and attitude. [5] define digital skills as a group of technological capabilities that are needed to before entering the workplace. 21st-century digital skills have become essential for graduates looking for jobs [6].

Although possessing digital skills is of great importance for graduates to effectively compete in the current job market, there is a digital divide; that is, there is a scarcity of digitally skilled candidates on the job market [7],[8]. In this respect, several studies stress the importance of bridging this universal digital divide. These studies revealed that 55% of institutions all over the world confirm this divide is increasing [9], 65% of individuals hired for jobs at African companies do not have even a rudimentary understanding of digital technology [10] and 79% of CEOs throughout the world are concerned about the scarcity of crucial digital skills [11]. The most significant obstacles to filling vacant positions are rapidly evolving technology and a shortage of skilled individuals [12]. Moreover, addressing the global digital skills shortage may boost global GDP by \$11.5 trillion by 2028 [13]. [14] confirm that the first step in bridging the digital skills gap is to educate or train people to gain these skills.

*Corresponding author e-mail: smmali@iau.edu.sa

In the Kingdom of Saudi Arabia (KSA), the government has responded to rapid worldwide technological advancements as well as government and institutional changes [15]. It has implemented several policies, strategies, and programs focusing on ICT integration that prepare the workforce for the knowledge economy [16]. Moreover, it has allocated \$1.6 billion to enhance digital infrastructure to make e-government services more accessible to Saudi Arabian residents [17].

The Saudi 2030 Vision outlines a series of objectives and initiatives with the intention of instigating transformations in various systems. Its goal is to enable Saudi citizens to embrace the new strategies on a cultural level, while also actively engaging in the essential societal and economic transitions towards a digital economy [18]. Saudi Arabia's 2030 Vision seeks to change a wide range of processes, allowing Saudis to actively participate in a digital economy. As highlighted by [19], Saudi Arabia's goals to develop its digital economy by 50% of the larger economy demonstrate the kingdom's status as a digital powerhouse. The current strategy, [20], is the third national strategy for digital transformation. It sets out to achieve the goal of the digital government in KSA. The initiatives directly align with the UN Sustainable Development Goals and Saudi Vision 2030 [21]. Moreover, the 2030 Vision includes the Human Capability Development Program (HCDP), HCDP is five years plan (2021-2025), the objective is to guarantee that every citizen possesses the necessary skills and abilities to effectively compete on a global scale. [22], The focus is to develop citizens' basic and future skills, essential skills in are "the skills required as a basis for learning future skills and knowledge, including reading, writing, numeracy, and essential digital skills" [23]. However, various studies have established there is a digital divide in the Saudi population in general and the Saudi workplace (e.g., [24]; [25]; [26]). However, higher education colleges and institutes should work to prepare graduates with necessary digital skills required in workplaces. Therefore, the aim of this study is to investigate the following:

- Types of digital technologies most required by employers in Saudi Arabia.
- The necessary digital skills and their proficiency demanded by employers in Saudi Arabia.
- Impacts of digital skills gaps in Saudi workplaces.

The result of this study will help to understand the digital skills require in Saudi workplaces. This will help to develop an essential digital skills framework to prepare Saudi universities' graduates for workplaces. The framework can be applied in higher education institutes at any discipline.

2 Literature Review

Digital skills in workplaces.

In the contemporary era, there lies great significance in possessing digital skills that are imperative for success in the 21st century [27] as they have become core competencies of employability [28]. The industrial economy has transformed into a service economy driven by ICTs [29] as organizational adoption of ICT boosts revenue, enhance efficiency and strengthen the level of competitiveness. while also driving innovation and job creation across the economy. Therefore, the current workplace requires employees who not only have the basic digital skills to conduct routine tasks, but also skills that enable them to work, communicate create and share knowledge online [30]. Furthermore, it is necessary to modify and adjust to the shifting dynamics of the job market [31].

