

Increasing Women's Employment Opportunities in Digitalizing Saudi Arabia's Economy

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How to cite this paper: Gadi, N. H. (2022). Increasing Women's Employment Opportunities in Digitalizing Saudi Arabia's Economy. *Open Journal of Business and Management*, 10, 2869-2902. <https://doi.org/10.4236/ojbm.2022.105142>

Received: May 8, 2022

Accepted: September 27, 2022

Published: September 30, 2022

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Abstract

While the Saudi Arabian government is looking for options to diversify its economy through innovation and the use of digital technologies to drive economic growth, likely in response to the global drop in oil prices, the participation of women in digital technologies in religiously conservative societies like Saudi Arabia is a poorly researched topic. Based on a theoretical framework suggesting the applications and construction of technological knowledge and skills for improving the prospects of women's employment in digital technologies, this study investigates the impact of information and communication technology (ICT) skills on employment opportunities in digital technologies for women in Saudi Arabia. The structuration theory adopted in this study explained how social structures, such as government institutions, academia, and businesses, play a key role in regulating the interaction of agents (both insiders—organizational employees and outsiders—potential job applicants) with technologies and, as a result, the acquisition of digital competencies, which can be used to find jobs, self-employ, or advance up the digital career ladder. The data gathering tool was semi-structured interviews, which matches well with the qualitative research approach utilized in this study. The study investigates the perspectives of individuals who are directly involved in the employment, knowledge, and training of Saudi Arabian women. Though participants from government groups believe that suitable law for equal education, training, and job opportunities is documented as part of Vision 2030, data does not provide insight into how equal opportunities rules are implemented in the labour market. The study's findings suggest that the barriers to Saudi women's engagement in digital technologies can be reduced by enforcing the equal opportunity norm within social institutions.

Keywords

Employment, Women, ICT, Digital Technology, Entrepreneur, Training

1. Introduction

In recent times, digital workplaces have started to operate effectively within those organisations taking the time and resources to invest in skilled workers and their tools. Today's digital workplace thus integrates technology with business processes and administration requiring a corresponding focus on managerial techniques and high-tech employee skills (Garside, 2014).

More recently, the evolution of women's participation in the highest levels of digital technology development has emerged in a pronounced way in industries rapidly using digital technologies for running the business operations such as e-enterprises, e-government and e-financial services (Faulkner & Lie, 2007). Jeong and Breazeal (2017), the founders of the Jibo Personal Robots Group at Massachusetts Institute Technology Media Lab and who teaches in USA, claim that the future of robotics is bright. She points out that nine women, namely, Cynthia Breazeal, Lydia Kavraki, Fei-Fei, Andrea Thomaz, Ruth Schulz, Ayanna Howard, Ayorkor Korsah, Stephanie Lacour and Marita Cheng, have supported and designed the processes of robotics and artificial intelligence and created new models of computer vision including prosthetics.

Indeed, Ehrlich (1997) confirms that digital technology has had a huge impact on human resources as the most important assets of any business enterprise; the resources who walk in and out of the door at the end of each working day to keep every organisation operation (Ehrlich, 1997). In realisation of the significance of the relationship between employees and digital resources, Tarafdar and Gordon (2007) point out those organisations should now employ digital technology to assist human resources management to manage the multiple processes required of the modern work-place.

The Fourth Industrial Revolution marked by the unprecedented growth and development of digital technologies has almost disrupted every business sector, thereby creating the employment opportunities for women (Howcroft & Rubery, 2018). It has been reported that emerging markets in MENA (Middle East & North Africa) region and Asian countries, the job opportunities are on the rise due to the application of digital technologies, and promise of higher wages will attract women in both high, medium and low wages sectors. It was shown that the high wage, medium wage and low wage positions require the digital technologies-related skills in the emerging markets in Asia and Middle East (Nordin & Norman, 2018). However, attraction for women for the high-wage IT jobs will still hold the promise for women (4%), while the attraction for medium and low wage IT jobs will decline by 11% and 7%, respectively, for women in the mature markets.

Organization for Economic Cooperation and Development (OECD) forecast that job opportunities for women in the industries using digital technologies for women holding the college and universities level-qualifications will be attracted by employers in the mature markets by 2030 (OECD, 2017). Nevertheless, the women having secondary education or lower than secondary education such as certificates and diplomas will not be able to benefit from the job opportunities mediated by applications of digital technologies by 2030. This situation is found to be on the opposite site of the emerging markets, where the growth of digital technologies is nascent, which will result in attraction of women with college/advanced degrees, diplomas and certificates (Dabla-Norris & Kochhar, 2018).

Interestingly, the women holding qualifications lower than secondary education will be attracted significantly higher than the ones with associate or college level degree-holders by 2030 (OECD, 2017). These data clearly indicate that mature markets have already attained substantial developments of digital technologies, and women participation in the profession requiring skills and training to work with the digital technologies is higher.

Most of the studies have explored the women, technology and employment from the perspective of developed countries such as the UK (Valenduc, 2011; Kofman, 2012; Belt et al., 2000; Webster, 2000), the USA (Lasen, 2010; Trauth et al., 2009), and Australia (Roan & Whitehouse, 2007; Lang, 2007; Bandias & Warne, 2009); however, there is a scarcity of literature dealing with the impact of evolving digital technologies on the women's employment opportunities in the developing countries such as Saudi Arabia (Metcalf, 2011). In a global context, men dominate the technology field while relatively few women are creators of technology-based hardware and software thus women are predominantly consumers rather than producers of technology (Porter, 2013).

In an effort to diversify, the Saudi Arabian government has now launched a new vision for a vibrant society, thriving economy and ambitious nation in an initiative known as "Vision 2030". The primary objective is to implement a strategy to curtail the Kingdom's dependence on oil. When implemented, Vision 2030 is expected to provide further opportunities for women's employment. Nonetheless, if it is to succeed, it will need to balance the interests of the government, the business elite and the religious establishment, who frequently have different perspectives on women's role in the new economic structure (Kayed & Hassan, 2011).

However, the participation of women in religiously conservative societies such as Saudi Arabia is not well researched area; hence, it is critically important to glean in-depth knowledge about the employment avenues created by proliferation of digital technologies in Saudi labour market. The objective of this study was to explore the impact of information and communication technology (ICT) skills on the employment opportunities in digital technologies for women in Saudi Arabia.

The paper is organized in sections. The introductory part of the paper em-

phasize on the need for digital for digital technologies as an option for diverse economy since Saudi Arabia depend so much on oil. The evolution of women's participation in digital technology was discussed. Research gaps and objectives were highlighted in the section. The next section explained the method of data collection and techniques employed for analysis. Results section reflects the objectives and methods of the paper by evaluating the technology-related careers, E-marketing and On-line businesses and entrepreneurship and training arrangements for women. The discussion section was based on the findings of the study which revealed that women have employment opportunities resulting from the applications of digital technologies in Saudi Arabia. The study concludes that Equal opportunity policy should be developed and implemented across national institutions in order to allow women to harness the employment opportunities through participation in training opportunities, and subsequently securing employment in digital technologies

2. Literature Review

Based on the literature survey, the women are most likely to have employment opportunities created by different digital technologies which are discussed in detail in the subsequent subheadings.

