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Cultural Factors and Usability of Online Social Networks by Adults with Autism
Spectrum Disorder (ASD) in Saudi Arabia

by

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ABSTRACT

FACULTY OF PHYSICAL SCIENCES & ENGINEERING
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CULTURAL FACTORS AND USABILITY OF ONLINE SOCIAL NETWORKS BY ADULTS WITH AUTISM SPECTRUM DISORDER (ASD) IN SAUDI ARABIA

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People diagnosed with Autism Spectrum Disorder (ASD) face difficulties in everyday life with their communication and interaction skills. Previous studies have shown that the use of technologies generally, and online social networks specifically, could be used by individuals with ASD to help them build connections and manage some of their social difficulties. However, most intervention research has involved young children in Western countries. In Arab countries, individuals on the autism spectrum experience the same difficulties in addition to dealing with other issues, such as the stigma within society, a lack of services, cultural rules, and the inability to benefit sufficiently from existing technologies, which are designed according to the culture and language of Western countries. This study focused on exploring and investigating the use of social media by high-functioning adults and adolescents with ASD in Saudi Arabia, and exploring social situations such as family relations and friendships, considering the influence of culture and traditional views on the usability and sociability of social media technologies. Existing literature focusing on technologies that have been implemented for adults with ASD and the use of social media is discussed. In addition, a Framework for Autistic Arabs' Social Communication and Interaction Technology (FAASCIT) was identified for cultural and technological factors that could have an impact on the use of social media by individuals with ASD in Saudi Arabia, and these factors were explored during the study. The research was descriptive qualitative research, and the data was collected and analysed qualitatively. To investigate the use of social media and to develop and investigate the FAASCIT framework, first, 12 experts in the field of autism and three adults with ASD were interviewed in the first stage.

Then 13 adults and adolescents with ASD in Saudi Arabia were interviewed. The online activities and profiles of eight individuals with ASD who were using social media networks or who started using social media were observed, with the focus on five participants who were more able to use social media on their own. The aim of this research was to investigate how online social networks may help adults with ASD who have limited support, and to explore whether online social networks are helpful for managing some of their communication challenges. The main findings of this research showed that individuals with ASD in Saudi Arabia enjoyed using technologies and the Internet. In addition, social media technologies were used by higher-functioning individuals for sharing their interests, self-representation, leisure and also for communication; however, each individual had different preferences and different uses of the technologies. It has also been noticed that photographs and videos in social media played a role in facilitating the online communication and interaction skills for the participants, and provided them with the opportunity to use social media. In addition, the investigation of the identified factors of FAASCIT, such Internet connection, digital literacy, education and support services, language, social rules, and independence, showed that these factors had an impact on the participants' usability and accessibility of social media, each according to their specific situation. These findings had contributed in adding knowledge to research regarding adults with ASD who were not given enough attention in Saudi Arabia. In addition, this research contributed in providing information for future researchers and technology developers by understanding the needs and behaviours of Arab individuals with ASD regarding social technologies, which could help in the design of inclusion technologies.

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DECLARATION OF AUTHORSHIP

I, Alaa Mashat

declare that the thesis entitled

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and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
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- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- parts of this work have been published as:
- Papers:
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List of Acronyms

AAC	Augmentative and Alternative Communication
ACT	Assistive Communication Technologies
ASD	Autism Spectrum Disorder
CMC	Computer-Mediated Communication
DSM	Diagnostic and Statistical Manual of Mental Disorders
FAASCIT	Framework for Autistic Arab Social Communication and Interaction Technology
HFA	High Functioning Autism
ICT	Information and Communications Technologies
MSA	Modern Standard Arabic
PCP	Person-Centred Planning
SNS	Social Networking Sites

Chapter 1

Introduction

The number of people diagnosed with various disabilities has been increasing globally (*World Health Organization*, 2011), particularly Autism Spectrum Disorder (ASD), which is a lifelong developmental disability. Since the early 1990s, the percentage of people diagnosed with ASD has risen, according to different worldwide studies (Wing & Potter, 2002). In the UK, a study by Baird et al. (2006) measured the prevalence of ASD to approximately 1 child in every 86. In the United States the number has grown from 1 in 2,500 in 1966 to approximately 1 in 150 in 2000, reaching the level of 1 in every 68 children in 2010 (Burke, Kraut, Williams, & Acm, 2010; Wingate et al., 2014). However, this large increase in numbers does not necessarily mean that the rate of ASD is increasing among young people; rather, it could be that ASD has been detected more frequently as a result of improved awareness and the availability of more developed services and diagnostic features (Wingate et al., 2014). It has also been noted that the number of males diagnosed with autism is much higher than the number of females (Wingate et al., 2014). In a number of developed countries, the prevalence of ASD is a major concern. However, in other countries, such as non-Western countries, the number of studies addressing the prevalence of ASD is limited, and most of the research has been undertaken in the USA, European countries or wealthy Asian countries such as Japan (Samadi & McConkey, 2011). In regard to the prevalence of adults with ASD, it has been estimated that approximately 4900 Canadians and 48,500 US adolescents with ASD turn 18 each year (Shattuck et al., 2012). Additionally, a study by Brugha et al. (2011) estimated the rate of adults with ASD in the UK at approximately 9.8 per 1,000 of the adult population (16 years or older), which is similar to the rate among children (Brugha et al., 2011; Orsmond, Shattuck, Cooper, Sterzing, & Anderson, 2013).

Individuals with ASD face potential difficulties in a range of situations in their daily lives. The main difficulties, as identified by the National Autistic Society (UK) website¹, are social communication and interaction, and restricted, repetitive patterns of behaviour, interests or activities. In DSM5², the main difficulties were mentioned as communication deficits and high dependency on routines (*American Psychiatric Association*, 2013). In the past few years, technology has been developed and more research has been undertaken regarding ways to support individuals with ASD in managing their social and communication difficulties and improving their lives (Bolte, Golan, Goodwin, & Zwaigenbaum, 2010). The use of technology for helping individuals with ASD has been widely considered: for example, Benford (2008) reported that some users with ASD prefer to interact with technology such as computers and robots rather than humans because they find it safer and more interesting. In addition, the Internet has been shown to be important for individuals with ASD. Blume (1997) reported that the Internet was considered as a communication tool for autistic individuals just as sign language is for deaf individuals. Shpigelman and Gill (2014) argued that social media could form an alternative environment for people with intellectual disabilities, and help them to live in the same way as people who do not have such disabilities, by being able to have relationships, receive social support and enjoy a social life. According to Graham (2012), social media networks such as Facebook were found to improve the social communication of individuals with ASD. In addition, a number of studies mention that individuals with ASD are more interested in visuals such as photos and videos than in text (Habash, 2005; Kana, Keller, Cherkassky, Minshew, & Just, 2006), which could be an interesting method for individuals with ASD to use social media. Meadan, Ostrosky, Triplett, Michna and Fettig (2011) also noted that the use of visuals could improve social interaction for children with ASD. However, the use of photographs is a significant issue in the Arabic culture, with different views and arguments around it, not only regarding conservatism towards women, but

¹ www.nas.org.uk

² Diagnostic and Statistical Manual of Mental Disorders (DSM)
<http://www.dsm5.org/about/Pages/Default.aspx>

also for religious reasons, as some people believe that photography is forbidden (Larsson, 2011, p.62).

However, most of the research in the ASD field has been concerned with children, with a relatively small number of research projects having been conducted regarding adults (Edwards, Watkins, Lotfizadeh, & Poling, 2012; Hendricks, 2010). Furthermore, almost all of the research studies and innovations regarding ASD have emerged in developed countries (Samadi & McConkey, 2011), with only a few studies (Al-Farsi et al., 2011; Al-Salehi, Al-Hifthy, & Ghaziuddin, 2009; Eapen, Mabrouk, Zoubeidi, & Yunis, 2007) carried out in Arab countries. For Arab individuals with ASD, in addition to the difficulties all individuals with ASD face as part of the condition, Arab individuals have to navigate a large set of cultural beliefs (Straub, Loch, & Hill, 2003). These could lead to raising obstacles when using technologies developed in Western countries and based on the Western social and cultural system (Hill, Loch, Straub, & El-Sheshai, 1998). "CS [Computer Science] was born and raised in the Western world, shaped by and responding to the varying needs of Western society" (Tedre, Sutinen, Kähkönen, & Kommers, 2006, p.127). In other words, technological systems are created and shaped by the values, beliefs and aesthetics of the creators according to the needs of the local users, but problems could arise when applying the technology in a different culture to be used by users who have different tacit knowledge and backgrounds (Tedre et al., 2006). Consequently, studies that have considered social skills technology for individuals with ASD in Western countries could be perceived in a different way and may have a different outcome and impact if undertaken with individuals with ASD in Arab countries. Cultural values could shape how users use information technology and shape their outcomes such as empowerment, decision making and communication (Leidner & Kayworth, 2006). It is important to consider the point of view of different users with different backgrounds in order to avoid bias of the developers in the implementation of the technology (Harrison, Sengers, & Tatar, 2011).

Despite the fact that online social networking sites (SNS) have gained widespread use in the Arab world (Salem, Mourtada, & Alshaer, 2013), there are still some social rules and cultural factors which could restrict Arab online users, such as

having relationships and the interaction between genders, in addition to other factors such as educational systems and level of literacy (Heble, 2007). Social media has provided Arab users with the freedom to express themselves and given them the opportunity to communicate with others ("68 Percent," 2010). However, many Arab users are aware of the cultural restrictions and can be more alert when using their online social accounts. For example, in Saudi Arabia some female users use nicknames or drop their last name, and add comic or other types of images as their profile photo on Facebook to get round the restrictions they could face ("68 Percent," 2010; McElroy, 2008). The use of such social networks by adults with ASD may have a different implication as individuals in this group tend to be less aware of social restrictions and social cues (Bishop, 2003), and yet this has never been considered in relation to the development and application of technologies for this group. In order to implement studies considering applying social technologies for Arab users with ASD, the impact of cultural factors on their use of the technologies should be studied.

This PhD research focused on studying and exploring the use of social media by adolescents and adults with ASD (High-Functioning or Asperger Syndrome) in Saudi Arabia, and the role of technology in their lives. As the focus is on identifying and exploring some of the different cultural factors that could have an impact on their lives and on their use of social networks, these individuals are all being considered as adults rather than adolescents and adults, for the sake this study. As visual stimuli have been suggested to be a preferred communication method used by individuals with ASD (Habash, 2005; Kana et al., 2006), the role of photographs in the online communication for the participants was also considered. A descriptive qualitative research methodology was followed, by applying different qualitative research methods including, interviews with experts, caregiver online surveys, one-to-one interviews with the participants with ASD, observation and an online survey targeting the participants with ASD. Thirteen individuals with ASD aged from 15 to 30 were reached through an online survey addressed to the caregivers and through personal contact, and were interviewed; however, not all participants were considered as high-functioning, and not all were using social media. In addition, one more participant with ASD (33 years old) was reached via

the online survey, which was addressed to the adults with ASD who could give their own consent. Difficulties reaching the participants and interacting with them was one of the major issues which occurred during the implementation of this research.

This study has shown that individuals with ASD in Saudi Arabia enjoyed using technologies and the Internet. Some of the individuals who were considered higher functioning desired the use of social media, and were using different social media applications for presenting their interests. Their use of social media technologies could also be viewed as a reason for gaining the feeling of social acceptance or satisfaction (Seiter, 2015). The use of photographs and videos in social media were beneficial in helping individuals with ASD to overcome some of their communication difficulties, and ease their interactions with others. However, usability and accessibility problems limit their use of social media in some cases. In addition, there are examples where cultural aspects of technology use influenced interaction and engagement, including how individuals perceived different sources of support during their lives. The lack of English language and language difficulties was a major factor that had an impact on their use of technology.