Researchers offered different classifications of digital skills. For example, [32] argue that some digital skills are needed to work using ICT to execute some tasks, while others are needed to plan, produce, and sustain technologies and solutions for various industries. However, introduce four digital skill types: critical-thinking, information, problem-solving, and creativity. They argue that these skills are considered as useful to the creative industries workplaces. [33] summarizes a report on digital skills in the UK economy that divides digital skills into three categories: (1) basic digital skills that are required for every individual, (2) basic digital skills in addition to skills required in any workplace (digital skills for the general workforce), and (3) digital skills for ICT professions (categories (1) and (2) in addition to skills needed to work in the Information Technology sector). [34] follow the ITU Digital Skills Toolkit and divide digital skills into three levels: (1) basic (ability to interact with basic digital tools), (2) intermediate (ability to create and use digital content using digital tools to via basic programming skills), and (3) advanced (improved technological proficiency and programming skills obtained through specified curriculum aspects).

Many countries are actively developing or revising their digital skills frameworks in order to adequately prepare their citizens for the digital economy. For example, the Department for Education in the UK has created a basic digital skills framework and subsequently updated it to the essential digital skills framework for life and work. This framework aims to support adults in enhancing their digital skills for the digital world. It is divided into five categories, namely Communicating, Handling information and content, Transacting, Problem Solving, and Being safe and legal online. Similarly, the European Commission has recently updated the Digital Skills Indicator (DSI) using the Digital

Competence Framework 2.0. The DSI serves as a benchmark for measuring citizens' digital skills in areas such as Information and data literacy, Communication and collaboration, Digital content creation, Safety, and Problem solving. By utilizing the DSI to assess individuals' activities, it can be viewed as an indicator of their digital skills and their preparedness for economic competitiveness.

Impacts of digital skills gaps in workplace.

Due knowledge economy, technologies are implemented across a range of workplaces. Therefore, digital skills have become an essential competency for knowledge economy. Technology changing increases the demand for high- skilled individual to deal with daily work tasks required by new technologies. However, low- digital skilled individual or “what can be called digital skills gaps” can affect the overall work performance.

Digital skills gaps are understood as the level of digital skills of employees is less than or not match a job requirement [35]. It can be determined by the ability of some employers to carry out tasks using ICT and this effect on overall workplace performance. report that some workplaces in the European Union have negative impacts of digital gaps. Especially those in Manufacturing, Construction, Commerce, transport, education, and health sectors. identifies health and social care, culture and creative industries, and financial services in UK at the risk from technology integration. Further a study by [36] reports that the lack of digital skills has effect on Saudi organisation performance.

Conceptual Foundation

At the G20 Summit, [37] suggested that the G20 need a general digital skills assistance strategy that outlines the basic digital capabilities that companies require. Moreover, according to the European Commission, demand for professionals with digital abilities is already increasing at a rate of roughly 4% each year [38]. In this respect, world economists believe that a digitally trained workforce is needed to take advantage of opportunities in the digital economy [39]. As a result, digital abilities have become a crucial component in facilitating job options. [40] as well as a necessary skill for full participation in an information society and a knowledge economy [41]. Therefore, ability to acquire these skills quickly has become a key differentiator between individuals who have a higher chance of succeeding in their jobs and others who are left behind [42].

The requirement for mastery of digital skills is not confined to specific careers. Several studies established that the demand for digital skills is required across various professions such as engineering [43], teaching [44], healthcare [45], marketing [46], banking [47], occupational therapy [48], translating [48], library management [50], news industry [51], journalism and mass communication, human resources (HR) management [52], business management, and creative industries [53].

3 Methodology

Research tool

From January to February 2022, we conducted a review of the literature to find a survey to match the research objectives. The utilized survey was adjusted from a tool that was developed by the European Commission (EC) (European Digital Skills Survey) in 2016 to assess the level and nature of digital skills necessary in diverse work environments.

The original survey consisted of 33 questions divided into five categories including background questions, ICT use and digital skills in the workplaces, ICT and digital skills gaps in the workplace, ICT use, digital skills, and digital skills gaps in specific jobs, and trends in ICT investment and use in the workplace. The types of questions included multiple-choice, Yes or No, and Likert scale-type (1, not at all to 3, essential).

Several modifications were implemented for this study. The ultimate iteration of the survey comprised 22 questions divided into four distinct categories. The first category collects information about the workplace such as type of workplace (single or multiple workplaces), economic sector, number of employees, gender and age of the employers, and the workplaces ownership (private or public).