2.1. Digital Web/Multimedia Tools and Employment Opportunities for Women

Roan and Whitehouse (2007) critically appraised the role of digital technologies in enhancing the employment opportunities for women in Australia. They reported higher representation of women in the careers of web or multimedia professions, and most of them were filled in the clerical roles, whilst women were under-represented in more technical roles relating to the design of software and games in the multimedia companies. The reason for women not making inroads into more technical roles might be related to the lack of education and training. Valenduc (2011) argued that women with artistic abilities are more likely to find their employment in the computer games industry, as most of the job roles in the design of games are reliant on the artistic conception behind the development of products. Geneve et al. (2009) found that women are also making inroads into technological careers relating to the role of consultants in the IT companies, however, the rate of progression of female workers is slow compared to male workers.

2.2. Software and Hardware Development Tools and Employment Opportunities for Women

The new software and hardware are being developed to control warfare aircrafts, aeroplanes, smart cars, building smart cities such as Neom city Project in Saudi Arabia (Farag, 2019). The digital ICTs tools such as sensor technology are also being designed for education and healthcare sectors to provide the education

and health services effectively to citizens (Iroju et al., 2013; Olaronke & Oluwaseun, 2016). The workers are needed to participate in the research and development of new software and hardware. The women with expertise in the software development can easily fill in software development-related positions in the local and multi-national high-tech companies across the globe (Arivanandan, 2013).

2.3. Artificial Technology and Opportunities for Women

Kaplan (2015) surveyed the employers and found that artificial intelligence and machine learning is the key digital technologies which are changing the way business works, as these technologies are being used in decision-making process. Infosys Consulting firm, while reporting the results from survey of 1000 ICT-decision-makers and seniors executives at various firms in seven countries at the World Economic Forum, demonstrated that artificial intelligence is at the forefront of creating job opportunities, which can be helpful in inducting women at the leadership positions in the SMEs (Report on Artificial Intelligence, 2017). However, some authors also reported that negative impact of the artificial intelligence and machine learning on the jobs in the high-tech companies (Bose, 2018; Roan & Whitehouse, 2007). Most of the authors have voiced optimistic view of the applications of artificial intelligence tools in terms of generating the employment opportunities in the future (Varley, 2018; Holtgrewe, 2014).

2.4. STEM Technology and Opportunities for Women

It has been reported that digital technologies employed for the growth of science, technology, engineering, and mathematics are increasing the job opportunities for women. Agreeing to the point of view of Ernst and his colleagues, Holtgrewe (2014) reported that culture of organizations in favouring the inclusion of women in the workplaces is another key factor along with innovative culture for promotion of women's roles requiring the skills in the use of digital technologies. Lachenauer (2018) quoted Khandelwal at the "Grace Hopper Celebration India Conference" in this way: "Digitalization is a change for everyone, regardless of gender, and I encourage you to be open-minded and stay curious. Ultimately, the nature of women need to go through the change which will help women to get the roles across industries and more importantly, into positions of leadership".

2.5. Educational Technologies and Opportunities for Women's Employments

Educational technologies are no longer about making the textbooks available online or the usage of tablets in the classrooms. According to Gomez et al. (2014), educational technologies are set to refine the resources used in educating students, and ultimately will deliver the positive outcomes on the students' academic achievements and society. There are several educational technologies-related products have been created and launched in the education sector, such as vid-

eo-contents, immersion technologies, tools for adaptive learning and gamification which have changed the ways students learn in classrooms and at homes (Yusuf, 2005; Laurillard, 2008). The digital skills relating to apply the gamification for enhancing collaborative skills and delivering socio-emotional learning, adaptive learning tools for tailoring educational programs to the individual needs, immersive technologies for mimicking the real-life settings while teaching courses relating to medicine and engineering (McMahon et al., 2015). Women in Saudi Arabia can obtain digital skills in the afore-mentioned educational technologies in order to find job opportunities in the education sector. The government, businesses and academic institutions appears to be logical partners in supporting the programs intending to support the digital skills of Saudi women.

2.6. Social Media Tools and Employment Opportunities

The growth of social media technologies has given tremendous impetus to the opening of new job opportunities regardless of genders. It made possible working at home, especially for women. The women connected to internet can easily perform so many tasks such as marketing of products, providing teaching services, serving as marketing managers for companies located in different parts of the world. The availability of social media tools created the enviable labour for the workers irrespective of genders, and Crain et al. (2016) further defined work mediated by social media as “activities... workers perform in response to requirements (either implicit or explicit) from employers and that are crucial for workers to generate income, to obtain or retain their jobs, and to further their careers yet are often overlooked, ignored, and/or devalued by employers, consumers, workers, and ultimately the legal system itself (p. 6). The preceding statement of Crain and his colleagues carries a great significance in terms of highlighting the potential of social media application in empowering the individuals in society. The empowerment may come in the form of generation of income and expression of thoughts. The main focus placed by employers recently is on the advertising potential of social media platforms, which help the women and men having expertise and skill in building their social networks to further their careers.

3. Method of Data Collection

3.1. Sampling

Purposive sampling was the strategy adopted in this study where, as Neuman (2006) indicates, “Purposive sampling occurs when a researcher wants to identify particular types of cases for in-depth investigation to gain a deeper understanding of types”. The purposive sample technique is used for recruitment of samples from the relevant organizations in this study, which enabled the researcher to target the participants which met certain criteria. For instance, the participants who are representative of academic, government and business groups must hold decision-making positions within organizations, such as re-

cruitment of employees, and digitalization of operations.

The study also pays a particular attention to the number of sample to be drawn from all of these groups. Selection of the appropriate number of interviewees is hence subjective. [Perry \(2000\)](#) suggests that 30 - 35 are required for conducting a qualitative research at the doctorate level, whereas [Bauer and Gaskell \(2000\)](#) suggest between 10 - 15 participants, arguing that the main concern is the quality of the information rather than the number of the respondents.

The participants in this study were comprised of forty people who were selected to reflect different experiences. The participants were divided into three main groups based on their affiliations with the respective organizations: government, academia and business whose roles and responsibilities affect women's relationship with technology ([Table 1](#)).

3.2. Semi-Structured Interviews

The semi-structured interviews were used as data collection tool, which fits well into the qualitative research approach adopted by this study. The choice and justification of semi-structured interview as a data collection tool since interview method is an appropriate data collection technique for use with an interpretive paradigm ([Smith, 2007](#)). Interviews help researchers to understand the feelings and thoughts of people expressed through speech and body language, enabling them to answer the questions in a natural way ([Hussey & Hussey, 1997](#)). In this study, semi-structured interviews were applied. Semi-structured interviews are commonly used in qualitative research ([Collis & Hussey, 2013](#); [Saunders et al., 2012](#)). The semi-structured interview subsequently uses open-ended and probing questions to allow the respondents to express their experiences in depth, while providing enough guidance and structure to ensure that the discussion remains focused on the researcher's topic of interest.

3.3. Data Collection Process

The process of data collection includes the preparation of the interviews, the pilot study, the design of the final interview protocol, field access, and then the conduct of the actual interviews.

Preparation for Data Analysis

Preparation for the data analysis requires several steps: recording, transcription,

Table 1. Participants in semi-structured interviews in Saudi Arabia.

Stakeholder	Female	Male	Total
Government	6	4	10
Academia	13	2	15
Business	9	6	15
Total	28 (70%)	12 (30%)	40

Source: Field survey.

translation and validation of the recording, transcription and translation. These steps are explained taken to ensure that the accurate data analyses are performed.