1.1 Research Gap

Research on cognitive impairments in the Arab world is still behind the average in terms of international publications (Jaalouk, Okasha, Salamoun, & Karam, 2012). Particularly, compared to research in the US and UK, there is much less research into ASD in Arab countries (Al-Salehi et al., 2009; Amr, Raddad, El-Mehesh, Mahmoud, & El-Gilany, 2011). Although several assistive communication technologies (ACT) for different special needs have been developed in Arab countries (Hock and Lafi, 2011), only a limited number of studies have focused on developing technologies specifically for supporting individuals with ASD in Saudi Arabia. Rare examples include teaching vocalisation to children with autism, and applications for teaching social and communication skills (Al-Arifi, Al-Rubaian, Al-Ofisan, Al-Romi, & Al-Wabil, 2013; Al-Ghamdi, 2014; Al-Wabil, Al-Shabanat, Al-Sarrani, & Al-Khonin, 2010), and are discussed further in Section 2.3.3. However, these technologies for assisting individuals with autism were designed for

children, and publications concerning support for Arab adults with ASD through the application of technology are almost entirely absent from the research literature.

Research focusing on the development of technologies for individuals with ASD and the use of technologies by individuals with ASD is important (Burke et al., 2010). Technologies may also offer avenues for support and provide opportunities to support confidence and wider integration into society. However, those with ASD could be more vulnerable to bullying and abuse when using technology than other individuals (Lough, Flynn, & Riby, 2014). Countering this view, Benford (2008) focused on technologies used by individuals with ASD and how integrating family support can protect them from these negative behaviours. Additionally, formal support services are not always available for adults with high-functioning autism (HFA) or Asperger's syndrome (Attwood, 2003; Brugha et al., 2011; Burke et al., 2010); however, some still require support in order to obtain better social outcomes (Burke et al., 2010). Technology has been shown to have a potential effect on the quality of life for individuals with ASD and on the improvement of social skills in Western countries (Bolte et al., 2010) but no research has been found on the effect of technology in improving social communication and interaction skills for adults with ASD in Arab countries. Focusing this study on the use of social technologies by Arab adults with HFA or Asperger's syndrome could help in determining what is more compatible with their needs and how they use the technologies in ways that are valued by them. The main aim is to provide a foundation upon which future research studies can build in order to enable individuals with ASD in Arab countries to benefit from available technologies and to fill the gap of the missing formal services.

1.2 Research Aims

This doctoral research addresses the social skills and communication technologies that adult Arabs with ASD are using, and whether adults with ASD in Arab countries are knowledgeable about using social networks, what difficulties they face regarding culture, gender, language, religion or any other factor, and how

existing social media can be used to help them in social interactions. In addition, the fact that cultural aspects represent a significant role in the lives of people, not only offline but also online when using social media, led to designing a framework identifying Arab cultural and technological factors that could affect the use of social media by Arab users. The aim was to examine and to investigate the use of a social media network by adult Arabs with ASD, evaluating their awareness with regard to the identified factors, described in Chapter 3, and exploring how these factors might affect the usability of online social networks for such individuals. However, the participants in this study were from Saudi Arabia, and the data collected was according to the culture of Saudi Arabia. The identified framework and the collected information could help future researchers to investigate the different use of social technologies by other Arab individuals with ASD. This will help in understanding the needs and behaviours of the Arab adults with ASD regarding social technology, and would help in the design of future technologies. It has been mentioned by Tincani, Travers and Boutot (2009) that in special education settings it is important for researchers to understand the different cultural factors of the students of who come from different backgrounds, and that teachers should be able to work with all the students.

The research also explored the participants' online activities related to visuals posted on social media networks and how the use of visuals supported adult Arabs with ASD in their social interactions. In addition, this research explored to what extent the identified factors had an effect on the usability, sociability and appropriateness of technologies for Arabs with ASD and their awareness of cultural aspects in the use of online technologies. However, there could be an argument that the cultural factors are not only specific to Arab adults with ASD, but can affect the usability for most Arab users, when it comes to social media. In addition, it could be argued that other factors could also affect adults with ASD in general and not only Arabs. Despite these considerations, the identified factors may be especially important to understand in the context of the limited services for adults with ASD in Saudi Arabia, and for the complexity and the restrictions of social rules in the Saudi culture that could be more difficult to be understood by individuals with ASD, in addition to the interaction of social vulnerability coupled

with the social and cultural restrictions that operate for people with ASD in the Saudi context. Moreover, it has been suggested that some people in Arab countries are using social media to escape from and avoid the cultural and traditional restrictions (Al Omoush, Yaseen, & Alma'Aitah, 2012), which made investigating the use of social media by individuals with ASD important, to find out how they cope with these restrictions in the online world, and what factors could affect their use or present a problem for them when using social media. In addition, understanding factors regarding individuals with ASD in Saudi Arabia would help in adding knowledge to understanding the diverse community of individuals with ASD, and the diverse community of people using social networks.

1.3 Research Challenges

Finding and reaching the appropriate participants for implementing the study was challenging, and many difficulties were experienced in communicating with them. The status of ASD in Arab countries is different from that in Western countries (Taha & Hussein, 2014); it is difficult to find adults with high-functioning autism (HFA) or Asperger syndrome for several reasons. These reasons may include the fact that their families are likely to deny their disability, feeling ashamed and hiding them from the community, or there could be some cases in which they are undiagnosed (Almasoud, 2013). In addition, people in Saudi Arabia are more private when it comes to a sensitive area such as disabilities or could feel ashamed of the disability so they are less likely to respond and participate (Al-Gain & Al-Abdulwahab, 2002). However, implementing the study and asking the participants to use social media to complete specific tasks was also challenging. Not all interviewed participants were knowledgeable enough to use social media technologies, even those who were high functioning. It could be that people in Arab countries, especially adults, are less familiar with the use of technologies than people in Western cultures, which could be a result of low literacy rates in Arab countries (Hamdan, 2005) or because of the status of Internet diffusion in the Arab world. This explains the effort that was exerted for the implementation of this study.

1.4 Research Questions

For the implementation of this study, the research questions were determined as follows:

RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?

RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?

RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult Arabs with ASD?

1.5 Contributions

The main contribution of this research is that it is the first research study, to the best of the author's knowledge, investigating adult Arabs with ASD in terms of their use of online social media and the usability of such media for this group. This study is important and it is a substantial contribution, as adults with ASD in Arab countries have not received sufficient attention and there is a considerable lack of research in this field. It is an important study as the diagnosis of ASD is increasing worldwide and excluding individuals with ASD leads to their segregation; instead these individuals need to be integrated into the society and to be given the same rights and opportunities as every other member of society. Therefore, understanding more about the specific needs and issues of Arabs with ASD is a major research objective, not least because of the dominance of Western perspectives and assumptions in the autism research field.

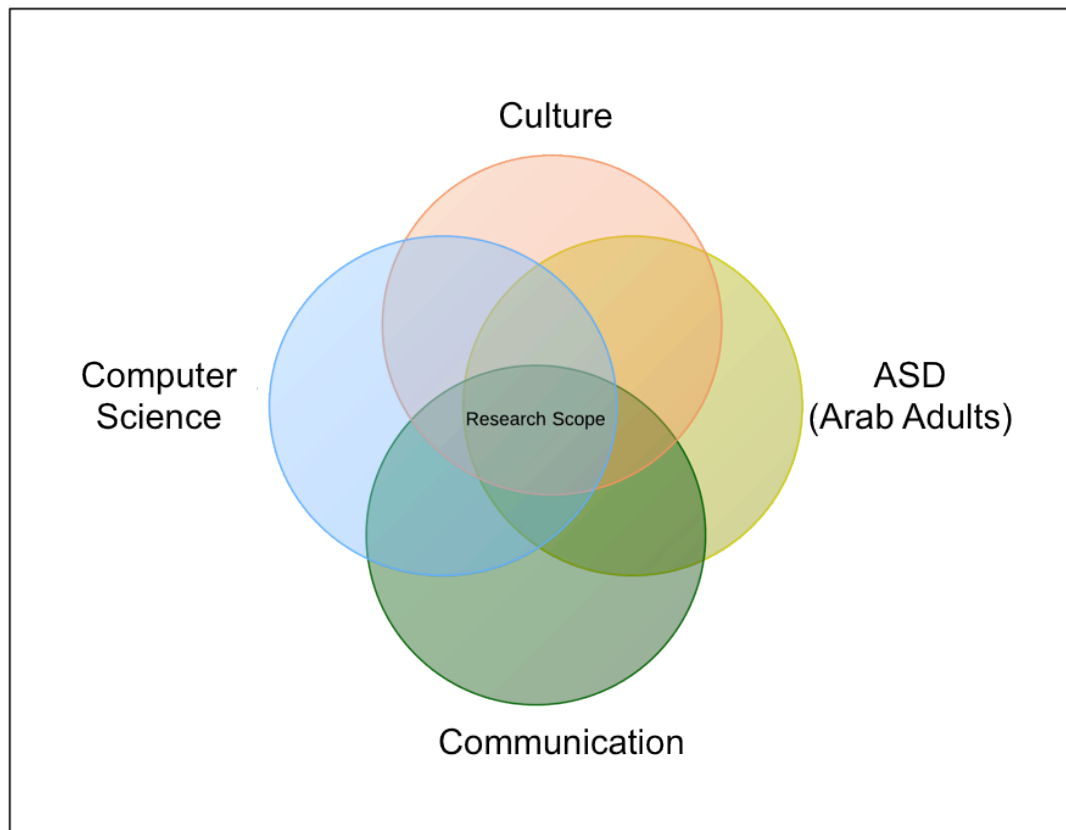


Figure 1.1 **Research Scope Diagram**

The scope of this research was the investigation of various intersections across Human-Computer Interaction (computer science, special needs “adult Arabs with ASD”, social science “communication”, and cultural factors); Figure 1.1 illustrates the intersection between these factors. In addition, this work has resulted in the following contributions:

- Adding knowledge regarding the status of services for individuals with ASD in Saudi Arabia; the findings of interviewing the experts not only added information regarding adults with ASD, but also information in regards to ASD in Saudi Arabia in general and the services, situations and difficulties that people encounter. In addition, there has been valuable insights gained into how the culture and the surrounding community could have an effect on the everyday lives of people. This provides new knowledge about ASD in Saudi Arabia and could help the responsible people to know which aspects of their services and support they could improve.

- Understanding adult individuals with ASD in Saudi Arabia and what they desire, what they are thinking of and what they want to tell to others.
- Framework for Autistic Arabs' Social Communication and Interaction Technology (FAASCIT). This framework has been designed in this study to investigate the use of social media by ASD users in Saudi Arabia; however, this framework can be adapted and applied in different contexts on different groups of participants from other cultures with or without ASD, or with other types of special needs. It could also be applied on more female individuals in Saudi Arabia to collect deeper information regarding the different impact of culture on different genders. In addition, it can also be applied to, and explored with, Arab participants from a different country or also from Saudi Arabia who do not have ASD but are facing the same cultural restrictions. Further research of the framework can show its effectiveness in indicating the factors that can be a useful for users, designers and developers when it comes to technology, and to study the power of culture across different societies. The factors of the framework can be generalised or modified through future research.
- This study is the first to examine the use of social media by adult Arabs with ASD, and investigate their awareness of the cultural aspects which are involved. The study has developed an initial research strategy in the field of autism in Saudi Arabia, which could be a guide for future researchers in the field.
- A further important contribution is that this research considers the inclusive design of products, in order to improve user experiences and the more appropriate design of technology solutions. The inclusive design tool kit designed by the University of Cambridge, Engineering Design Centre³ consists of a number of phases (Manage, Explore, Create and Evaluate), and each phase contains some activities, as shown in Figure 2.1. This current research covered the activities in the Explore phase, apart from 'Generate personas'. Further details in presented in Section 4.3.5 in the Methodology Chapter.