The second category gathers information regarding the utilization of technologies and the digital proficiency present in work environments. But the skills in European Digital Skills Survey are very general. Therefore, we tried to find a framework that covers 21st century skills and digital skills definitions. We found a study by [54] that address our need. derived five categories of digital skills and related levels of importance, technical, Information management, Communication and Collaboration, and Solve problems.

The third category investigates the influence of deficiencies in digital skills on the overall effectiveness of employees in the workplace. Finally, the fourth category asks about the trend in the use of ICT in the last five years.

The survey was deployed in two languages (Arabic and English) using the Question Pro website. Arabic is the main

language in KSA and English is the second main language. From March to April 2022, the links to the surveys were sent to the target groups by the research team using official emails.

The objective of the survey was to gather information pertaining to the research questions detailed below:

- What specific digital technologies are in highest demand from employers in Saudi Arabia?
- "What specific types and levels of digital skills are demanded by employers within the Saudi Arabian workplaces?"
- What are the impacts of digital skills gaps in Saudi workplaces?

Data analysis

Descriptive statistics analysis was used to identify the percentage of level and types of digital skills in Saudi workplaces.

Sample of the study

The survey was carried out among a sample of 1500 workplaces in the Eastern Province in Saudi Arabia. Of these, responses were received from 300 workplaces, totalling 64,400 workers. The Eastern Province of Saudi Arabia was selected due to the location of the Imam Abdulrahman bin Faisal University (IAU) as most of the graduates have work in this area.

Validity and Reliability

A pilot survey was conducted, and Cronbach's alpha values were verified. The survey was developed using Question Pro, and a link to the survey was emailed to the participants. Ten participants returned the survey.

Cronbach's alpha values were computed to assess the reliability of the survey questions. The values for Cronbach's alpha suggested a substantial level of internal consistency, surpassing the threshold of 0.7. (Table 1).

Table 1: Cronbach's alpha values.

Items	No. of questions	Cronbach's alpha value
Technical skills	8	.77
Information Management skills	6	.72
Collaboration skills	3	.76
Communication skills	3	.71
Solve Problem skills	4	.70

4 Findings

This section presents the findings from the survey. The findings will help to develop a digital skills framework and to prepare IAU graduates for future work.

General information about the workplaces.

The survey explores the general information about the workplaces that participated in this study. It asks about the main area of activity under 20 economic sectors. The results presented in Figure 1 indicate that the workplaces operate in eight economic sectors. Most of the workplaces surveyed operate in professional, scientific, and technical activities (23.3%) and manufacturing 20%. Around 10% are active in water supply, sewerage, waste management, and construction. Finally, only 3% operate in the information and communication sector, administrative and support service activities, and human health and social work activities (Figure 1).