3.4. Data Analysis

Thematic analysis was used for analyzing the qualitative data obtained from the participants in this study; and is considered to be a useful tool for analyzing the textual data or interview transcripts (Braun & Clarke, 2006). Thematic analysis carries several advantages. First, it is a flexible and straightforward technique that can be modified for different qualitative studies depending on the research questions and accounts of participants which “Provides a rich and detailed, yet complex account of data” (Braun & Clarke, 2006). Various techniques were used to analyse the data. These include:

- Reading, Thinking and Annotating, Marking and Linking
- Importing data into NVivo
- Coding and Sorting Codes in Nodes
- Searching for themes
- Interpretation
- Writing the Report

Note that similar methods were applied in my previous published work (Gadi, 2021a, 2021b).

4. Results

This section presented and analyzed the findings obtained from the semi-structured interviews conducted for this research project. First of all, the researcher confirms that the research participants were comprised of forty people in total, both female and male, from three stakeholder groups; namely, *government*, *academia* and *business*. The rationale for the choice of both stakeholder groups and participants was earlier explained in the methodology section.

4.1. Career Opportunities for Women

A career can be defined as an occupation for which one is trained and progresses through a working and professional life; on the other hand, the most common conception of employment is having a job for which one is paid (Malhotra, 2015). In the interviews, these two terms were mentioned by participants without a clear distinction, but I believe that their intent here was to refer to the creation of “jobs”.

In the world, or the global economy today, multiple potential career and employment paths are open to both men and women (Fountain, 2000). However, the extent to which access to such opportunities is facilitated is determined by the degree of appropriate training available, and most notably in the case of technology-related employment and careers (Kirkup, 2002).

4.1.1. Technology-Related Careers—Reality Not a Dream for Saudi Women

Here, some of the respondents acknowledged that technology-related careers are opportunities for women, being that they are suitable for either men or women. At the same time, the interviewees appeared socially regressive in outlining what they considered appropriate areas of employment for men or women only. For example, Thamer/B said:

“Both genders can have the same job, such as work on the technical, professional, and technological side. These jobs are subject to a suitable work environment for women.”

As a businessman, Thamer/B was of the opinion that employment is accessible to both men and women but, in the case of women, opportunities are dependent upon a suitable work environment (i.e. whether or not positions involved a gender-segregated workplace). However, this viewpoint is only partially valid because Thamer/B and Olfat/B attested (and they are managers), they conduct meetings with members of their companies via teleconference.

Olfat/B had a range of experience in the private sector. She was the manager of a women’s branch in another city separate to the company headquarters. Hence, she is continuing to look for a better job suited to her experience and qualifications because she had worked hard to reach her current position and had attended numerous training courses and seminars related to technology.

She is thus an example of a woman who is not just waiting for a great opportunity to come to her but is proactive in creating her own career path. Other women could follow her example and may, indeed, be starting to do so. For instance, Salah/B is the senior director of a factory and allowed me to visit a factory in Riyadh city where I found Saudi women working with professional and technological devices (e.g. stock management software, ordering software for ordering raw materials).

Other participants identified numerous different types of jobs, which they perceived as suitable for women. For example, participant Olfat/B between 35 - 45 years of age and is a manager. The meeting took place without interruption, during which I observed her body language and saw that her level of eye contact was very strong, and her hands stayed still and calm on top of her desk.

Olfat/B argued that Saudi women find employment opportunities in various fields requiring them to work through the digital technologies:

“Career opportunities are available in the call centre, web design and programming, coding, data processing, marketing through websites, social media programs, IT, solar energy technology, and nanotechnology. Today women have started working in the production lines of electrical tools and assembling devices.”

Indeed, the consensus amongst Saudis today is that work in the future will

involve artificial intelligence, robotics and big data.

Sara/A had her own accounting consultancy business and delivered accounting classes online using the relevant software. She was hired because of her knowledge and her ability to help others. Like Shatha/B with robots, Sara/W had a clear picture of her future career plans.

“Artificial intelligence and the use of robotics, tools and apps are the area of future cutting-edge career opportunities. There will be job opportunities in the field of in the field of robotics, especially in research, development and usability areas, if I get opportunity to work in field of robotics, I will go for that.”

Olfat/B suggests that there are various types of jobs available to Saudi women. She herself is an actual example of a career woman. She had begun working in a bank and ended up in a company for women’s employment “Taqat”, with required a high level of digital technological skills such as using social media and communication tools to interact with potential customers if they are already running a business, or employers if they are looking for employments in some organizations.

Her response to women’s employment opportunities in digital technologies was based on more than ten years’ experience, after which she believed that women have the potential to succeed in every field. I agree with her because I also believe that with equal opportunities in education and training, different career choices will now begin to open up for women and more diverse occupations will welcome their applications.

Hind/B stressed that the digitalization of Saudi economy and society offers employment opportunities for Saudi women in film graphics, hardware manufacturing and incubator projects in digital technologies.

“Many like to use software in the design of graphic films. Now manufacturing technology relies on technology. In addition, manufacturing the hardware is a smart innovation. Business incubators support projects and smart innovations.”

I would be skeptical of above-mentioned assertions, which stems from the existing literature reporting limited and small proportion of women in manufacturing technologies and graphic designs (Huntemann, 2013). The critical discussion on these issues will be done in the discussion section.

Aliya/B then pointed out that various skills could be transformed into a career by using technology, such as digital manufacturing, with an integrated, computer-based system and various collaboration tools to create a product and manufacturing process.

“Drawing, embroidery, the line has become a leading Digital Manufacturing area. Here is a direction for the majority of women who enjoy a great passion for this area.”

Fahad/B added a very important point about employment opportunities in tech-dependent companies:

“Opportunities are available in IBM, Microsoft, Cisco and Apple only in the field of accounting and sales, but not much in IT. There are some girls who work on building applications, but a very small percentage.”

Fahad make references to some tech-companies such as IBM, Cisco and Apple which have entered into Saudi labour market due to efforts of government to proliferate the digital technologies in Saudi Arabia. This resulted in career opportunities for Saudi women in application development. Simultaneously, there is note about the little representation of women in this area, which mainly springs from his experience in business organizations.

4.1.2. E-Marketing and Online Businesses

The government of Saudi Arabia plans to diversify the economy away from its dependence on energy resources and develop more advanced economic sectors, including information and communications technology. The technology provides a large number of services, up-to-date knowledge and fast performance, as well as an efficient means to facilitate business processes and other organisational procedures.

The participating interviewees thus raised a range of pertinent points with regard to impact of digitalisation of Saudi society and its impact on the employment opportunities for women and subsequent economic development of the country. Most of the participants from the government group remarked that digital technologies have enabled the process of buying and selling online which accelerates the volume and speed of business transactions, which offers employment opportunities to women. For example, Mariam/G said:

“The digital economies are presenting a range of innovative practices to businesses involving the online selling and buying to customers. Reaching out to customers via online channels holds opportunities for unemployed skilled women to do the work for the businesses”.

The above comments indicate that employers need the skilled workforce for managing the online resources in order to have effective interactions with customers, and skilled but unemployed women at homes can perform the job of targeting customers for increasing the sales revenues for companies.

Participants also reported that an increase in production is achieved through the use of computer-aided design, robotic production and facilitation of material or product logistics; and to operate the technological tools, the skilled workforce holds critical value for companies. The female's workers with appropriate training and experience in handling the digital technological tools can be the best fit for the tech-dependent organizations in Saudi Arabia. For example, according to Mariam/G, digital technology asserted the need of skilled labour in digital tech-

nologies in tech-dependent companies in modern Saudi Arabia. She stated:

“The desire and need for higher production are making companies dependent on the use of digital technologies. They are in need of workforce trained in working with the digital technologies in order to meet the needs of labour market.”