³ <http://www.inclusivedesigntoolkit.com/betterdesign2/integratedtool/integratedtool.html#nogo>

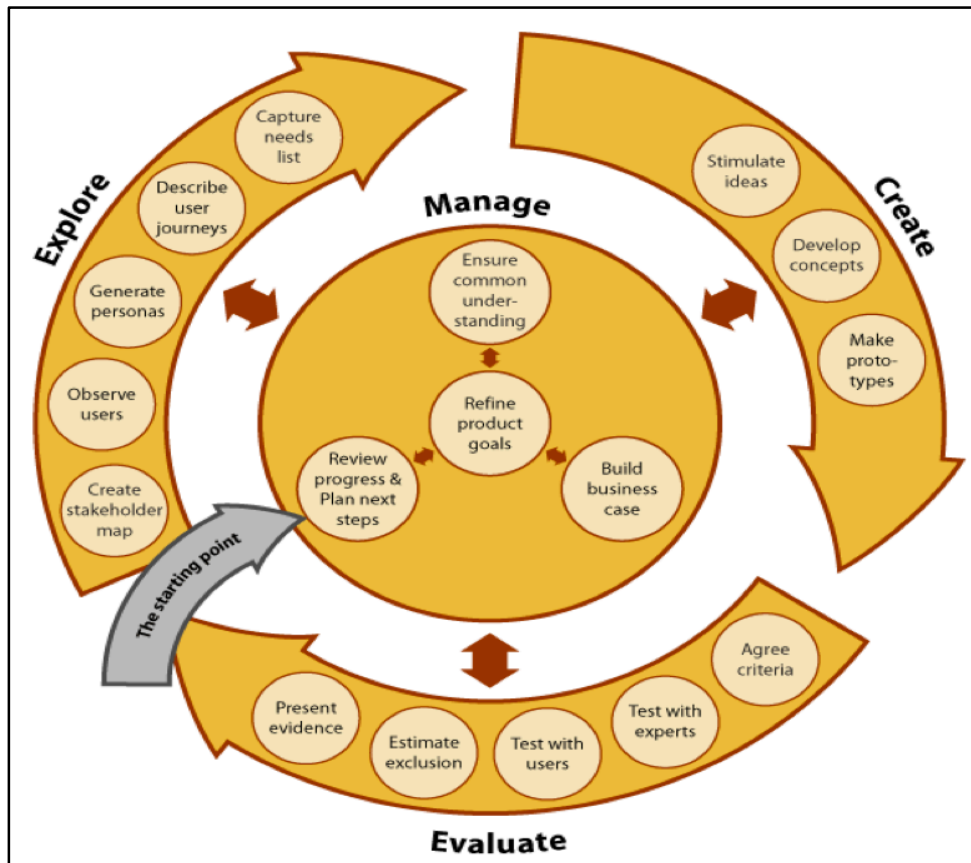


Figure 1.2 Inclusive Design Log (v1-1c)³

1.6 Thesis Structure

Chapter 2 is a literature review providing a brief background on ASD and a comprehensive review of previous research regarding technologies for improving the social skills of individuals with ASD and research in this area covering Arab countries. The Framework for Autistic Arabs' Social Communication and Interaction Technology (FAASCIT), which represents the cultural factors that might have an effect on the use of social media by this group, is presented in Chapter 3. Chapter 4 describes the methodology and design of this research study. Chapter 5 presents the interviews carried out for collecting information regarding the status and support of ASD and centres offering support to individuals with ASD and their carers in Saudi Arabia, with experts in the field of autism and three adult participants with ASD. In Chapter 6, the online survey for recruiting participants is

described and its outcomes are presented, in addition to the findings of interviewing the adults with ASD, and exploring their use of social media. Chapter 7 follows up these findings, by reporting the observations of the online activities of the participants. Chapter 8 discusses the findings of this PhD research and Chapter 9 draws conclusions and suggests future research ideas to follow up this PhD research.

Chapter 2

Literature Review

Individuals with ASD may require interventions and services not only during their childhood, but also through adolescence and beyond (Shattuck et al., 2007). Individuals with ASD face more difficulties after leaving school, and more support is required (Orsmond et al., 2013). As they reach an age where some of them may be capable of independence, they confront a range of obstacles in their everyday lives, such as low level jobs, problems with friendships and relationships (Howlin, Goode, Hutton, & Rutter, 2004). Ganz (2007) reported that the costs of caring for people with autism increase during adulthood; medical costs are also much higher for adults than children (Buescher, Cidav, Knapp, & Mandell, 2014). Parents, teachers, therapists and other caregivers may not always be available to provide support, so alternative support should be available to give individuals the opportunity for independent living and to be included in the society (Hong, Kim, Abowd, & Arriaga, 2012).

A substantial amount of research has been conducted on the use of technology and its impact on the lives of people diagnosed with ASD. Studies have focused on such factors as education, behaviour, social skills and communication. In this chapter, an overview of ASD will be presented in general and then in regards to Arab countries. Existing studies regarding technologies for ASD are also discussed, to clarify the advantages of the use of technology in developing social skills for individuals with ASD in developed countries such as the United States, the United Kingdom, Canada and Spain, in addition to previous research considering technologies that were developed for Arabs with ASD.

2.1 Autism Spectrum Disorder (ASD)

The term 'autism' was first used in 1911 by a Swiss psychiatrist named Eugene Bleuler, who used the term to describe a problem that some people had with social interaction (McNally, 2009). In 1943, Leo Kanner identified a new category of

autism called 'early infantile autism' or 'Kanner syndrome' (Wing & Potter, 2002). Meanwhile, Hans Asperger was working in the same field and published his work in 1944, describing a disorder similar to Kanner's, which was later named after him: Asperger syndrome (Wing & Potter, 2002).

In the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR), autism spectrum disorder was categorised under pervasive development disorders (PDD), and ASD included three types of possible diagnoses: autism, Asperger syndrome and pervasive development disorders—not otherwise specified (PDD-NOS) (American Psychiatric Association, 2000). However, in the DSM 5th edition (2013), the three types were replaced with the diagnosis of autism spectrum disorder (American Psychiatric Association, 2013). Autism spectrum disorder (ASD) is a lifelong developmental disability and individuals with ASD could have a different continuum of symptoms; with some individuals having mild symptoms and others severe symptoms (American Psychiatric Association, 2013).

According to the most recent version of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), the core diagnostic features of ASD are difficulties with social communication, social interaction and social imagination, and also repetitive behaviour (American Psychiatric Association, 2013). In communication, individuals with ASD tend to have difficulty understanding facial expressions and gestures, initiating a conversation, recognising voice tone and understanding jokes or colloquial phrases, which could lead them to avoid social situations, causing isolation (Bishop, 2003). Some individuals could have more serious communication problems, such as limited or poor language abilities, and some could have complete lack of speech and language delays (American Psychiatric Association, 2013, p.53). In the case of social interaction, individuals with ASD tend to struggle in friendships, do not recognise acquired social rules, may become confused and uncomfortable in the presence of other people, exhibit a lack of interest or act in a way that is perceived as strange (Escandell-Vidal, 2009; Frith, Morton, & Leslie, 1991). In addition, with regard to imagination skills, individuals with ASD often struggle to predict what might happen next in a given situation, to

anticipate likely outcomes and to understand other people's feelings, thoughts and actions (Kamp-Becker et al., 2010).

Similarly, Macintosh and Dissanayake (2006) considered social skills and the presence of problem behaviour the main areas of difficulty in ASD, listing under social skills co-operation (sharing, assisting others and complying with rules), assertion (requesting information, introducing themselves and responding to other behaviours), self-control (turn taking and developing compromises), and responsibility (effectively communicating, performing household chores and having regard for others' property). In addition, externalising (physical or verbal aggression, poor anger management or arguing), internalising (sadness, anxiety, low self-esteem and loneliness), and hyperactivity (excessive motion, impulsiveness or distractibility) were listed under the problem behaviour domain.

However, to improve the quality of life for individuals with ASD, it is important to keep in mind that some individuals with ASD may have more sensitivity than others towards bright lights and colours, loud sounds, strong smells and other environmental stimuli (Burke et al., 2010). Moreover, as mentioned earlier it has been reported that some individuals might prefer to use visuals, such as pictures, symbols or sign language, rather than speech or even written words when they need to communicate (Habash, 2005; Kana et al., 2006). In addition, Chen, Tsai and Wu (2005) demonstrated that the best way to achieve text comprehension performance of the participants with autism was displaying text on a computer with images, compared to the other methods, which were text only, and text with audio (Grynszpan, Martin, & Nadel, 2008). It has been shown by different studies that the use of visuals produced positive results for individuals with ASD, and that visual have been used for different purposes (Johnston, Nelson, Evans & Palazolo, 2003). For example, FPECS (Picture Exchange Communication System) is widely used for children with ASD, and studies have confirmed its usefulness for prompting speech for some children with ASD (Charlop-Christy et al., 2002; Howlin et al., 2007). Social stories⁴ have also been considered for teaching

⁴ "Social stories Include four to six sentences that describe factual information regarding a social situation, possible reactions of others in that social situation, and directive statements of appropriate or desired social responses" (Thiemann & Goldstein, 2001).

behavioural and social skills for individuals with ASD (Gray, 1995; Thiemann & Goldstein, 2001). In the study by Thiemann & Goldstein (2001), the use of Social Stories combined with text cues and video feedback showed improvements in the social communication skills of their participants, that could help them in communicating with their non-ASD peers.

Moreover, a number of studies (Copeland & Hughes, 2000; Lancioni & O'Reilly, 2002; Pierce & Schreibman, 1994) have utilised photo prompts for teaching individuals with ASD about daily living skills, food preparation and vocational skills in order to build independence (Van Laarhoven, Kraus, Karpman, Nizzi & Valentino, 2010). In addition to the use of photo prompts for individuals with ASD, other studies used video prompts or video modelling for explaining daily life tasks (Sigafoos et al., 2005; Van Laarhoven & Van Laarhoven-Myers, 2006). Video and photographic prompts have all shown a positive effect on the individuals with ASD (Alberto, Cihak & Gama, 2005; Van Laarhoven et al., 2010). Other studies used visuals for individuals with ASD to initiate interaction. A study by Johnston, Nelson, Evans & Palazolo (2003) showed that using communication graphic symbols linked to meaningful verbal short sentences has been effective for initiating entrance to playing activities for preschool children with ASD. These are just few examples that show the effectiveness of using visuals for people with ASD of different age groups.

2.2 ASD in Arab Countries

As mentioned in the introduction, the number of people diagnosed with ASD in the United States is 1 child out of 68 (Wingate et al., 2014). In Arab countries, the reported prevalence is also increasing; in several existing studies on ASD, it has been reported that the overall percentage of diagnosed individuals is higher in some Arab countries but much lower in others. For example, Al-Farsi et al. (2011) reported that, in Oman, the rate of people diagnosed with ASD is 0.014 out of 100,

whereas in Saudi Arabia, the results showed that the rate is 0.18 out of 100 (Al-Salehi et al., 2009; Yazbak, 2004). In a more recent study, a much higher diagnosis rate was indicated in Saudi Arabia, one out of 160 (Cooper, 2013). However, there is a lack of studies reporting the prevalence of ASD in Saudi Arabia (Mohammed, Wahass, & Mahmoud, 2016), so the exact number is not clear. In addition, Almasoud (2013) and Alqahtani (2012) claim that it is difficult to obtain a clear idea about the exact statistics of people with autism in Saudi Arabia, which could be as a result of poor diagnosis services, family denial or feelings of shame about the disability. The use of different methodologies and classifications, as pointed out by Al-Farsi et al. (2011), might be the reason for the difference between Saudi Arabia's and Oman's estimated rate of diagnosis. In the United Arab Emirates (UAE), Eapen et al. (2007) conducted a study with two stages, the first stage they used an 'Autism Screening Questionnaire' and they found that the average prevalence of ASD is 0.58 out of 100; however, in the second stage, they used 'clinical interview' for a DSM-IV diagnosis of PDD, and the average prevalence of PDD was about 0.29 out of 100.

Although research results have generally shown that the rate of diagnosed individuals in Arab countries is lower than in developed countries, there is still a significant difference between the rates of ASD diagnosis in different Arab countries. This might be due to differences in beliefs, customs or relationships or because of economic problems (Hussein, Taha, & Almanasef, 2011). It has been claimed in various studies (Al-Farsi et al., 2011; Al-Salehi et al., 2009; Amr, Bu Ali, et al., 2012; Samadi & McConkey, 2011) that the assumption of a low percentage in some Arab countries and other developing countries is due to the lack of information on identifying children with ASD, under-diagnosis and under-reporting of cases, and a number of other possible factors, such as cultural differences, level of education and lack of services, experience and professional training. Additionally, both Al-Farsi et al. (2011) and Essa et al. (2012) mention that in Arab countries there is low awareness of the prevalence of ASD and its symptoms are not widely recognised by the general public.