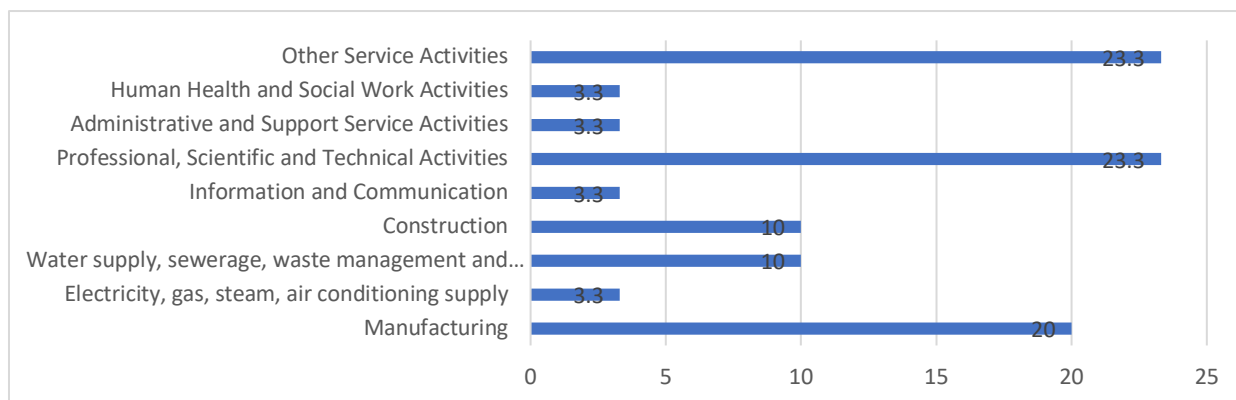


Fig. 1: Workplaces by economic sector

In terms of the size of the workplaces, around 41% are large-size (more than 250 employees), about 32% medium-size (50-250 employees), and about 27% are small-size (10 to 49 employees). The organizational structure is also explored in this study. The data reveals that the majority (around 70%) are one of many different workplaces belonging to the same organizations. Further, about 76.7% are headquarters while the rest are subsidiary sites.

Regarding the ownership, a substantial majority of workplaces (approximately 66.7%) operate under private ownership. The employees' gender and age are also explored. Overall, approximately 33% of the workplaces have female workers, 43% are less than 30 years old, and around 40% of employees are older than 50.

ICT and digital technology in workplaces.

The survey investigates the digital technology in workplaces in the Eastern Province in KSA. It also explores the plan for the use of digital technology in the future.

Digital technologies in Saudi workplaces.

The overall findings indicate that digital technologies have been widely adopted in workplaces, leading to a significant level of their usage and implementation. The data presented in Figure 2 indicate that most Saudi workplaces use desktop computers (63.3%) and portable computers (23.3%). Only 10% of the workplaces use other devices. A much smaller percentage use internet platform (3.3%).

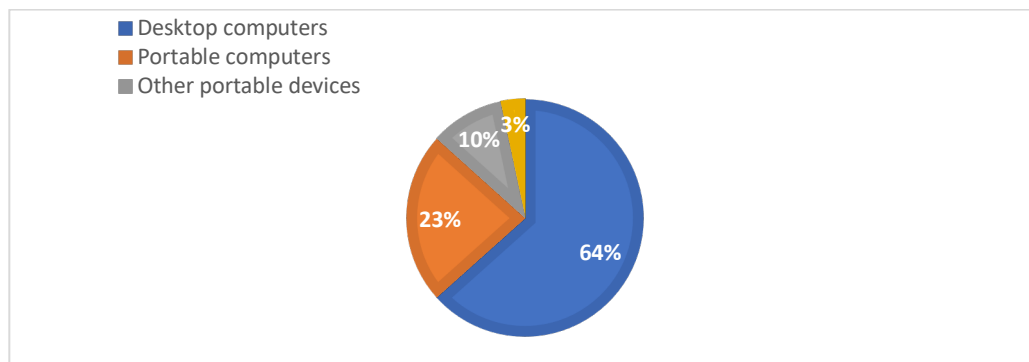


Fig. 2: Digital devices in the workplaces

Recent trends in the use of digital technologies

The participants were asked about their perspective on the utilization of digital technologies both in the past as well as the upcoming five years. Based on Figure 3, most workplaces (approximately 70%) agree that there has been an elevation in the employment of digital technologies over the last five years. Around 23.3% stated that there has been no such increase. Additionally, 76.7% of the participants agree that the use of digital technologies will experience growth in the next five years, with only 23.3% reporting that there will be no increase in the future.

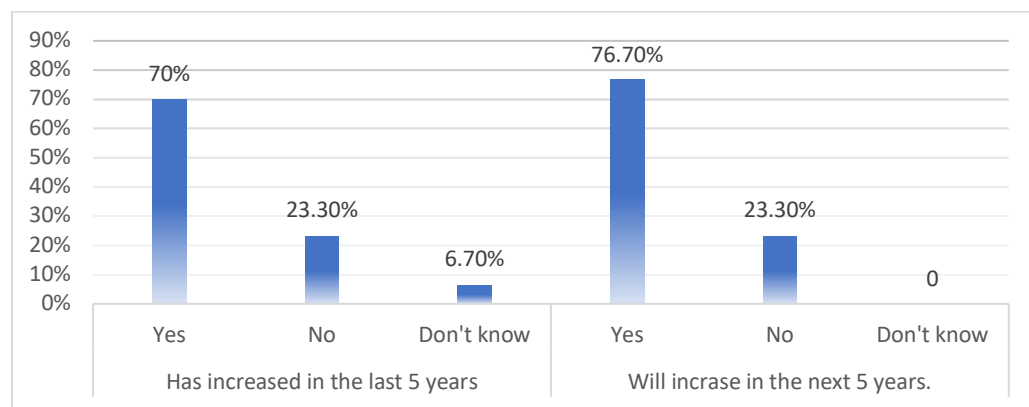


Fig. 3: Workplaces by trends in the use of ICT in the last and next five years

Type and level of digital skills in Saudi workplaces.