Afrah/B supported the arguments of Mariam/G, and said:

“The businesses in the technologically driven economies are always in the need of skilled and trained workforce, and we would welcome inclusion of skilled workforce in our organization regardless gender.”

It is clear from comments from government and business groups that trained and skilled women have opportunity to participate in the labour market. The stress of participants on the training and skills vindicate the importance of digital skills in empowering the women. E-marketing has emerged as a new phenomenon in a decade, and women can only increase their employment share in the e-marketing through the knowledge of utility and training in the use of the digital technologies.

In addition, Laila/G and Ali/G mentioned that technology is used in e-marketing to increase sales, which can be capitalized on by women to start selling their own products online by setting their own online shops while sitting at homes as per requirements of Saudi social traditions. In her work-place in particular, Laila/G mentioned her use of advanced technologies for selling her products online while studying in the USA. Indeed, having conducted the interview at her Saudi workplace, I observed that it was a small office with inadequate IT services illustrating the amount of progress still required in the Kingdom. Nonetheless, Laila/G attested that e-marketing is available in Saudi Arabia and most businesswomen use it in their companies:

“Technology diversifies the economy in many (ways), such as e-marketing, increased production, increased intellectual progress.”

In the above comment recorded by Laila/G seems, the “role of technologies” can be interpreted in terms of aiding diversification of the economy in different ways. Diversification is the process of moving the economies to more diverse lines such as creation of new business opportunities such as online business, e-marketing, digital enterprises. The increased intellectual progress in the above quote, from my point of view, means that women in particular and citizens in general in Saudi Arabia can work through technologies, participate in the economic diversification process aided by digital technologies, and can fulfil their ambitions of pursuing careers in digital technologies. Taken together, the diversification of Saudi economy drive by the digitalization process impacted in creation of digital technologically supported businesses which are opening employment avenues for women aspiring to pursue careers in digital technologies.

Participant Aliya/B supported this point as a businesswoman now serving as

the owner of a chocolate factory, but also as a former employee in a bank and a financial analyst. She had extensive knowledge of the labour market and has used a variety of marketing and communications applications to obtain customers in the name of selling her products profitably and using the most suitable delivery method. Her experience provided a real example of how e-marketing can help empowering women in the modern Saudi economy. She commented on the role of digital economies in empowering women in this way:

“The trained and skilled women who knows how to use the information and communication technologies can do a lot via online channels, such as internet use, social media use for e-marketing of home-made items or products made by national and international companies can really help women to have economic empowerment.”

In the above comment, the emphasis of the participant was on the technical know-how and digital skills in using the digital technologies for productive purpose such as applying the communication supported by digital technologies to the online advertising and e-marketing. The women with digital expertise and experience can achieve the economic empowerment easily and can find in a variety of business settings, which is evident from the perceptions of Manal/G:

“Economics has become digital, and I think the present generation copes with technology. If women convince themselves that they are not the consumers only, and they can learn to work through digital technologies productively, which can be more helpful for making them do many things online such as increasing income through selling products online.”

This statement was supported by Asma/A, who is a Senior IT and training specialist. When I met her, she highlighted how technology has had an impact on the computer skills of young girls in high school, notably demonstrated by their student inventions in the field of robotics. Asma/A said:

“Women whether they are studying or in work are in better position to become economically empowered nowadays thanks to the development of the digital technological tools, and there are many opportunities out there in the market, important one is selling and advertising products online which suits to female students, and women who are restricted to their homes.”

From the above quote, Asma/A’s experiences with working through digital technologies reached to the conclusion that women after having wider exposure to career opportunities in digital technologies can get the economic empowerment like the way she feels.

Ahmad/A added that women who have online advertisement expertise are also suitable candidate to advertise the online educational programs, and was of view that it is now possible to employ women from home:

“We employed two girls in the call centre from (home) and to activate the

remote education program. I mean, I could provide them with an effective training to make them capable of dealing with advanced technology.”

The point of focus made by Ahamed/A based on his academic experiences and dealing with teaching of digital technologies is that training can be an effective solution for women in order to pursue careers in digital technologies successfully.

Fahad/B gave the real example of the Mobily Telecommunications Company, which has employed Saudi women from home and thereby giving them an additional employment opportunity. However, to be efficient workers, these women will require state-of-the-art training and best practice to be successful.

4.1.3. Entrepreneurships and Training Arrangements for Women

Most of the interviewees from government bodies, business groups and academia had emphasized on the concept of self-employment and entrepreneurship in digital technologies for women in Saudi Arabia. Furthermore, they perceived that digital technologies provide strong and positive models of work and economic participation for woman and their children, who gain experience of self-sufficiency, economic autonomy and the ability to work together for a shared advantage. Laila/G claimed that women are more involved in entrepreneurship and successfully so,

“Look, women have a significant role that is greater than yesterday, and they engage in entrepreneurship. Women now have large projects in the country... Imagine that, every day about 30 to 40 businesswomen visit us [Ministry of Labour and Employment], and each one has 4 to 5 projects, whether small or large.”

Thus, women have now established a growing number of enterprise projects in KSA thanks to the support and encouragement of the Ministry of Labour and Social Development. Indeed, the emerging role of women in productive family enterprises established with the help of digital technological tools is a positive step, serving as a practical and constructive way to reduce unemployment in the female population. In Saudi Arabia, home-based enterprises showed great success in the past, such as handicrafts, fashion accessories and jewellery, which used to be marketed through the traditional marketing channels such as shops or personal contacts. Mona/B responded argued:

“The digital technology created a new concept of family owned business; in fact, it supplemented the marketing of the home produce manifold. It brought women in contact with hundreds of thousands of contacts, which increased the sale and productivity of family owned business, and increased the interest of unemployed women to start the family owned online businesses.”

From the above comment, it is clear that the advent of digital technologies in Saudi Arabia provided different avenues for marketing the home-based products

such as internet and social media tools, which increased sale revenues manifold for home-based enterprises manifold. Hence, it can be argued that digital technological tools made the women's involvement and participation in the home-based self-managed enterprises.

Participants Lama/A highlighted the importance of the training opportunities for women entrepreneurs, which can improve the ability of women to avail the employment opportunities offered by digital technologies. For example, one of participants was of the view:

“The information and communication tools are useful in increasing the family economy through the participation of women in the labour market, either in the form of employment in organizations or in the form of online businesses run by women at home. The government and educational institutions are thinking seriously to provide training to women to help them to start a home-based family business.”

The training is an important component for women entrepreneurship, as they are not bold and confident in the male dominated society. There are different digital technological platforms, infrastructure and software which are useful for connecting users with other users, customers and stakeholders in the wider community. The above comments show that academic institutions are government are still planning phase to devise the curricula for training women in digital technologies so that they can start their career as women entrepreneur. This holds a great promise for women in future in terms of receiving training and knowledge to become involved in the applications of digital technologies for initiating their own businesses.

Participants Mariam/G, most favoured the idea of giving training to women so that they can set up their own businesses, use the online channels for selling the home produce.

“The digital technologies are helpful in increasing the economic development. The women can contribute to the national economy by making the homes independent of the benefits given by state to the low-income people in Saudi Arabia. The encouragement of women to acquire training and establish their own family businesses with the help of information and communication tools is also very promising”.

The view of Mariam/G reflects the change in government policy towards pushing women into the labour market to increase the home and national incomes. The women with the support of governmental policies would be in better position to increase their career as a women entrepreneur. The training may encourage women to participate in the labour market, and help them to become independent earner and contributing member in the homes to increase the family income.