On the other hand, although gender differences affect both Arab countries and developed countries (Al-Salehi et al., 2009), their influence in Arab countries might

involve more cultural concerns. In one study it has been claimed that, in Arab countries, the lower rate of females diagnosed with ASD compared to males might be because of societal pressures concerning seeking treatment, which makes the females less visible to external viewers (Amr et al., 2011). However, this might not be true, as the age of diagnosis and symptom occurrence is usually three to five years of age (Filipek et al., 1999), and children of both genders are treated equally at this age. The gender difference is more likely due to core characteristics of the disorder: Fombonne (2003) reported that, globally, the percentage of males diagnosed with ASD is higher than that of females, with a ratio of 4.3:1 (Park et al., 2012).

Although individuals with ASD once received less attention and less health care services in the Arab world (Al-Farsi et al., 2011), the situation is changing, and supporting this group is now given greater consideration. More centres for supporting individuals with ASD have been established in various Arab countries, and a number of events and workshops have been organised to raise awareness (Qabbani, 2011; "Raising autism," 2008). However, it was reported in the *AlMadina* newspaper that families of autistic children in Almadinah Almunawarah (a city in Saudi Arabia) were asking for centres to be established for individuals with ASD, and complaining about the current lack of services (Aldifyan, 2013). In addition, quite recently there were still problems at some centres, especially public ones, regarding health care services and the limited number of teachers, according to the parents (Aljuhani, 2013). In addition, it was reported in *AlMadina* newspaper that a centre for autism located in Makkah, Saudi Arabia had informed the parents of children aged 12 years and older that they would not be providing services for them starting from the following year and that they would need to leave the centre and find alternative support (*AlMadina*, 2014).

This frustrated the parents, because no alternative public services were available. The decision was made to avoid the integration of male and female children, as stated in the report. This shows the difficulty adults on the autistic spectrum are facing in seeking support. Not only is the cost of services high, but services are also very limited or unavailable (Aljuhani, 2013; *Saudi Gazette*, 2014).

2.3 Related Studies Regarding ASD and Technology

It was mentioned previously that difficulties with social skills are one of the main diagnostic features of ASD (Macintosh & Dissanayake, 2006; Noterdaeme, Wriedt, & Hoehne, 2010; Venkatesh, Greenhill, Phung, Adams, & Duong, 2012). Individuals with ASD find it difficult to communicate and interact with other people (Grandin & Attwood, 2012). In a study by Orsmond et al. (2013) on young adults with ASD in England, the authors found that 40% never got along with friends, 50% never received any phone calls or were invited to social activities and 28% were never contacted and were actually isolated from the community. As found by Putnam and Chong (2008), individuals with ASD want to include social skills in technologies to overcome their difficulties, in addition to organisational and academic skills. Significant research efforts have focused on developing and applying various technologies to support social and communication skills for individuals with ASD (Bolte et al., 2010).

Many strategies and tools have been developed for teaching appropriate rules and behaviours in dealing with different situations to improve quality of life, such as using peer mediated-practices, social networks, robots and virtual reality environments to improve social skills (Harper, Symon & Frea, 2008; Parsons, Leonard & Mitchell, 2006; Porayska-Pomsta et al., 2012; Scassellati, Admoni & Mataric, 2012). The majority of the technologies for ASD were developed for the use of children. A number of studies, such as (Moore & Calvert, 2000) have found that children with ASD enjoyed working with computer technologies and experienced better learning results. However, the main interest of this research study was the use of the Internet and computers as assistive technologies for supporting social skills and communication of adults with ASD. A high number of adults with ASD face problems in face-to-face communications and try to avoid social interaction and group activities (Bishop, 2003; Burke et al., 2010). Moreover, about 60%–75% of adults with ASD have had poor outcomes in friendships, education, employment or independent living (Newschaffer et al., 2007; Seltzer, Shattuck, Abbeduto, & Greenberg, 2004). However, the level of social outcomes for individuals with ASD is improving over time, which could be related to the

improvements of the service system for supporting those with ASD (Levy & Perry, 2011). In some Arab countries, this situation is more difficult, with more cultural communication restrictions, as communicating with the opposite gender is already an issue with many people (Alsheikh, Lindley, & Rode, 2010). In addition, as pointed out earlier, awareness of ASD in these countries is limited (Essa et al., 2012), and families are more likely to hide their diagnosed children to prevent themselves from feeling shame and to protect themselves from harsh societal judgments, which could increase the social isolation of individuals with ASD (Nasr, 2008).

Research has shown the value of innovative use of technology especially when it is connected to the internet, in the way it can enhance communication, encourage interactions and prevent social isolation (Bolte, Golan, Goodwin, & Zwaigenbaum, 2010). Personal therapists and hospital services are expensive and not affordable for all people (Goodwin, 2008); additionally, medical treatments for ASD are mostly for children and may not be very effective for adults (Brugha et al., 2011; Burke et al., 2010). Moreover, as mentioned earlier formal government support services such as allowances and medical insurance coverage do not always apply to high-functioning individuals or people with Asperger syndrome (Attwood, 2003). This problem occurs worldwide; however, the ways of dealing with it might differ between countries, and the use of assistive technologies may also be different, depending on various factors. Some effect has already been shown from the use of computer technologies and the Internet in helping people individuals with ASD (Bolte et al., 2010). Nevertheless, the number of research studies on adults with ASD is very limited overall (Parsons et al., 2009).

Burke et al. (2010) claim that the use of computer-mediated communication (CMC), such as emails, blogs, online social networks and text messaging, for social support is an ideal method for individuals with ASD, because it provides the user with some control over the conversation as well as more processing time. According to Benford (2008) and Hong et al. (2012), the use of the Internet reduced the difficulty of adults with ASD in communicating and offered social support and useful information. Computerised technologies also offer the

opportunity for the users to work at their own pace and level (Golan & Baron-Cohen, 2006; Wainer & Ingersoll, 2011). It has also been suggested in research studies that computers can be reassuring, controllable and adaptable by individuals with ASD (Brosnan & Gavin, 2015; Grynszpan et al., 2008). Although the results of the study by Burke et al. (2010), showed that CMC helped individuals with ASD in initiating social conversations and interactions, not all the participants were satisfied by the use of it. Some features of CMC might be annoying and difficult for individuals with ASD, such as changing the subjects suddenly and quickly in chat rooms, knowing the boundaries of who to trust and to what extent; missing the advantage of face-to-face feedback; and grammar and spelling mistakes (Burke et al., 2010). In addition, users could be subjected to an inappropriate language style (Benford, 2008), which might also be distracting and unpleasant.

Furthermore, the use of smart phones and touchscreen devices has had a significant impact on a wide range of software platforms and in simplifying the use of the technology and forms of communication for individuals with limited verbal abilities, for a lower cost (Shane et al., 2012). A large number of 'apps' for people with various special needs have been created; some sources have listed and categorised them (Sailers, 2010). Concerning these lists, it is noticeable that most of the applications are designed for children, particularly in education, and only a small number of apps are aimed specifically at adults. Nevertheless, several computer-based technologies have been produced that are appropriate for use by adults and adolescents with ASD, for example:

- increasing motivation to learn and manage social skills (Hong, Kim, Abowd, & Arriaga, 2012),
- for communication and daily life activities such as doing the laundry, washing, dressing or cooking (Cullen & Alber-Morgan, 2015),
- virtual reality technologies aimed at enhancing social skills, social cognition, and social functioning (Kandalaft, Didehbani, Krawczyk, Allen, & Chapman, 2013), and social understanding (Mitchell, Parsons, & Leonard, 2007).

The main goal of these technologies is to help individuals with ASD learn specific skills or knowledge and apply what they have learned in the real world. It is important to support individuals with ASD to become more integrated into society and not to over-rely on the technologies so that they become isolated (Bishop, 2003; Bolte et al., 2010).

Previous studies have introduced the idea of using virtual reality (VR) systems to make it easier for people to understand and transfer newly taught social skills from computer technologies to real-world situations (e.g. Bolte et al., 2010; Wallace et al., 2010). A limited number of these types of systems have been designed in the form of virtual environment systems (VEs), which are “3-D computerised representations of “real world” or imaginary scenarios and can be designed to allow the user the freedom to navigate through an environment (e.g., a house or a street) and interact with objects and people” (Wallace et al., 2010, p.200). For example, in the study by Mitchell, Parsons and Leonard (2007), a VE system containing a café and a bus was evaluated for teaching adolescents with ASD social understanding and decision-making techniques. This study showed that the participants improved in judging and reasoning about some cases in the café and bus scenarios when they experienced the VE system. However, it was not possible to examine whether there was an effect on the behaviour of the individuals with ASD in real life situations after their experience with VEs and so the extent to which using the VE was able to support transfer of knowledge was not possible to judge. Nevertheless, a review of the educational use of VR for autism (Parsons & Cobb, 2011) noted that different studies suggested that some individuals could transfer procedural and ruled-based social skills which they learnt from the virtual system to their real-world situations.

In the study by Wallace et al. (2010), immersive virtual environments (IVEs) were developed to explore the experiences of adolescents with ASD. This type of VE allows the user to interact with the environment, which could be more encouraging for social skills development in different situations. An IVE called the ‘Blue Room’ was designed to allow users to enter and leave the environment easily, without any restrictions of a VR headset or goggles; it was used to test the ability of

the participants to accept and believe that what they experienced might apply in real-world situations. Additionally, the study tested the response of participants with ASD and their judgments of various scenarios in different scenes, such as in a residential street, a school playground and a school corridor, and compared their responses to those of typically developing people. The study showed that children with ASD engaged with, and became involved, in the content and felt 'present' within the IVE, in the same way as the typically developing children. However, these technologies are not readily available for personal use and so they do not yet represent a realistic solution for supporting social understanding (Wallace, Parsons & Bailey, in press).

Although individuals with ASD show improvements in interacting with familiar people such as parents and teachers over time, as they grow older, interacting with peers and building friendships in general remains difficult (Orsmond, Krauss, & Seltzer, 2004; Trepagnier, Olsen, Boteler, & Bell, 2011). As pointed out by Parsons and Mitchell (2002), VEs require collaborative learning for more efficiency, rather than self-learning techniques, so that individuals can obtain the advantages of social communication when interacting with their peers (Bishop, 2003). An example of collaborative learning comes from a prototype of a virtual peer simulation that has been invented to teach adolescents and adults with ASD conversational skills, and to help them to improve their interaction with peers (Trepagnier et al., 2011). The idea was to encourage the learners to be involved in an interactive, multi-turn structured conversation, allowing them to practice interacting in various verbal and non-verbal behaviour situations with an on-screen partner, by choosing from available response options and receiving feedback (Trepagnier et al., 2011). Overall, the participants agreed that the simulation partner positively helped them in conversations and that it was less stressful than real-world conversations. A larger simulation and having a longer conversation, with new conversational subjects and more response options would be more helpful for training in social conversational skills, in order determine the efficiency of this method for individuals with ASD in improving real-world interaction (Trepagnier et al., 2011). The findings from VR systems have shown that VEs can simulate real social situations successfully (Bolte et al., 2010;

Georgescu, Kuzmanovic, Roth, Bente, & Vogeley, 2014), although such assumptions have also been recently challenged (Parsons, 2016).

2.3.1 The Use of Existing Social Networks for ASD

Social networking sites (SNS) have been popular in the past few years, and a large number of people are connecting via these networks, with around 29% of the world's population active users in 2015 (Kemp, 2015). SNS such as Facebook, Twitter and MySpace; and video sites such as YouTube and blogs are all considered social media sites (O'Keeffe & Clarke-Pearson, 2011). Social media technologies can have a potential impact on people's communication skills, socialising and learning (Veltri & Elgarah, 2009) as it is a type of human-human interaction rather than just a computer-human interaction (Spolsky, 2004). Online social networks have been indicated as a method for providing social support and strengthening the relationship with close friends (Shpigelman & Gill, 2014). It provides users with the ability to connect and socialise without the pressure of time and immediacy that they face in real-life social situations. It has been reported by Scealy, Phillips and Stevenson (2002) that online communication provided people who are shy the opportunity to communicate, as they feel more comfortable and less shy than when communicating face-to-face. Moreover, communicating via online social media has been found to be beneficial for socially anxious individuals, providing the ability to increase the quality of friendships, enhance engagement and decrease loneliness, which has raised the issue that social media could be relevant and well-suited for adults with ASD as well (Brosnan & Gavin, 2015; Mazurek, 2013). This section presents a number of studies considering the use of social networks for supporting social communication for individuals with ASD, leaving out other studies in relation to supporting other topics.