The digital skills, according to UNESCO, encompass the competence to utilize digital devices, communication applications, and networks to access and oversee information. These skills empower individuals to generate and distribute digital content, communicate, and collaborate with others, as well as resolve problems for effective and

creative self-fulfillment in various aspects of life, learning, work, and social engagements (2018).

In this study, a collection of 25 digital skills has been considered. The participants were asked to evaluate the significance level of these digital skills in various work settings, ranging from not at all important, moderate importance to essential. The overall outcomes demonstrate that digital skills are necessary in a broad spectrum of workplaces. The outcomes regarding the five classifications of digital skills can be found in Tables 1-5. Technical skills can be described as the capacity to acquire and utilize information in order to make well-informed choices.

In terms of technical skills, the evidence collected from the survey (Table 2) indicates that high percentages of workplaces need their employees to have a high level of technical skills, as most of workplaces (50-90%) rate most of the items under this category as essential. Only 36.7% of the workplaces see using software for design, calculation, or simulation is essential, while 33.3% of them see this item is not at all important.

Table 2: Technical skills required by the workplaces.

Items	not at all important	moderately important	essential
	Percentage (%)		
Using a word processor (e.g., Word).	0	16.7%	83.3%
Creating a spreadsheet (e.g. Excel).	3.3	20%	76.7%
Using programming languages.	0	10%	90%
Search for, collect and process information using ICT (e.g., online/Internet)	6.7%	30%	63.3%
Use software for design, calculation, or simulation...	33.3%	30%	36.7%
Undertake programming and software development.	6.7%	36.7%	56.7%
Use software or operate a digital device.	3.3%	26.7%	70%
Search, evaluate and organize information in digital environments.	0	26.7%	73.3%

The results regarding information management skills are presented in Table 3. Information management skills can be defined as the ability to effectively express one's information requirements, locate and recover digital data, information, and content, assess the importance of the source and its content, and store, handle, and arrange digital data, information, and content.

The data reveal that four skills in this category are required by employers as they rated these skills as essential. The aforementioned competencies encompass verifying information from an alternative website (86.7%), precisely storing digital files in the appropriate directory (83.3%), arranging digital files using a hierarchical folder arrangement (83.3%), utilizing several search terms simultaneously (66.7%), and employing search actions to narrow down the number of search outcomes (53.3%).

Table 3: Information Management skills required by the workplaces.

Items	not at all important	moderately important	essential
	Percentage (%)		
Change the search terms based on the obtained search results.	3.3%	50%	46.7%
Specify the search action to limit the number of search results.	6.7%	40%	53.3%
Combine multiple search terms in one search action.	0	33.3%	66.7%
Check the information found at a different website.	0	13.3%	86.7%
Save digital files directly to the right folder.	0	16.7%	83.3%
Organize digital files via a hierarchical folder structure	0	16.7%	83.3%

Moreover, collaboration and communication skills can be described as the aptitude to engage, interact, and cooperate using digital technologies, while simultaneously acknowledging cultural and generational differences. These skills enable individuals to actively take part in societal affairs through both public and private digital platforms and exercise participatory citizenship. Additionally, they empower individuals to effectively handle and navigate their digital presence, identity, and reputation.

Collaboration and communication skills are more frequently required by employees as the skills under these categories were rated as essential by more than 50% of the workplaces (see Tables 4 and 5).

Table 4: Collaboration skills required by the workplaces.

Items	not at all important	moderately important	essential
	Percentage (%)		
Communicate using email.	0	13.3%	86.7%
Communicate using social media, Skype/video calls.	6.7%	43.3%	50%
Share online content and media.	10%	23.3%	66.7%

Table 5: Communication skills required by the workplaces.