Many other participants agreed to comments of Mariam/G, and argued that

education and training for female students and workers can enable them to use their capabilities in digital technologies for earning and finding the suitable employment or training female workers to reach their potential in their workplaces. For instance, Manal G, who works in a government organisation, believes that Saudi women have the ability to contribute significantly to the economy through their participation in the labour market generated by digital technologies:

“Now women have entered the world of production and have developed simple enterprises as a businesswoman with the application of digital technological tools. Today, Ministry of Social Affairs tries to support the digital technology-based work of women through providing support services, workshops and training courses to help develop competitiveness.”

Manal/G’s testimony is illustrative of the vital role of affirmative action. In turn, the government now recognizes the important role of support services, workshops and training courses in order to help develop competitiveness of women. Such support initiatives on behalf of government can be helpful in increasing the women’s participation in the labour market created by digital technologies. The promise is that such state support can be useful in changing the repertoire of women’s skills in digital technologies, which in return can increase the employers’ motivation to accept women for positions involving the digital competencies and women’s suitability for starting their own business based on the applications of digital technologies.

Participant Shatha/B also supported the claim of Salam/G, and referred to the digital technology as a source for employment while being restricted to home;

“Though we are supposed to stay at home as part of our culture, but now with the help of information and communication technologies, we can do sell our home-made product to customers. This is still good change to start our own business while staying at home.”

The women’s support to the perceptions of Salman/G is also reflection of certain women’s submission to the men’s control over their lives. Even though they are ambitious to work, they are willing to go outside and find the job; they are ready to implement their ambitions with the help of technologies while still respecting the family values in the Saudi society. Of note, the stance taken by Shatha/B coincide with responses gathered from most of the women’s participants, which suggested that it should be accepted with caution, and it is most likely that skilled and qualified women are still forced to work within boundaries of the house, which is a form of tacit violence against women in Saudi society.

Women-led ventures can offer hope for the ambitious female students/workers living in conservative families to fulfil their ambitions of working or starting their own ventures in collaboration with experienced women entrepreneurs. Janna/B reinforced Aliya/B comments, and views women’s participation in digital technologies-assisted businesses as a good example for other women to follow:

“If more women are in the business, and run their own business, it means that they can consider training and helping other women to set up their businesses using the digital technologies, however, sadly, there are not too many women in business world in Saudi Arabia. Technologies and media are motivating more women to have their start-ups.”

From the above remarks, it seems that skilled and qualified business women, in Saudi male dominated and conservative society, will be in better position to set their own business by taking guidance from the women-run organizations. This is partly due to the allowance given by men to women to work but only in the female dominated workplaces. This may be reminiscent of the control of men over women in terms of deciding where and when they should work. With the change of position of women as active contributor to the family income, women might be empowered to make their own choices within the Saudi conservative families. Women can achieve quicker economic empowerment through using their skills and experience in the information and communication technologies. Unfortunately, women who are lacking in the skills and training in using the digital technologies productively would not be able to achieve the economic empowerment promised by the digitalization of Saudi society and economy. This refers to the importance of imparting the awareness, education and training to the female students/workers in using the digital technologies for increasing their income.

Moreover, the greater women’s participation in the political process can also be helpful in solving the issues for ambitious women aspiring to start ventures in digital technologies by putting forward a strong case for provision of funds and training in order to support women’s work within and without homes. Aliya/B had personal experience of this progression when she applied in municipal elections to be one of the candidates and was not accepted. However, she persevered and eventually reached her goal. She was of the view that

“It is hard for women to work without the active role of government in preparing the society to accept changes regarding women’s employment in the society. The women’s presence in the government bodies responsible for decision-making about the women’s future in the work can start the process of structuring inclusive work-related policies for both public and private sectors, and supporting the funds to women looking for start-ups. I have planned to push such initiative in my own municipality.”

From the above comments, it can be gathered that women are not able to take up employment opportunities created by digital technologies in the labour market or launch their own start-ups without the support from governmental bodies, Aliya/B’s ambition to become a leading political figure and with the work experience can help her to identify the challenges for women at work, and the possible solutions which can be suggested or planned at the government level in

order to facilitate the entry of women in the digital technologies-mediated labour market.

Distance working became possible for Sara/A, who was prevented from attending university for some time. Another woman who benefitted from technology was Afrah/B, who ran a small business buying and selling through Instagram application. She was studying and working using online applications to earn money.

“I find social media a helpful tool for advertising my home-made products, attracting so many customers through my contacts in Instagram. I am sure that other students can study and work at the same time using the social media.”

Given that there are cultural restrictions for women free-movement, Sara/A’s experience is that by using social she could outreach wider customer base. Being an academic, she urges other students to do as she does.

Another participant Aliya/B who was running chocolate factory was also working through Instagram for selling the chocolate via the online channels.

“Being women entrepreneur, social media is a powerful tool for finding the customers in different regions of Saudi Arabia, where it is not possible to travel due to high cost of travelling involved. I have increased the customer base for my products through the use of some other social media such as Snapchat, Instagram and Facebook.”

It can be argued based on the comments of Aliya/B, social media can help give the best start to the women entrepreneur. The way digital technologies have assisted Aliya/B to widen its customers, and increase the revenue for her company, presents a viable example for other women to follow, and can be seen as a viable example of teleworking through the social mean channels for increasing the customers’ base instead of travelling and advertising the products in different cities using traditional advertising means such as holding meetings and displaying banners in different cities. . Similarly, it helped female students to work online while they were studying as was obvious from the online buying and selling experience of Afrah/B.

Most of women participants from the academic and businesses argued that social media holds a great potential increasing the income of women if they use it with proper training and guidance. The women remarked on the social media. Jana/B stated that,

“The social media is a source of providing additional avenue for raising the family income for women in Saudi Arabia, if they know the real benefits of social media. The issue is that women take the social media for granted, and consider it only to communicate with their friends. The training and awareness can provide some know-how as to how to increase their employment potential.”

Shatha/B and Lama/A agreed to the comments given by Jana/B. Furthermore, Aliya/B posited on the potential of social media in this way:

“I would be happy to offer employment opportunity to girls who show their experience in using social media to advertise their products.”

This reflects the importance of training and experience in using the social media for commercial purposes rather than just the application for personal communication with friends and family members. Taken together, social media can be a useful way of increasing the women’s employment if the women are trained and given experience in using the social media tools productively for commercial activities.

5. Discussion

The findings of this study revealed that women have employment opportunities resulting from the applications of digital technologies in Saudi Arabia and are applicable to developing countries in Asia, Africa and many parts of the world. Several other studies have reported in line with the outcome of my study. [Joshi et al. \(2015\)](#) described those trends in textile dressing using the embroidery has increased, which involve the development of needlework patterns and other elegant textile forms using the computer-controlled tools. The women with knowledge of digital technologies are more efficient in producing the 3-D woven and non-woven fabrics in their traditional home-made textile products. [Kim et al. \(2018\)](#) reported the use of designs and patterns developed using the design technologies among Korean women to increase the economic empowerment of women in South Korea. The author showed that women accomplishing the computerized designs on the home-made textile products have become popular in the market, thereby attracting the women textile designers to start their own start-ups in South Korea ([Kim, 2018](#)). The examples of Korean women can be followed by Saudi women to use the computer graphics and digital machines for converting the traditional textile design into modern and elegant textile products.