A project developed by Autism Connections Europe (ACE) to help adults with ASD to make friends, ACEbook, aims to enable friends to meet via Facebook according to a specific interest and then arrange personal meetings around Europe to strengthen their friendships. This could help in maintaining friendships, which individuals with ASD usually find difficult to accomplish in everyday life (Parsons

et al., 2000). Results for ACEbook have indicated improvements in social and communication skills, independence and mood, and in overcoming fear ("ACEbook project," 2011). Participants stated that the project gave them the opportunity to travel to different countries and learn about different cultures. Besides all the aforementioned advantages of the project, other beneficial aspects include the use of existing technologies shared with typically developing people, enabling individuals with ASD to engage with them more easily. However, some potential drawbacks of ACEbook could be that travelling to different places around Europe or other countries can be an issue for some people, especially those individuals with ASD who may be less able to travel or live independently. This is in addition to the cost, time and effort needed for arranging and attending a meeting to have the chance to communicate with new people. In addition to these drawbacks, trusting someone online and planning for personal meetings could put the person under the risk of being abused. Encouraging Arab users with ASD to use a social network such as ACEbook might raise particular concerns, opinions and views that will be discussed further in Section 3.2.4.2.

In a study by Graham (2012), Facebook was used for improving the social skills of individuals with ASD. The study was implemented in a private special education school in southern New Jersey, USA. Teaching and training participants how to use Facebook properly was also undertaken in the study. The effectiveness of social media in improving social communication skills was measured before learning the use of Facebook and then afterwards. The study showed the effectiveness of social media in improving social communication skills. It showed a slight improvement in initiating conversations, maintaining already known friendships and preventing users from bullying others. A teacher also reported that participants might build new friendships if they had more time to continue the project. In addition, the study showed improvements in face-to-face engagement for the participants in the class with their peers.

Another study, by Bahiss, Cunningham and Smith (2010), was implemented to investigate whether social networking sites were appropriate for teenagers with ASD and whether such sites were proper communication tools for them. The study tested the usability and accessibility of the Facebook and Orkut social networks

with five teenagers with ASD. Participants were asked to perform basic tasks such as creating a profile, adding a friend, messaging a friend, adding a community, uploading an image and removing an image. The study did not focus much on sociability i.e., interaction with people, via these networks. It was more concerned with the effectiveness of the system, the ease of use efficiency, utility and user support. However, this study involved participants with different levels of ASD, including low-functioning autism. It was clear that higher-functioning participants were more positive about the use of social networks. The results showed that the tested network sites were effective and efficient but not easy to use. They lacked spelling help and verbal prompts, leading to the need for additional learning, and they had too much information, which caused confusion and frustration. Bahiss et al. (2010) concluded that teenagers with ASD preferred to interact and communicate via online sites when they could be involved in an activity, and that they were not motivated by the functionality of the common social networks. The aim of this current research was to bring the efficiency of these social networks together with the ability to be involved in an activity via communicating about the images uploaded on the social network.

Moreover, a study by Mazurek (2013) investigated the use of social media by people with ASD in the case the quantity and quality of friends, and loneliness. It has been found from their study that social connection and engagement is a primary reason for using social networks amongst individuals with ASD within the Western culture. Whereas, maintaining contact with family members and using social media for business purposes was the least reasons of using social networks among the individuals with ASD. In addition, adults with ASD who use social media were found more likely to have close friends than those who do not use social media. For adults with ASD, having offline friendships and relationships had an impact on decreasing loneliness, but there was no difference in the level of loneliness between the participants who were using social networks and who were not; however, this finding needs more exploration (Mazurek, 2013).

In another study the use of social media by individuals who use augmentative and alternative communication (AAC)⁵, such as individuals with physical disabilities or individuals with low cognitive and literacy skills, was investigated (Hynan, Murray, & Goldbart, 2014), which could also include individuals with ASD. The study was carried out in the UK, and their findings represented six analytical categories, the desire to be online, self-determination, self-representation, enriched friendships, accessing technology and describing support. They have found that the increase of self-determination was associated with the use of the Internet among their participants. In addition using Facebook increased opportunities for self-representation, and helped the participants to be in touch with people who they do not see a lot. In regard to support, it has been found that limited literacy skills, slow speed in accessing the technologies and irrelevant equipment were reasons that lead many of the participants in their study to gain support from their parents or personal assistants in order to use social media and share content online (Hynan et al., 2014). However, these findings were not specific for people with ASD, but the fact that it reflects the use of social media by people with communication difficulties, which people with ASD also experience.

2.3.2 Special Social Networks Designed for ASD

Some social networks have been designed specifically for individuals with ASD and their caregivers, for sharing information and improving their awareness and capacity to communicate in a safe space. MyAutismTeam by Rochman (2011) and Squag by Winter (2012a, 2012b) are examples of social networks for those with ASD but are specially designed for children and do not focus on improving their ability to connect, socialise and be independent in real life. Supportive Eyes, or *Miradas de Apoyo*⁶, is a social network that enables users to organise groups to provide support for any individual who needs it, such as someone with ASD, based on person-centred planning (PCP), which is “an approach to organizing assistance to people with intellectual disabilities” (Mansell & Beadle-Brown, 2004, p.1). This is a secure network, and only parents and families are able to view an individual’s

⁵ <http://www.inclusive.co.uk/articles/alternative-and-augmentative-communication-aac-a280>

⁶ <https://www.miradasdeapoyo.org/acierta/loggined.do>

information. Current versions support only English, Spanish and French (Mansell & Beadle-Brown, 2004). In 2014, a social network '*Connect*' was created by Autism West Midlands. The social network is a supportive network, which was designed to help people with autism in the UK and their families to meet new people and find friends (Francis & Begley, 2014). However, no study for evaluating the use of '*Connect*' has been found.

With assistive devices, integrating social networks could bring the benefits of socialising to the life of an individual with ASD. One example of this comes from the Graphics, Visualization & Usability Centre in Georgia, a social supportive technology for adults with autism spectrum disorder implemented by Hong et al. (2012). The aim was to help adults with ASD to be more independent by providing them with on-demand support to gain independence and to learn daily life skills, based on an idea similar to prompting systems. The design is called the SocialMirror; the name was derived from the idea of the device, which is an interactive display integrated into a mirror and connected to a trusted online social network. Its concept is to monitor adults and adolescents with ASD and try to advise them and provide what they need in any situation at any time of day, combining the benefits of both technology and human support. A prototype was implemented to test the effectiveness and the usability of the system. Pictures and visuals were used to help the user in initiating a conversation with the network. Several services were provided, such as managing the user's personal appearance by capturing a video while standing in front of the mirror and allowing the caregivers to offer advice. Other services are also provided, such as help with organising household chores, arranging tasks and events, managing and reviewing the user's calendar and teaching self-care skills such as shaving, dressing and personal hygiene. Although caregivers need to answer all the questions and provide advice at different times of day, the social network still provides the advantage of distributing the load to several caregivers, and the distance monitoring could help in minimising the pressure of face-to-face support. To provide more accessibility at any time and place, the SocialMirror is also available as a smartphone and a web application. However, even at home, the mirror could be expensive and not affordable for everyone, so using the system on a computer

might be more appropriate and useable. Fairbrother (2002) suggests that adjusting the diet and hygiene of individuals with ASD might help in overcoming some specific difficulties with social understanding (Bishop, 2003); this function could be added to the SocialMirror monitoring system, to help the users improve their social skills.

Another research example considered the use of a supportive social network aiming to provide young adults and adolescents with Asperger syndrome with the opportunity to gain support from a group of family and friends instead of over-relying on one caregiver. The idea was to use circles ('a feature in social networks that brings together a group of people interested in a particular topic or people with a common social connection') to seek information and advice and to build independence (Hong, Yarosh, Kim, Abowd, & Arriaga, 2013). They used the GroupMe app, 'a commercial, cross-platform social networking service' (Hong et al., 2013). The results showed that the engagement of the participants with non-caregiver members increased after their study, which helped in minimising the over-reliance on the primary caregivers. Furthermore, participants preferred to interact with people online in a small circle rather than a large group of people. Using circles in a supportive social network also showed a level of independence, as the participants received more than one reply with different ideas in response to their questions, which helped them in making their own decisions afterwards. These findings suggest that this kind of approach might be particularly useful in supporting at least some users with ASD.

In addition, Bishop (2003) developed an Internet-based collaborative learning technology, the Portable Affect Recognition Learning Environment (PARLE). It is used to explain and simplify idioms, aphorisms and phrases for individuals with ASD in real-time conversations via mobile phone. It also suggests responses for the user to use during the conversation. Users with ASD have found it useful and efficient; however, its main disadvantage is the need to pause the conversation while typing, which causes loss of eye contact.

Another technology to support individuals with autism is called Brain in Hand. The aim of this technology is to help individuals to live independently by connecting

them with a support network of experts. Brain in Hand experts offer different levels of support regarding daily life activities and diary organisation⁷. It is also convenient and can be used on smartphones or tablets. This technology received the National Autistic Society Award 2014 as the best new technology; however, no peer-reviewed articles evaluating its effectiveness have yet been published. Moreover, another study by Simm, ferrario, Gradinar and Whittle (2014) presented a prototype of a peer support tool designed for adults with HFA named 'Clasp', which measures the anxiety of the individuals with ASD and connects it to a smartphone. The idea is that, the data measured will be recorded on the smartphone and connected with peers via a peer-supported network and short message service (SMS). It has been pointed out that this tool has similarities with 'Brain in Hand', but the researchers of 'Clasp' argued that their tool allows the individuals to be supported by the network around them and not only by experts. In addition, they argued that 'Brain in Hand' is more for supporting scheduling and planning and not as 'Clasp' which is for managing the anxiety levels of the individual when communicating (Simm et al., 2014). However, the evaluation of these technologies with adults with ASD will help in having a clear view of its benefits on the users.

Because understanding social rules and interactions is difficult for individuals with ASD, finding the perfect partner who understands their concerns and accepts their situation is also problematic (Ousley & Mesibov, 1991). A number of dating websites have been created to help people to find their perfect match, such as AutisticDating.net, Aspie Affection and Disabled People Date (not specifically for ASD). However, online dating is not fully trusted; some people find it risky, as many users use fake profiles (Couch & Liamputtong, 2008), which could be more dangerous for a person with ASD, as it has been found that people with intellectual disabilities could be more vulnerable socially than others (Lough et al., 2014). Individuals with ASD may have less understanding of sexual behaviours, lack judgment, are socially naïve, and have difficulties with social awareness (Mehzabin & Stokes, 2011). Additionally, users on such sites may be from very dissimilar

⁷ <http://braininhand.co.uk/>

cultures and backgrounds. Individuals with ASD are likely to find it more difficult to meet someone they can feel comfortable with, perhaps because they have less understanding of social skills and because they might share fewer interests with other people (Orsmond et al., 2004), and they may be disliked by others (Grandin & Attwood, 2012).

Moreover, no Arabic social networks specifically designed for individuals with ASD exist, nor do any such networks support the Arabic language. Although adults with ASD can use the more popular social networks, such as Facebook, Twitter and MySpace, users could still be vulnerable to cyber bullying and inappropriate language (Benford, 2008). Encouraging family members and close friends to be part of their online social networks could be a solution to help in protecting adults with ASD from online bullying or inappropriate situations. It has been shown that parental communication and parental involvement in online activities of persons with ASD could reduce the effect of cyber victimisation and provide higher levels of self-esteem (Kowalski, Morgan, Drake-Lavelle, & Allison, 2016; Özdemir, 2014).

Providing individuals with ASD with the opportunity to obtain the advantages of using both computer-based technology devices and social networks minimises the possibility of relying totally on the technology, by interacting and communicating with real humans (Parsons et al., 2006). Moreover, it has been claimed that using online communication tools does not minimise face-to-face interaction, but rather enhances the quality of existing relationships (Mazurek, 2013). Although many technologies are available to be used by those with ASD, some individuals, especially young adults and their parents, still find it difficult to select the most effective technology and to identify which particular need it can address (Habash, 2005). The wide range of options can cause confusion, and some of the technologies can be expensive, which makes it all the more challenging to decide which to choose. To address these kinds of issues, this PhD study has explored: what technology devices adults with ASD in Saudi Arabia are using; what their views are towards using social network sites; how they are using social networks and for what; the nature of their online relationships and communication; what difficulties they are facing when using social networks; and the effect of online

social networks on their lives, from their own perspectives, as well as family or friends.