Items	not at all important	moderately important	essential
	Percentage (%)		
Share ideas and opinions within organizations and Online forum communities	6.7%	30%	63.3%
Connects and collaborate with others.	3.3%	3.3%	93.3%
Work together on shared documents and projects.	0	13.3%	86.7%
Understand and manage the sharing information	0	13.3%	86.7%

The notion of problem-solving skills can be characterized as the aptitude to recognize needs and issues and to address conceptual problems and problem situations within digital surroundings. It entails utilizing digital tools to foster innovation in processes and products, as well as staying abreast of the ongoing digital advancements.

The results in Table 6 indicate that more than 70% of the workplaces rate using the internet to find ways to solve problems and transfer knowledge to new situations as essential. Further, 70-73% rate “finds multiple solutions” and “solves unfamiliar problems” as moderately important, while about 27-30% rate these as not at all important.

Table 6: Problem solving skills required by the workplaces.

Items	not at all important	moderately important	essential
	Percentage (%)		
Using the internet to find ways to solve problems	0	26.7%	73.3%
Finds multiple solutions,	30%	70%	0
Solves unfamiliar problems,	26.7%	73.3%	0
Transfer knowledge to new situations.	3.3%	20%	76.7%

Impact of digital skills gaps.

As mentioned before, digital skills gaps are where the employee has the lack of the right digital skills to conduct the current work.

Before determining digital skills gaps, participants were asked about the changes that ICT made to how job tasks are carried out and whether new job profiles will emerge in the workplace in the next five years.

The results indicate that ICT has led to changes in workplaces. According to Figure 4, approximately 83% of the workplaces report that the use of ICT creates major changes, approximately 13% report that it causes moderate changes, and only approximately 3% minor changes. Furthermore, the result reveals that all participants agree that ICT will lead to a new job profile in the workplace in the next five years.

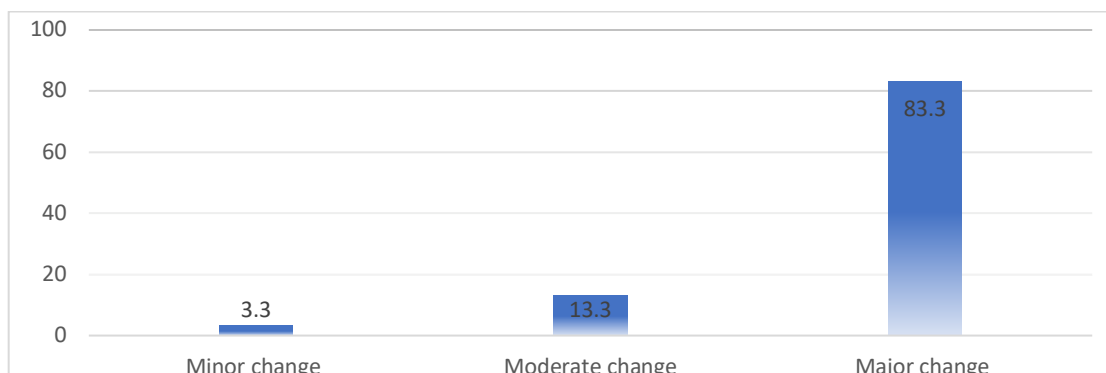


Fig. 4: Changes due to ICT.

In terms of digital skills gaps, the participants were asked about the impact of some workers who are not proficient to carry out the job using ICT. According to Figure 5, a significant influence on overall performance is reported by over 66% of workplaces, while the remaining workplaces indicate a minor impact.