Another artist called Maggie Grey featured an article in the Textile Artist Organization showing the increasing application of computer textile design (GEM Paint) in accomplishing patterns and design on fabrics with ease and within short time ([Textile Artist Organization, 2016](#)). It was further concluded in the article that women’ participation in the digital embroidery has increased due to time saving and ease of use of the designing and stitching the textile products. The digital technologies such as computer design has great potential for women in rural and urban areas to seek economic empowerment through the production of elegant design and patterns while sitting at homes, which supports the outcome of this study for Saudi women aspiring to pursue digital careers.

[Gong \(2015\)](#) also showed findings in relation to the earning by women

through teaching the embroidery and knitting skills to students via the applications of computer knitting and embroidery technology for teaching students. Though the paper focused on development of innovation of experimental teaching, but it clearly construed to the potential of women having knowledge and expertise in knitting technology and computer embroidery process can gain economic empowerment through arrangement of teaching classes to other female students. This corroborates the findings of this study, which showed that digital embroidery has potential employment opportunities for Saudi women aspiring to follow digital careers. Many other studies have supported the increased economic empowerment gained by women through the digital technologies, thereby corroborating the finding of my study (Hasiru et al., 2020; Luckman, 2013).

Taken together, it is obvious that Saudi women with knowledge and expertise in handling the computer knitting and computer embroidery are only able to exploit the employment opportunities. Hence, the condition of training, knowledge development in the area of digital embroidery seems to be prerequisite for exploiting the employment opportunities resulting from the deployment of digital technologies in the textile industry in Saudi Arabia. The perceptions in relation to employment opportunities for Saudi women due to digitalization of textile industry mostly come from the academic and business groups which are supposed to hold good knowledge about the market potential of digital embroidery in increasing the employment opportunities for Saudi women due to their close links with the labour market. This adds strength to the finding showing the link between the digital embroidery and career opportunities for Saudi women. Moreover, participants sounded confident with smile on their faces and movements of hands while talking gave me impression that they were sure of what they were expressing.

This study found that entrepreneurship opportunities have become available for women aspiring for digital careers in the Saudi labour-market. Women can start the start-ups with the help of digital technologies. Joshi et al. (2015) supported the same outcomes in the Indian context that women women-run enterprises run by women has significantly increased due to the proliferation of the digital technologies in the textile, food sector and many other areas in the online businesses. This is in line with the perceptions of participants in this study. Supporting the outcome of this study, Danish and Smith (2012) reported the increase of entrepreneurship opportunities for female, and concluded that overall increase in the entrepreneurship opportunities for female boosted the family business run by women in Saudi Arabia. Similarly, Kargwell (2015) also showed that improvement in entrepreneurship opportunities is potentiated by the digitalizing economies of the Middle East and Saudi Arabia. Al-Munajjed (2019) reported the rise of female entrepreneurs in event management, ICT, e-commerce, marketing, public relations and education, which is due to the proliferation of digital technologies in Saudi society. She further documented that commercial

register in Saudi Arabia demonstrated 98,853 women in July 2018, which again exhibits the increased participation of women in business ventures developed with the help of digital technologies. These data corroborate the outcome of my study.

Reporting in agreement with the outcomes of this study, Statistical Data on Women Entrepreneurs in Europe showed a rise in the entrepreneurship opportunities for women aspiring for careers in digital technologies. The report highlighted that with advent of digital era, the female entrepreneurs in Europe has risen by 30% which represents a massive leap for women aiming to increase family income (European Commission, 2017). Pappas et al. (2018) reviewed literature in both developed and developing countries, and found that rate of women's businesses has increased due to the digital applications such as social media tools.

Moreover, they argued that social networks have created tremendous potential for women to establish their home-based small ventures. Another survey showed that women's participation in the online businesses has improved through the establishment of online shops. Women have more freedom to sell their own products with ease and flexibility bestowed by digital technologies on them. Similarly, in line with perceptions of participants in this study, Scuotto et al. (2019) showed that shift is occurring from male entrepreneurship to females' entrepreneurship in creative industries involving design, music, crafts, fashion and publishing due to digitalization of these industries in Italy. They concluded that digital technologies in the creative industries have opened up entrepreneurship opportunities for females all around the world, which is consistent with the outcomes of this study.

Many other studies have supported the finding of this study by referring to the emergence of entrepreneurial opportunities for women due to proliferation of information and communication technologies and adoption of digital media (Davidson & Vaast, 2010; Sarason et al., 2010). Sarason et al. (2010) focused on the inseparable relationship between the entrepreneurship and the opportunities to be created in the labour market under influence of digital technologies. Applying the arguments and thesis put forward by Sarason and her colleagues in the context of entrepreneurship opportunities for Saudi women due to proliferation of the digital technologies, there is a strong association between the exploitation of opportunities and availability of role models. If there are limited role models for enabling women to implement their business ideas, then the rate of translation of business ideas into practical ventures decrease (Mole & Mole, 2010). This suggests that if women will not be able to find the suitable role models in form of female entrepreneurs from their own localities in Saudi Arabia, the perceptions of participants about the availability of entrepreneurship opportunities can be challenged.

In the same way, participants' views about the opportunities in the area of establishing family enterprise can be challenged in the absence of the training op-

portunities and proper communication mechanisms between the industry and the women aspiring to develop careers in digital technologies. The structural theory explains the extent to which women aspiring for digital careers can avail the entrepreneurial activities created by digital technologies in Saudi Arabia.

Drawing on the tenets of structuration theory, the coordination between the women and the agencies (academic, government and business) also determines the ability of the women to achieve for what they aspire in the context of career opportunities (Mole & Mole, 2010). The training and development opportunities for women aspiring for entrepreneurship are critically important for enabling them to exploit participate in the labour market.

The finding relating to entrepreneurial opportunities for female intending to follow careers in digital technologies was bolstered by Mathew (2010) who peeped into the entrepreneurship opportunities for women in the two Gulf countries: Oman and UAE, and reported that digital technologies have opened up the entrepreneurship's opportunities for women and men. The women, like their male counterparts, can participate in the business world and start their own ventures, however simultaneously, he signalled the cautious approach as the male dominance in the Gulf countries, which can reduce the ability to women to initiate their own business ventures.

The data from this study showed that e-marketing opportunities have become available for Saudi women to follow their careers in digital technologies. Crain et al. (2016) highlighted the importance role of information and communication technologies in increasing the economic empowerment of women, and reducing the gender gap in the labour market. They argued that ICTs not only improved the empowerment of women in terms of expressing their thoughts on social issues, but it increased their prospects for earning income through the e-marketing. The data from this study also demonstrated the potential of social media in marketing of businesses. The employers have recognized the potential of ICTs in enhancing their revenues; therefore, they are looking for experienced human resources to advertise their products on social media. Several studies have highlighted the role of social media in advertising the businesses to larger inaccessible customers (Corrigan, 2015; Duffy & Pruchniewska, 2017; Kuehn & Corrigan, 2013). These data support finding reported in my study.

Gandini (2016) concluded that with advent of social media and ICTs, women in Middle Eastern countries, who are restricted to homes due to home responsibilities, are in better position to increase their income by advertizing their own products or products from other companies on social media platforms. Jones (2016) called women workers working for advertising products for other companies as invisible workers, as they work in background for increasing their income. Some scholars have mentioned that women on social media may work for increasing their social exposure and increasing their own incomes. From the data presented in this study, participants noted the application of social media.