2.3.3 Technologies for ASD in Arab Countries

Only a few studies regarding the use of technology among individuals with ASD in Arab countries were found in the literature search. Al-Wabil et al. (2010) conducted a study in Saudi Arabia on the development of a multimedia environment for teaching vocalisation to children with autism. The goal of the project was to help the Arabic-speaking children with their communication skills (Al-Wabil et al., 2010). However, it was reported that the development of the system was still in process and had not been completed. Another study also in Saudi Arabia by Al-Arifi et al. (2013) introduced a portable and configurable augmentative and alternative communication (AAC) tool for Arabic-speaking users, called 'Touch-to-Speak', which aimed to support people with speech and language impairments in carrying out their daily conversations. It worked by translating a series of pictures into well-structured Arabic sentences; it supported Modern Standard Arabic (MSA), in addition to various local Arabic dialects. However, the target users of the tool were children with ASD and elderly people following a stroke, so it may not be very useful for adults with high-functioning autism or Asperger syndrome. This application has been evaluated by Al-Wakeel, Al-Ghanim, Al-Zeer and Al-Nafjan (2015), in comparison to another evaluated application, which is the Arabic version of 'Tap to Talk'. The study (Al-Wakeel et al., 2015) evaluated the usability of the two mobile applications, and demonstrated that both have a set of advantages, such as the variety and large number of pictures and the ability to customise pictures, and concluded that both applications are easy to use by children with non-verbal abilities. However, some predicted disadvantages from both applications are, for example, that 'Touch-to-Speak' had a multi-page picture display which the child could not predict, and the picture displayed in the centre of the category in 'Tap to Talk' was distracting for the children. Al-Wakeel et al. (2015) proposed the development of a new optimal AAC design combining the advantages of both evaluated applications, in addition to new features based on their suggestions.

In addition, a study of an Arabic app called 'Talk the Talk', designed by Fatani and Mashat for teaching conversational skills to children with ASD, was reported in the Al-Watan online newspaper as the first Arabic app in this field (Al-Ghamdi, 2014). The implementation of the app has not been yet completed; therefore, it has not been evaluated or reported in the peer-reviewed literature. Overall, there is a limited number of studies in relation to technologies for ASD in Arab countries. More specifically, the use of social networks has not yet been studied for Arabs with ASD, making this an important and interesting gap in the literature.

Social networks are increasingly important in the Arab world: it was indicated in the 5th edition of the *Arab Social Media Report* (Salem et al., 2013) that the use of social networks has been increasing in the Arab world, and this significant increase could be connected to the Arab Spring. The 'Arab Spring' is the term given for the set of anti-government protests "including the various movements erupting in 2011 from Tunisia, Egypt to Bahrain, and including protests in Syria in 2012" (Ahy, 2016, p.105). Social media played an important role in this movement for Arab users and the number of users has been growing since then, for the reason of feeling empowered, and for the sense that using social media can create a change in their lives (Salem et al., 2013). In addition, the *Arab Social Media Report* (Salem & Mourtada, 2012) determined how eight different Arab countries have been affected by the use of social media and how their communities were influenced by online socialising. Moreover, although, Arab users are using social networks to be liberated from many restrictions and to seek freedom of speech, their cultural values are still affecting their attitudes and activities on social media (Al Omoush et al., 2012). The popularity of social media in Saudi Arabia was the main interest in this research ("Arab Social Media Report," 2015).

2.4 Related Cultural Studies and Social Networks for non-ASD Arabs

The majority of studies regarding Arabic culture and technology have specifically addressed design issues and design guidelines, such as that by Marcus and Hamoodi (2009). Only a limited number of studies were found regarding the

impact of Arabic culture on social networks (Al Omoush et al., 2012; Askool, 2013; Kalban, 2007; Veltri & Elgarah, 2009). In this section, the influence of culture on usability among Arab users generally will be discussed briefly.

The impact of Arab cultural values on the use of Facebook was studied by Al Omoush et al. (2012), to determine how people from different nations and different cultures are engaging through social networks. The study addressed the relationship between cultural values, motivation, attitudes and continuation as a member in a social network. Sherry et al. (2006) claimed that the motivation to use media is not fixed among all users; it differs according to the media, gender and culture. So in Al Omoush et al.'s (2012) study, the motivation to engage in online social networks was considered from four perspectives: self-presentation, social interaction, freedom of speech and expression, and curiosity. In addition, trust, credibility and strength of ties were identified for the attitude towards the use of Facebook (Al Omoush et al., 2012). Al Omoush et al. (2012) based their measurements of cultural values on the most frequent dimensions developed by Geert Hofstede (Hofstede, 1980; Hofstede & Bond, 1988; Hofstede, Hofstede, Minkov, & Vinken, 2008). These dimensions are used in most usability studies that consider the effect of cultural values on engagement in social networks (Al Omoush et al., 2012). Hofstede's dimensions are individualism versus collectivism, masculinity, power distance, long-term orientation, uncertainty avoidance and indulgence versus restraint. An explanation of each dimension is as follows.

Individualism versus Collectivism: the dimension of individualism is the degree of strengths of relationships people have within the society, and the degree to which a society reinforces individual/group relationships and achievements. In individualistic cultures, the ties between individuals in the society are loose, but they are more direct and open with strangers. In contrast, in collectivist cultures, people are more integrated in strong closed groups, with strong relationship ties with their families; they have less trust towards strangers and are less open (Al Omoush et al., 2012; Hofstede & Bond, 1988). *Gender Role Differences (masculinity)*: refers to the degree to which the distribution of roles between genders is clearly distinct. In feminine countries women and men have the same

value, whereas in masculine countries men have more value than women (Al Omoush et al., 2012; Hofstede & Bond, 1988). *Power distance*: measures to what extent the less powerful members of a society expect and accept that power is distributed unequally, and the degree inequality of the distribution of power, wealth and political authority in the society (Al Omoush et al., 2012; Hofstede & Bond, 1988). *Long-term Orientation*: refers to the degree the society prefers a short term approach and embraces traditional values, or prefers forward thinking, long-term values (Veltri & Elgarah, 2009, p.170). *Uncertainty avoidance*: the extent to which members of a society can tolerate or feel threatened by uncertain conditions. When interacting with strangers or other people, members of high uncertainty avoidance cultures are more ambiguous and are less risk-taking; such people rely on rules, laws and believe in minimising the possibility of uncertain conditions. In low uncertainty avoidance cultures, people tend to manage coping with anxiety and are less ambiguous (Al Omoush et al., 2012). *Indulgence versus restraint*: concerns happiness and life control, it measures the level of happiness, freedom and leisure time opportunities, (Al Omoush et al., 2012; Hofstede et al., 2008). In indulgence cultures, people are more concerned with enjoying their lives and having fun, whereas, in restraint cultures people are regulated by strict social norms and have less enjoyment opportunities (Hofstede, 2010).

In regards to Saudi Arabia's culture, it was classified as *low individualism, high masculinity, high power distance, high uncertainty avoidance* and it gained a low score for *long-term orientation* and an intermediate score for the *indulgence/restraint* according to Hofstede dimensions⁸. See Figure 2.1.

⁸ <http://geert-hofstede.com/saudi-arabia.html>

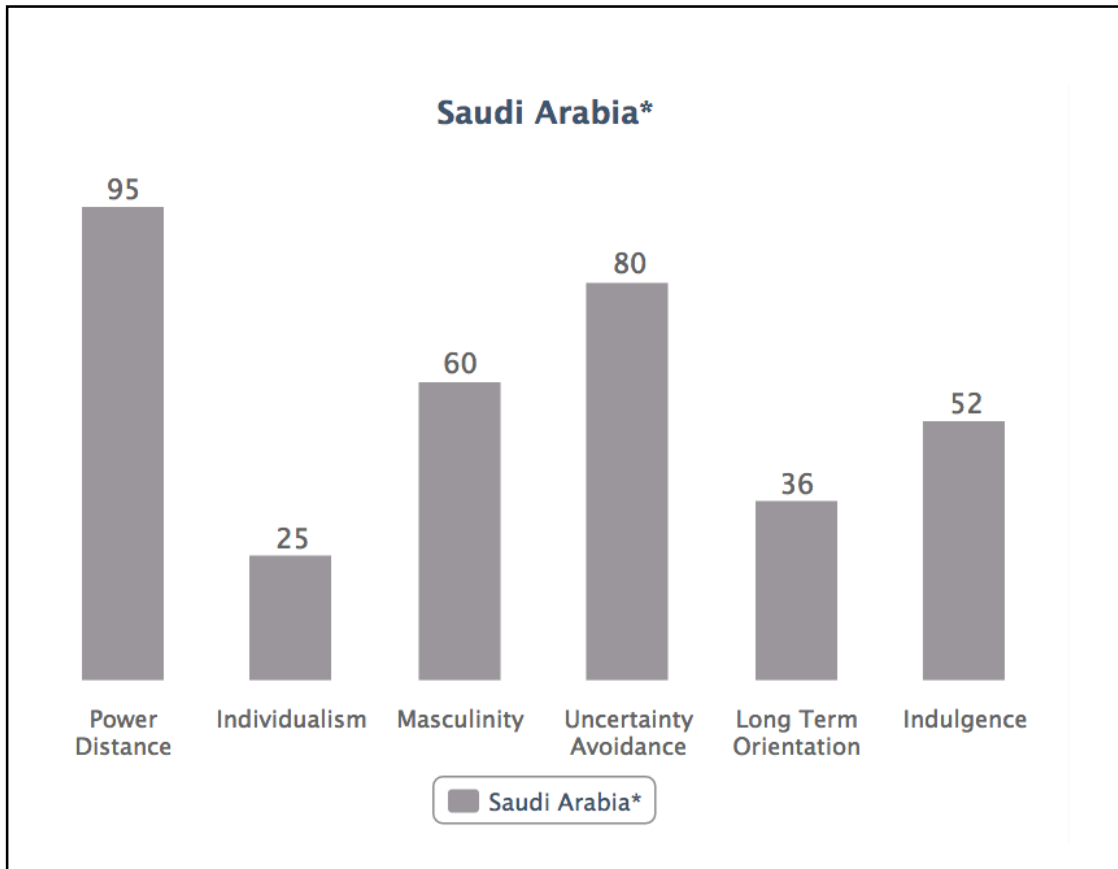


Figure 2.1 **Measurements of Geert Hofstede's cultural dimensions for Saudi Arabia⁹**

However, Arab countries do not all score exactly the same, as there are some differences in their traditions and cultural aspects, and some dimensions could be slightly different¹⁰. In addition, measurements in different settings could result in different scores, and also cultural values changes over time, which could result in changes in the scores in different studies (Wu, 2006). The study by Al Omoush et al. (2012) investigated the relationships between the cultural dimensions and the motivation for using social networking sites and the attitudes towards the use of social networks among the participants from different Arab countries, including Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Saudi Arabia. The relation to the motivation and attitude of Arab users toward the use of social networks is illustrated in Figure 2.2.

^{9&12} <http://geert-hofstede.com/saudi-arabia.html> [last access 15 August 2016].