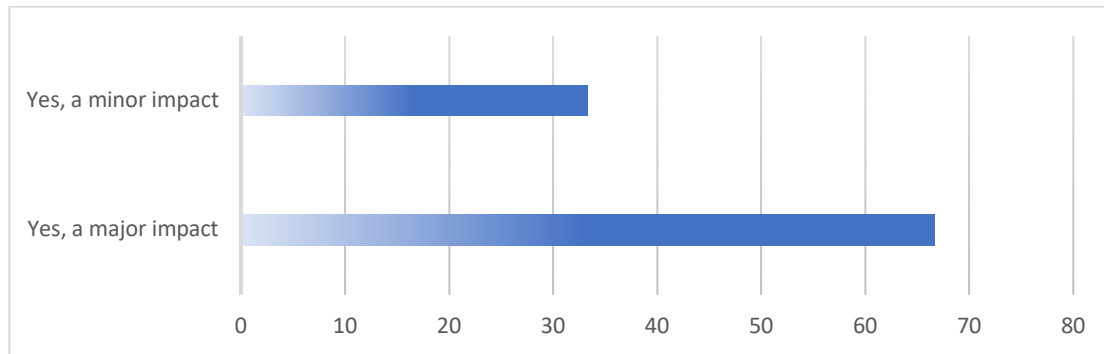


Fig. 5: Impact of digital skill gaps on overall performance in workplaces

5 Discussion and Conclusion

The study explores the digital skills required in Saudi workplaces. The aim is to develop conceptual framework to prepare Saudi universities' graduates for workplaces. To do so, three research questions were formulated to explore type of digital technologies are used in Saudi workplaces, types and level of digital skills and the impacts of such skills on work performance. A survey was adapted from the European Digital Skills Survey (2016). The set of digital skills in here were defined by the set of digital skills defined by [55].

The survey was sent to 1500 workplaces in Saudi Arabia's Eastern Province. Only 300 workplaces replied, totaling 64,400 workers in eight economic sectors.

For the first question, the findings reveal that almost all Saudi workplaces in private and public organizations are now using various digital technologies, with desktop computers being the most common technology. This confirms the CITC, 2015 findings, Saudi workplaces have rapidly increased spending on computers, networks, and storage systems in the last few years.

Furthermore, the findings also indicate that the use of digital technologies has increased in the last five years and will increase in the next five years. This finding is supported by CITC (2015) in that the annual growth rate for ICT workforce in Saudi Arabia is 9%. This finding is also present on an international level. For example, in the European Union, digital technologies are increasing across a wide range of workplaces [56].

Regarding the second question, technical, information management, collaboration, and communication skills are reported as essential across a wide range of workplaces. It was argued that operational skills "technical skills", communication, collaboration, solving problem skills are the most important skills for 21st century employees [57].

In contracts, this study finds that problem solving skills, especially the items "finds multiple solutions" and "solves unfamiliar problems," were reported to be moderately important. This result differs from other studies found that solving problems in workplaces using digital tools is essential and it should therefore be integrated into digital skills frameworks [58].

In terms of the third question, this study finds that ICT led to changes in job tasks and is expected to foster a new work profile in the workplace in the next five years. This finding is also supported by [59]. stated that the growth spending on ICT will create a new job profile.

The question also asks about the impact of digital skills gaps on work performance. The digital skills gaps can be understood as a lack of the individual digital abilities to conduct the current work. The findings from this study reveals that most workplaces reported a major impact of digital skills gaps in workplaces on the overall performance. It was also reported that lack of digital skills has a significant effect on ICT operations and performance in Saudi workplaces. This also is supported by the findings from some studies [60]. [61] argues that workers with low digital ability can be affected by technological change, recommends that evidence could be collected in order to provide support for future job seekers. [62] states that the lack of digital skills can negatively effect on employees' career.

6 Recommendations

Based on the findings, the researchers concluded that digital skills are highly important for workers in Saudi

workplaces.

The study highlights a conceptual framework that includes definitions and classifications of digital skills. It recommends that actions should be undertaken within higher educational systems and this framework used as a guide to develop digital skills for university students. To support and develop digital skills, university curricula should be improved and include digital skills as core competences. Teachers and trainers should be supported to develop their ICT skills and technology integration within continuous professional development programs. Teaching pedagogies should include practices on how to use digital technologies. Finally, universities and higher educational institutes should work closely to develop digital skilled workers. Finally, a national standardised instrument identified from this framework should be designed to assess graduates' digital skills and monitoring Saudi digital skills levels.

Limitation and future research direction

This study was limited by the number of workplaces that participated. The results can be considered representative, but the relatively small sample does not allow for more in-depth analysis. This study was based on a self-reported survey. However, interviews with key people in Saudi workplaces for example top managers, executive directors will provide more details about the interrelationships among these skills. Further research could also extend this study to assess university graduates' digital skills.

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

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