The findings revealed that call centres present the promising employment

opportunities for women. Of note, this finding was derived from business participants who are supposed to have a sound knowledge of business needs, operations and suitability of employees. They reported the potential job opportunities for women aspiring to follow careers in digital technologies in the call centres. Call centres in this finding might have dual meaning; non-digitalized call centres and digitalized call centres. This makes the interpretation of the finding a bit difficult. However, I would preferably infer the digitalized call centres from the quotes relating to “opportunities in call centres”, which is mainly because of the nature of question and aim of my research project of which the participants were aware prior to the beginning of interviews. In addition, my question involved the opportunities arising from the digital technologies.

The simple operations of the call centres are not dependent on the state-of-the-art digital technologies. For example, contacting the customers via telephones or answering the queries of the customers through the telephones. However, with advent of digital technologies such as social media, the customers services provided via the call centres is undergone the digital transformation (Richardson & Howcroft, 2006). The desires for fastest and productive customer service, organizations in public and private sectors have introduced or will integrate the social media element in the call centre-based customer services.

The employees in the customer services in the digitalized customer care centres use the social media tools such as Facebook, twitter, and mobile-based social media applications to become engaged with the customers regardless of the time and place (Chikandiwa et al., 2013). Koivunen (2011) argue that digital technologies-mediated operations at call centres are instrumental in increasing the flexibility in the employment terms for employees in order to deal with customers efficiently and productively. Noronha and D'Cruz (2009) posit that flexibility mediated through the social media tools and social attributes of women required for effective customer care make the call employment opportunities in call centres reality for women aspiring to follow careers in digital technologies. Scholarios and Taylor (2010) reported the increased proportions of women in call centres compared to men, which is due to greater ability of women in terms of providing social care to customers than that of men.

In addition, some studies have provided a direct evidence of potential of increased applications of internet of things (IoT) in the customers services for exchange of data about the customer's needs and the features of products (Haviland, 2020). IoT means a “network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data” (De La Bastide, 2018).

De La Bastide (2018) also reported the survey taken by Oracle and International Customer Management Institute (ICMI) which revealed that more than 350 executives and managers intend to install the IoT technologies at the call centres for management of customer's data efficiently and effectively. Oracle and ICMI

further concludes that with potential applications of digital technologies such as social media, mobile messaging, live chats and IoT at customer care centres, the opportunities for women workers with skills and training in the digital technologies are mostly likely to expand, thereby fostering the inclusive workplaces. These data are in line with the outcomes reported by my study. It must be acknowledged that job opportunities arising from the digital technologies will only depend on the extent of digital proliferation in call centres of different companies.

It has been reported that the most of companies are not well prepared to introduce mobile messaging, social media-supported communication, and Live chat for the customers in the Telecom, Financial services, E-commerce and utilities. These data suggest that women aspiring to follow digital careers in Saudi Arabia will only be able to exploit the employment if the management of main sectors including Telecommunication, e-government, E-commerce, financial services and travel will implement the digital technologies-mediated communication with the customers. It is possibility that companies participated in this study might have already installed or planned to establish the digital technologies-mediated communication with customers at their call centres. Participants from an academic group did not mention call centre related opportunities, which might indicate they were yet to implement the social media or other technologies to interact with customers.

The emergence of new employment opportunities due to proliferation of digital technologies at call centres will also bring some negative impact on the overall women inclusion in the workplaces. The women who would not be able to equip themselves with the skills of working through the digital technologies at digitalized call centres are mostly likely to suffer setbacks in Saudi call centres. Hence, right level of skills, qualifications, experience and training are critically important for harvesting the employment opportunities arising from the digital technologies at call centres.

The results showed that women have employment opportunities in different professions relating to web-designing, programming, coding and application development. Most of the participants who expressed these views came from the academic background, and some participants from the business background. The participants from the government did not mention the availability of graphic designing, programming and coding for female, which might be due to being in government and their less exposure to such professions. The academic and business participants vehemently indicated the potential employment opportunities for women aspiring to follow digital careers in the graphic design, programming and coding.

Various reports showed that women's participation in the graphic designing is increasing, however, this growth of women in the programming and coding and application development is slow globally (Webster, 2014). Another study conducted by A List Apart organization surveyed 33,000 web professionals from the

USA and worldwide, and showed that web-designing profession consists of 82.8% male web designers and 16.1% female web designers, showing that web-designing profession is male-dominated, and carries potential for creative female web-designers to participate in the web-designing industry.

It was further demonstrated that female participation in the profession is on rise due to availability of more role models in both developed and developing countries (ALA Staff, 2008). Burns (2014) surveyed 7 most influential female web-designers from India, Canada, Norway, England and Korea, which expressed the most positive prospects for female web-designers in the web-designing industry for women aspiring to follow careers in digital technologies, which is consistent with the findings of this study.

Similarly, the programming, coding and application development areas have potential for women inclusion in the IT industry. Many studies have showed that female representation in the programming, application development and coding is lower than that of male counterparts, which attracts the female application-designers, programmers and coders to fill in the gap in the Tech Industry (Du & Wimmer, 2019; Zarrett & Malanchuk, 2005). This is in line with my study, showing the participation of Saudi women in application development, coding and programming is limited, nonetheless, the employment potential for female workers aiming to follow digital careers have arisen from the rapid deployment of digital technologies across a variety of sectors (e.g. banking, solar energy, health).

Without knowing the main drivers causing the low participation of women in the web-designing, application development, coding and programming, one cannot predict whether the Saudi women will be able to exploit the employment opportunities arising in afore-mentioned professions. One study showed that though the women are better than man at the artwork, but the only issue they face is the coding and programming for developing the elegant web-designs. The availability of training and female role models in the web-design industry is main drivers in motivating the women to participate in the web-design, coding, programming and application development professions. The outcomes of interviews with female leadership in different programming and IT companies in the UK clearly reflected a wealth of career opportunities for women in digital careers, especially in the web designing, coding and programming areas of Tech industry (Golpys, 2018).

In addition, the study concluded that women's participation in web designing, coding and programming areas is showing the increasing trend globally, through the growth is slower than expected by experts in Tech industry. The reason of low representation of women in the web-designing, programming and coding is that academic institutions and employers pay excessive attention to male tech. The report highlighted the number of women in web-designing, coding and programming can increase with positive attitude of parents, employers and academic institutions in changing the mind-set of women towards adopting the IT

profession in the areas of web-designing, programming and coding (Golpys, 2018).

Taken together, the above literature reported in line with the findings of this study, that Saudi women have good career opportunities in the field of web-designing, programming, coding and application development. The demand of workforce is triggered by the rapid proliferation of digital technologies across a range of business in both public and private sectors in Saudi Arabia under the umbrella of Vision 2030 aiming to transform the Saudi economy through digital technologies. The change in attitude of parents, employers, academic institutions and government policies is critically important for enabling the women aspiring for digital careers to exploit the employment opportunities in web-designing, coding and programming.

The limited female web-designers, programmers and coders as role models may have demotivating influence on the Saudi women aspiring to develop careers in the afore-said areas. The socio-cultural factors such as male dominance or stereotypical attitude of men towards women in Saudi Arabia may also pose additional challenges in the way of women aiming to participate in the web-designing, coding and programming professions. Thorough discussion on the male dominance and social-cultural factors as threats to the women's employment opportunities.