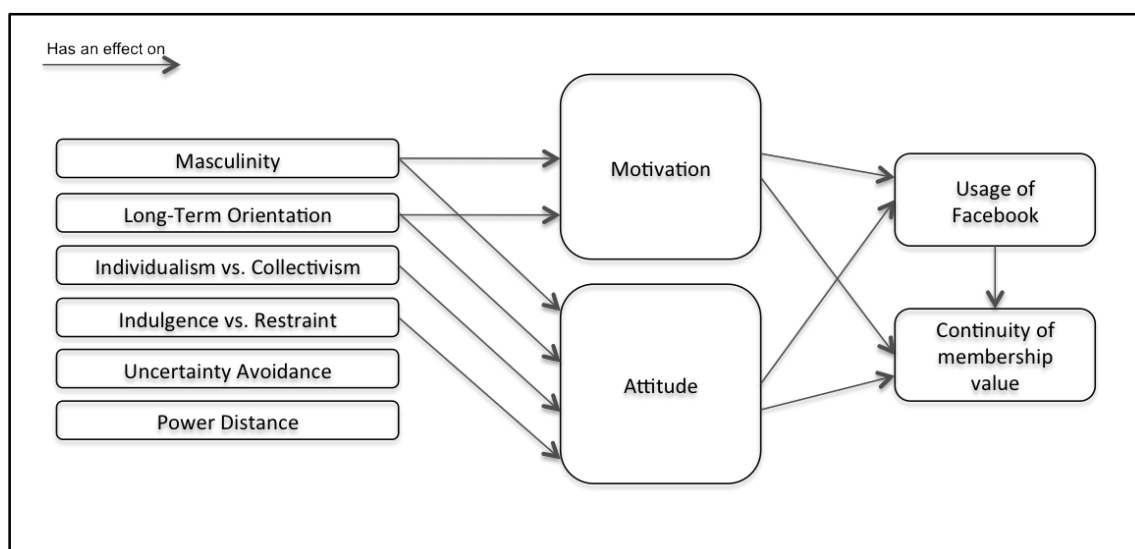


Figure 2.2 The effect of cultural dimensions on the motivation and attitude of Arab users on the use of Facebook¹¹

In regard to the use of ICT, Table 2.1 summarises examples that could be considered as measurements for the dimensions when using ICT, the examples were taken from the literature of Al Omoush et al.'s study (2012).

Table 2.1 Examples of measurements of the cultural dimensions in using ICT¹²

Dimension as scored for the Arabic culture	Examples of measurements of the dimensions
Low Individualism	Fewer friends for a longer time
	More cautious about online privacy and self-disclosure
	High level of trust and social interaction between each other
	Ambiguous and less trusting with strangers
High Masculinity	Disclose more information and contribute to SNSs with lots of activities
	Tendency to be more deceptive on SNSs
High power distance	Higher use of authentication and passwords, and restricted choices of communications, where no member information is accessible by non-members.
	Stronger motivation to enhance image and show themselves and stand out.
High uncertainty	Look for a structure in their relationships and are more discreet in the expression of individuality.

¹¹ & ¹⁴ As found in the study by Al Omoush et al. (2012)

Dimension as scored for the Arabic culture	Examples of measurements of the dimensions
avoidance	Profile photos consist of animals, toys, children, or even celebrities instead of pictures of themselves.
Strong restraint	Restraint in the adoption and use of Internet applications

In addition, it has been claimed that autonomy, competence and relatedness can be determined from the user's self-presentation when interacting on social network sites for the intention of achieving self-esteem, satisfying their psychological needs and for life satisfaction (Al Omoush et al., 2012). Moreover, other studies (Ellison, Steinfield, & Lampe, 2007; Zywicki & Danowski, 2008), have reported that people who use social networking sites have higher self-esteem and are more satisfied with their lives than people who are not on social networks, which suggests that social networks could help people in overcoming low life satisfaction and low self-esteem (Correa, Hinsley, & De Zuniga, 2010). For individuals with ASD, the use of technology can help in social development, which leads to increasing self-esteem and independence (Silver & Oakes, 2001). Online social networks can provide them the opportunity to present themselves in a way that allows them to stand out and show who they are. Working on improving communication and interaction skills could support a user in being independent and provide individuals with ASD with a better quality of life; thus, the current research considered investigating how participants were presenting themselves online.

Several issues have been highlighted regarding the use of social networks in relation to Arabs. As stated above, social networks have given people more freedom, and a high number of Arabs are using Facebook and other social networks to discuss issues and topics which are not allowed to be discussed in person (Al Omoush et al., 2012). The ability to use fake names and hide their real identities offers people freedom of speech. In addition, a study by Veltri and Elgarah (2009) considered the impact of cultural differences on the adoption and usage of Facebook, comparing the United States and Morocco. They measured the cultural differences between the two countries with reference to four of Hofstede's

dimensions. The results for all the measured dimensions varied between the two countries. Morocco has a *high power distance*, which refers to high inequality in power and wealth, and *high uncertainty avoidance*, which indicates that people do not tend to try new methods and prefer to use tested ones and avoid taking risks. In contrast, the US had lower scores for these two dimensions. In regard to *individualism*, Morocco had a very low score compared to that of the US, indicating that the culture in Morocco is more *collectivist*. This reflects the way in which people create their profiles; US users share detailed information, whereas Moroccan users reveal less information. *Masculinity*, on the other hand had a lower score in Morocco than in the US, in contrast to what was reported by (Al Omoush et al., 2012). These differences show how culture has an impact on the use of social media by users in the general population.

However, Hofstede's cultural dimensions are used to investigate and measure the impact of cultural aspects in the society on the values of its members. They do not allow us to investigate personal aspects of different groups of people within the same society, such as individuals with ASD and how they react to specific things. For example, individuals with ASD, in general, could face difficulties with independence (Hume, Loftin, & Lantz, 2009), not only in the Arabic culture, but also in Western countries that are scored with a higher independence level, so measuring the level of independence among the participants with ASD would have a different result. In addition, individuals with ASD have difficulties with communication (*American Psychiatric Association*, 2013), which might make uncertainty avoidance measurement different for this group. Hofstede's cultural dimensions do not investigate more specific personal cultural and traditional aspects and what impact these have on the users, and how cultural rules could restrict people from the freedom of using online social networks. Therefore, this current PhD study adds knowledge in regard to Arab users with ASD, by investigating the personal use of online social networks by individuals with ASD under the Arabic culture, in specific in Saudi Arabia and how their use of social media is affected by the culture. Brosnan and Gavin (2015) report that knowing how individuals with ASD use social media is important because they face socio-

emotional difficulties in addition to having strong capabilities for using technologies.

Moreover, existing studies focus on the design of Arabic websites or on localising non-Arabic websites to be used by Arab users (Kalban, 2007; Marcus & Hamoodi, 2009). A study by Askool (2013) considered exploring the use of social media in Saudi Arabia for Saudi users in general, by investigating the impact of cultural restrictions on the motivation of the users, their attitude, their behavior and their main use social networks. However, no research was found regarding the use of online social networks by Arab users concerning all cultural issues as to the perspective of the current research study, and specifically considering individuals with ASD. In this PhD research study, the main usability issues investigated were related to communication and interaction situations and how cultural values may play a role in usability. Determining the cultural factors that affect the usability of online social interaction could help in teaching adults with ASD how to use social media in a way that suits them, in order to interact with other people and improve their communication skills. Moreover, it would help people generally in understanding the needs and preferences of individuals with ASD when online. It could also help developers of web applications to consider usability and accessibility factors in their designs, by including the diverse community using the system and understanding the different perspectives of different users, as illustrated in Waller, Bradley, Hosking and Clarkson (2015), so that they will be more useful and accessible for Arab users with ASD.

2.5 Usability and Sociability

Usability testing concerns human-computer interaction, while sociability is concerned with human-human interaction with the support of the technology (Preece, 2001). Preece (2001) claims that focusing on sociability issues when designing software is important and that it is not enough to consider only usability issues, in order to support social interaction within the system. Therefore, in this PhD research study, the usability and sociability of social media technologies for

adult Arabs with ASD was investigated. Usability refers to how the user interacts with the product, how easily it can be used and how easily it can be learnt. Usability is “a quality attribute that assesses how easy user interfaces are to use. The word "usability" also refers to methods for improving ease-of-use during the design process”(Nielsen, 2012)¹³. According to Nielsen, the main components of usability are: learnability, efficiency, memorability, errors and satisfaction (Nielsen, 2012).

Usability has also been defined in three international standards: ISO/IEC 9126-1, ISO 9241-11 and IEEE (Abran, Khelifi, Suryn, & Seffah, 2003), as follows: “

“The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions.” (ISO/IEC 9126-1, 2000)

“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” (ISO 9241-11, 1998).

“The ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component.” (IEEE Std. 610.12-1990)”

(Abran, Khelifi, Suryn, & Seffah, 2003, p.326).

In the Standard ISO 9241-11, the usability model was designed from the perspective of experts in Human-Computer Interaction. From the perspective of these HCI experts, performance measurement and user satisfaction are important measures for achieving enhanced usability levels to achieve a usable product, besides including the usability attributes (effectiveness, efficiency and satisfactions) when designing the product (Abran et al., 2003). However, different experts have different viewpoints with regard to usability.

From the definition of ISO 9241-11, in addition to the main attributes of usability (effectiveness, efficiency and satisfaction), Speicher (2015) suggests the other elements from the definition that should also be included when evaluating usability, which are, the product, the users, the goals and context. In addition, there

¹³ Nielsen Norman Group, <https://www.nngroup.com/articles/usability-101-introduction-to-usability/>

are also three levels of usability metrics that should be indicated for usability evaluation: internal metrics (e.g. software structure), external metrics (e.g. behaviour of the system when executing) and in-use metrics (e.g. the use of the system by actual users in a certain context) (Speicher, 2015). The indication of the usability elements and the focus of this current research are presented in Chapter 4.

Furthermore, online social networks consist of social gatherings, which could be referred to as 'online community', 'online social space' or 'online cyberspace' (Preece, 2001; Preece & Maloney-Krichmar, 2003). These social gatherings are defined differently in different fields (Preece & Maloney-Krichmar, 2003). Preece defines them as "any virtual space where people come together to get and give information or support, to learn or to find company" (Preece, 2001, p.348). It is important to evaluate online communities, and alongside usability evaluations, sociability issues should be included in order to understand how the technologies are supporting the social interaction of the users (Preece, 2001). According to Preece (2001), the main usability components that determine the success of an online community are: (1) dialogue and social interaction support, (2) information design, (3) navigation, and (4) access. Dialogue and social interaction support can be referred to for example, as supporting the interaction in the community by prompting feedback, or the ability to execute commands. Information design is the ease of understanding and reading the information within the online community. Navigation is the ability of users to navigate through the community-related websites easily to find what they require, and access refers to making the software requirements of the community clear to download and run easily (Preece, 2001). In addition, Reinecke and Bernstein (2011) point out that the design of websites has an effect on usability in the sense that users differ in their design preferences depending on their cultural context. So to ensure sufficient usability of a technology by a specific group of users, it is important to study their requirements and preferences according to their background, which is why this research is important. Studying the requirements and preferences of individuals with ASD in Saudi Arabia could benefit them by including and considering their preferences in

future technology designs, in order to make technology more useable and accessible for them.

Social networks have had a major influence on global socialising, but people may face some barriers when using social networking sites. The majority of social network sites are developed in relation to Western culture and in English (Evers, 1997; Veltri & Elgarah, 2009), and although English is a commonly spoken language around the world (Kalban, 2007), there are still some people who do not speak English, which causes usability and accessibility issues. Purpose, people and policies are the three main components that comprise good sociability in an online community, as reported by Preece (2001). 'Purpose' is the reason for joining the community, 'people' refers to the people in the online community that the user can interact with, and 'policies' are the social norms that guide people when communicating and interacting online with other users, such as language and protocols (Preece, 2001). For exploring the value of sociability of online social networks by Arab users with ASD, the three components were considered within the implementation of this research. It is important to know why Arab adults with ASD use social media (purpose), who are the individuals with ASD using social media, and with whom they are communicating with (people), and what are the social norms (policies), that influence the use of social media and online communication by Arab users with ASD. The investigation will help in addressing these usability and sociability issues and in pointing out some factors that should be kept in mind for these target users, as will be presented in the following chapters.

In order to ensure the usability and sociability of the web, accessibility has to be achieved; accessibility is an important attribute that means allowing all people including individuals with disabilities to use the web, regardless of the type or nature of their disability (*World Wide Web Consortium W3C*, 2005). Making the web more inclusive to be useable and accessible by everyone is an important focus that developers and designers are trying to address (Waller et al., 2015). However, individuals with different types of disabilities are facing barriers when trying to use the web (Cooper, Sloan, Kelly & Lewthwaite, 2012), and there is still a need for understanding more about people with disabilities and their interaction with the

technology. In addition, for inclusive web designs, all users with different languages and cultures should be included, and understanding the diversity of users when using the web, and the barriers they face is important to be recognised (Waller et al., 2015). However, accessibility guidelines are designed mostly based on the western technologies and applications. Consequently, understanding more about the accessibility issues for Arabic websites is required (Al-Faries, Al-Khalifa, Al-Razgan, & Al-Duwais, 2013). The current research aims to contribute information and knowledge regarding the use of social media by Arab users with a cognitive disability (ASD), which will help developers who are working on accessibility for Arabic websites in achieving inclusive web designs, especially the accessibility of online communities.