Few participants from academia mentioned job prospects for female in nanotechnologies, artificial intelligence, robotics, and solar technology. These opportunities might be related to the research opportunities, as only academics mentioned about them. Additionally, the foregoing advanced sectors of technologies are actively being researched globally, and women with high qualifications and expertise are required to play an active role in these areas. It also shows that participants from business and government groups did not show a deep understanding about the artificial intelligence and nanotechnologies and solar sector. The possible explanation for this limited understanding is that they were not from the business or government sectors directly dealing with nanotechnology, solar energy, robotics, and artificial intelligence. Furthermore, these areas are still under extensive research and development stages, and their applications are tested in limited organizations in developed countries (Webster, 2014; Brown, 2012). Participants in my study from Saudi Arabia, a developing country in the digital technologies, might not be aware of the latest developments and their potential applications in the local industries and their resulting employment potential for Saudi women.

The availability of employment opportunities in digital technologies does not come without banes for Saudi women, as the invisibly coercive and controlling strategies will still be planted by men to control the work of women in digital technologies. The recurring rhetoric from male participants in this study in relation to the home-based women's work in digital technologies is reminiscent of

keeping the control over the women. This also implies that women working through ICTs can be scrutinized and monitored by male members through the very ICTs being used by women to work and contribute to the family income. This indicates the multilevel factors influencing the extent and limits of work to be conducted by women in digital technologies.

In response to a Sex and Power Report written by [Jewell and Bazeley \(2018\)](#), women rights activists pointed to the fact that despite the emerging employment opportunities for women globally, men will try to keep the reins of power and progress in their hands, and are more likely to make the progression of women at workplaces painfully slow. This phenomenon is more visible in male-dominated societies in Middle East including Saudi Arabia ([Algerholm, 2018](#)). [Al-Asfour et al. \(2017\)](#) suggested reformation of organizations restructuring the family structures through political interventions in order to promote economic empowerment of women aspiring for digital careers in Saudi Arabia.

Women can gain economic freedom; but at the same time, they have to live under coercion of males in a family-structure. The economic liberty does not truly depict the social empowerment in real sense. Saudi Arabia enjoys the male-dominated society, where males are so-called guardians of women, and are responsible for making all decisions regarding their shelter, education of children, and marriages of children regardless of opinions of women ([Pharaon, 2004](#)). However, situation has changed since the government's liberal stance about women's rights, though it will take a while to show the real change in women's status quo as workers or as independent citizens earning their income without excessive interference from males in families and workplaces ([Thompson, 2015](#)).

Digital technologies, as highlighted by this study, appear to be boon and blessing for Saudi for women, because it displayed a promising future for women aspiring for careers in digital technologies. Simultaneously, the perceptions of men in Saudi society seem to promote the home-based economic activities on behalf of men of Saudi society. This may restrain the true economic empowerment under the shade of digital technologies; and may be disadvantageous for long-term employment goals of Saudi women.

Contributions to the Practice

Findings from this study contributes to the practice by proposing plan, which if implemented properly at the social structures' level, can lead to an increased participation of Saudi women in the labour market created by proliferation of digital technologies in Saudi Arabia. Structuration theory which guided the methodology and data analysis of this research is extended to propose the blueprint of the Women-Employment in Digital Technologies Promoting Structuration (WEDTPS) theory in the context of Saudi Arabia, which can be used to inform practices and policies regarding an increase in participation of Saudi women in digital technologies-generated labour market ([Figure 1](#)).

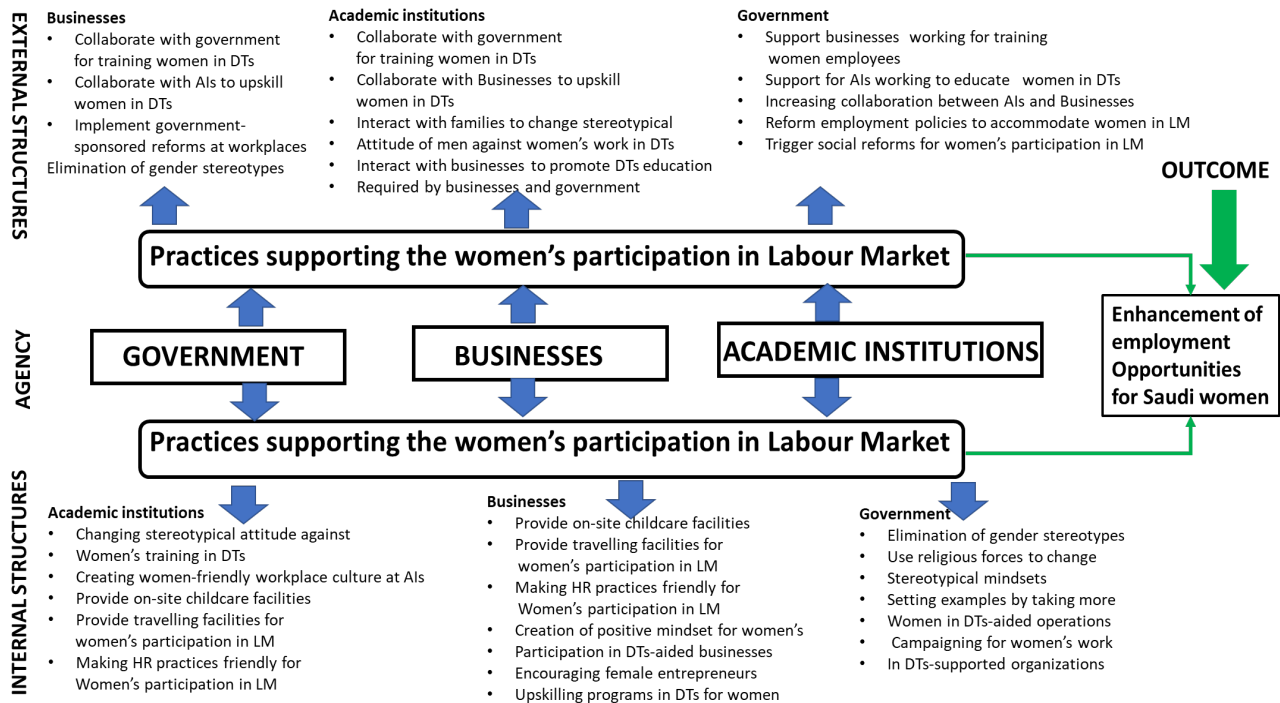


Figure 1. Women-Employment in Digital Technologies Promoting Structuration (WEDTPS) theory for improving practices leading to an increased participation of Saudi women in digital technologies-generated Labour market (Source: Author).

6. Conclusion

Though participants representing government group do believe that proper legislations for equal education, training and employment opportunities are documented as part of Vision 2030, data does not provide an insight into the implementation of equal opportunities rule within the labour market. The barriers to participation of Saudi women in digital technologies as described in result sections can be minimized by exercising the equal opportunity rule within the social structures. According to Giddens's structuration theory, social structures produce and reproduce practices to accommodate changes which are necessary for continuity of structure-agency stability. Based on this premise of structuration theory, the rule/practice of equal opportunity seems to be viable at social structures-level for accommodating the increased participation of Saudi women in the labour market in Saudi Arabia.

Equal opportunity policy should be developed and implemented across national institutions in order to allow women to harness the employment opportunities through participation in training opportunities, and subsequently securing employment in digital technologies. The mechanisms for improving equality of opportunities may include the development of legislative structures governing the flexibility of work allowing the part-time work, tele-working options for female meeting essential criteria for the employment in digital technologies. The establishment of independent equality agency should be set up in order to monitor the implementation of laws related to the equality of opportu-

nity. Minimum wage, maternity leave and competitive pay should be legislated as additional mechanisms for promoting the equality of opportunity at workplaces in Saudi Arabia.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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