2.5.1 Related Accessibility and Usability Testing Studies

Abran et al. (2003) note the importance of testing the usability of the products by the users who will be using the product in order to achieve user acceptance, and to make the products useable by everyone. This also requires considering usability issues and testing of products by people with different disabilities, to help in providing them with an accessible environment (Williams & Nicholas, 2006). Both studies (Williams, Jamali, & Nicholas, 2006; Williams & Nicholas, 2006) pointed out the lack of literature at that time regarding research on the usability of developed applications in general, and also that there was less research regarding the usability of developed products by users with disabilities. Since then, a number of studies, (Agarwal, Sampath, & Indurkha, 2013; Hersh, 2014; Mei, Mason, & Quarles, 2014; Williams, 2013) have included investigation of the usability of different technologies by people with different disabilities, including ASD. For example, Mei et al. (2014) evaluated the usability of the 3D User Interfaces (3DUI) in VR systems by adolescents with ASD. The aim was to find the factors of 3DUI that could affect its usability by adolescents with ASD, and to provide general guidelines on 3DUI applications for individuals with ASD in the future (Mei et al., 2014). Their results showed that individuals with ASD needed extra cues and assistive technologies to help them in hand-eye coordination applications, and they

recommend that this should be considered by interface designers (Mei et al., 2014).

The use of ICT (Information and Communications Technologies) for learning for disabled users has been evaluated by Hersh (2014). The aim was to provide an evaluation framework by investigating the usability and accessibility issues of learning technologies, in order to inform developers in developing learning technologies which are more accessible for disabled users, and to help learners in finding the appropriate technologies. In addition, the evaluation of the technologies considered identifying gaps in provision, and parts which might need to be modified. An example of a gap in provision given by Hersh (2014) was having a positive evaluation of a functionality in a technology which is only available in one language, while technologies with other languages having the same functionality cannot be found, which illustrates the importance of this current PhD research. The evaluation methodology of the ICT-based learning technologies presented in (Hersh, 2014) can also be used to identify suitable technologies for the users, according to the accessibility features, age group, gender, language, cultural groups, educational background or experience.

In another study, Williams' (2013) investigated the usability of a Web Portal site, which was created in the Rix centre at the University of East London. The Web Portal site was created for people with low literacy, and who have learning difficulties and rely on images or audio for accessing the content. The study investigated how usable the Web Portal was for the target users, and their ability to navigate through it. The results showed that users with learning disabilities and limited literacy skills could use a specially designed web interface to search for information. However, Williams (2013) suggests that providing more accessible and usable features should be considered to make the website more helpful for the users, such as having larger images and providing input devices that would be more suitable for the users. These findings show the usefulness of images for the individuals with learning disabilities, which also could be for individuals with ASD, as it has been mentioned that individuals with ASD are interested in images and visuals more than text (Habash, 2005; Kana et al., 2006).

In addition, other studies (Karreman, Van Der Geest, & Buursink, 2007; Sevilla, Herrera, Martínez, & Alcantud, 2007) have examined the usability of a website with two versions, a standard version, and an easy-read (or more accessible) version by two groups of participants, those with intellectual disability and those without. The results of Karreman et al.'s (2007) study showed that in terms of their comprehension of the website, both groups of participants, preferred the easy-read version. However, in regard to their satisfaction with the website, the group with intellectual disability preferred the easy-read version, whereas, the other group preferred the standard version. In the study by Sevilla et al. (2007), the use of the accessible version by their participants, all with intellectual disabilities, showed a better performance in the efficiency and efficacy measures. Other studies explored the usability of social networking sites (SNS) in general and not specifically for individuals with ASD or any other disability (Alam & Ali, 2010; Askool, 2013; Hart, Ridley, Taher, Sas, & Dix, 2008). The study by Askool (2013) considered the case in Saudi Arabia as mentioned earlier. With regard to ASD, studies such as that by (Burke et al., 2010) considered the usability of CMC by users with ASD, and a study by Bahiss et al. (2010) investigated the usability of Facebook and Orkut, which was mentioned above in Section 2.3.1.

From these studies, it is clear that it is important for the usability and accessibility of different technologies to be evaluated by users of the technology, including users who have disabilities, especially in the case of standardised material, which should be accessible and usable by everyone, as this limitation could form a gap in provision which needs to be covered (Hersh, 2014). This current PhD study focused on exploring the usability and sociability of social media technologies among adults with high-functioning autism or Asperger syndrome in Saudi Arabia, and what accessibility issues have been involved. This group of people lack support and attention in the Arab world (Al-Farsi et al., 2011).

2.6 Summary

The literature review has shown that the majority of social skills technologies for individuals with ASD have been developed for children, and only a limited number

of technologies are applicable to adults with ASD. For adolescents and adults with ASD, it is important to practice their social skills and learn social rules to improve their communication and interaction with other people. By working on improving these skills, individuals with ASD can have a better chance to become employed, be in a relationship, have friends, increase independence, have a better life and be part of the community (Grandin & Attwood, 2012). A number of studies mentioned in the literature review have clarified the usefulness of technology in improving social communication and social interaction skills for adults with ASD in Western countries. Arab adults with ASD also need help in improving their social skills, just like individuals with ASD in Western countries. However, technologies for helping those with ASD developed in Western countries might not be appropriate for Arabic users. This could be related to differences in language, culture, traditions and religion. By understanding the diversity of web users, designers and developers can create inclusive web pages and applications that are useable and accessible to users from different cultures. In addition, by ensuring accessibility guidelines have been adhered to, individuals with disability will also have the ability to interact with the web. The idea of this PhD research study has been to investigate and discover how adults with ASD in Saudi Arabia use social media technology and the different factors that might influence their use of technologies and their online communication habits.

Chapter 3

Framework for Autistic Arabs' Social Communication and Interaction Technology (FAASCIT)

As mentioned in the previous chapters, Arab individuals have a different set of beliefs and social, religious, moral and political rules and restrictions (Straub et al., 2003; Al Omoush et al., 2012; Dardas & Simmons, 2015), which makes the Arabic culture and society an independent and complex system that is filled with contradictions (Barakat, 1993; Hill et al., 1998). Although Arabic culture has borrowed ideas and materials from Western culture (Hill et al., 1998), the Arabs' original beliefs and cultural rules are strong and could be carried over from the offline world to the online world. Reinecke and Bernstein (2011) claim that there is a difference between cultural influence in the use of technology by Eastern and Western people, suggesting that certain factors, such as language, religion and education level, could have an influence on the technology interface preferences. Therefore, the usability of the online technologies could be affected by these cultural perspectives (Al Omoush et al., 2012; Askool, 2013), especially because the majority of online technologies are designed based on the very different Western cultural system.

In this chapter, the designed framework which has been identified for this study is presented, together with a description of each of the proposed factors and its relation to the target sample. This chapter will help in addressing the research question:

RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?

The idea of the framework was to clarify some factors that could have an impact on the use of social media by adult Arabs with ASD. By using online social media, people are able to communicate with many people from different backgrounds

and come across a wide range of different cultures (Sawyer, 2011). This research would also help people from different cultures to understand how individuals with ASD from Saudi Arabia perceive and use social media. If they happen to communicate and interact with them in social groups or networks via social media.

Different cultural values have a different effect on the perceptions, adoption and diffusion of information technologies (Srite & Karahanna, 2006; Veltri & Elgarah, 2009). Miller (2012) identified factors that have different influences on people when using technology, such as education, race, income, age and marital status. For instance, Arab cultural beliefs are very strong regarding the acceptance of using computers and the Internet (Loch, Straub, & Kamel, 2003). Thus, when implementing a study or designing software developers should be aware of cultural differences, such as 'ethnic stereotypes, religious symbols, gender roles, treatment of animals, jargon, humour, text and graphics formats, colours and customary languages' (Evers, 1997, p.2). Considering cultural categories (language, visuals, colours and page layout) could have a positive impact on the usability of a web page (Sun, 2001), as people tend to apply their cultural preferences when evaluating a web page, for example, seeing their preferred colours, seeing a specific image, text direction or arranging the links in a specific order on the navigation bar (Kalban, 2007).

Aside from usability issues, studies have shown that cultural differences have an influence on the sociability, communication, online activities and the engagement of people using online social networks (Al Omoush et al., 2012; Pfeil, Arjan, & Zaphiris, 2009; Veltri & Elgarah, 2009). For example, people in low *individualism* or *collectivism* societies tend to interact with a fewer number of friends on social networks but for a longer period of time, whereas in higher *individualism* societies, individuals have a wider range of friends (Al Omoush et al., 2012). In addition, in regard to individuals with ASD, as mentioned in Section 2.2, factors such as cultural differences, level of education and lack of services, experience and professional training and the level of parental awareness could have an effect on the percentage of people diagnosed with ASD in Arab countries (Al-Farsi et al., 2011; Al-Salehi et al., 2009; Amr, Bu Ali, et al., 2012; Samadi & McConkey, 2011).

However, not all Arab countries are the same; some may differ in social, cultural and economic respects (Amr, Bu Ali, et al., 2012). Language and religion in some Arab countries can also be diverse. Some of the factors might be more influential than others, while some might not have any effect on the usability of social media by Arabs and might not even pose a problem. To form the framework developed in this PhD study, a number of factors which might have an influence on Arab users in using technology have been identified. In this chapter, the factors are categorised as follows:

- (1) Technological factors: this refers to factors which are related to technical issues and not to personal or social issues.
- (2) Cultural factors: Some of these factors could be related to the traditions and rules of the society or of the people themselves within the society, that could be associated with the religion or beliefs of the people. Other factors are related to the facilities and materials available in a specific country or area.

These factors for the initial framework were informed by the literature as summarised in Table 3.1, and some of the researcher's background knowledge. The factors were chosen to align with the main cultural and traditional factors that are widely represented and known in the Saudi community, and which could also have an influence on the individuals with ASD. The design of the framework started by identifying and coding manually any factors that are related to the Arabic culture or other factors that could have an impact on the use of technologies for Arab users when reading the literature. The factors later were updated, and more evidence was searched for in the literature for the factors that could form an issue with the technologies presented for ASD in Western countries, acknowledged by personal insights. At the outset, the factors were identified depending on personal experience of being a Saudi female, and experiencing some restrictions when using social media. These restrictions were mainly related to cultural aspects to do with restrictions within daily life and appreciating how other Saudi individuals were also experiencing the same limitations and having different discussions with various individuals about this issue. For the purposes of this research the focus was on adults with autism and

Asperger's syndrome, as social media has been used in different Western studies as a facilitating method to assist individuals with ASD to overcome their social communication and interaction difficulties. The added issues of cultural and/or technological restrictions in addition to the social behaviour and communication difficulties could cause problems in the use of social media. Therefore, the motivation was to investigate the restrictions of the cultural and the technological factors that could be a barrier for the adults with ASD in Saudi Arabia. Moreover, this stage of the process also drew on the study by Askool (2013), who identified a number of cultural factors regarding the use of social media by Saudi individuals in general, supported by the consensus among cultural related resources from the literature and online articles or news, that could be related to Arab users and or some could be related to ASD in general. In selecting the factors for this study, some factors, such as business related factors, were neglected, as they might be less related to the social aspects of relevance to individuals and were likely to have less impact on individuals with ASD. The designed framework was called a "Framework for Autistic Arab's Social Communication and Interaction Technology" (FAASCIT). These factors were then considered when investigating the use of social media technologies by the participants in the fieldwork conducted and reported in subsequent chapters.

Table 3.1 The designed Framework for Autistic Arabs' Social Communication and Interaction Technology

Factor	Description	Evidence
Technological Factors		
Internet access and cost	Some countries or different areas in the same country might have less or no access to the Internet. Internet prices could be too expensive for some users.	(Wallace et al., 2010) (Alrawabdeh, 2009) (Al-Jarf, 2005) (Al Omoush et al., 2012)

Factor		Description	Evidence
The availability of web services		Not all services are supported in all countries, such as FaceTime on iPhones ¹⁴ . Some social media technologies such as Viber (a messaging service) are blocked in Saudi Arabia.	("FaceTime not working," 2016) (Usher, 2013)
Language medium of technology		English technologies with English icons and symbols could be difficult to use for some users, especially for Arabs, as Arabic is a completely different language; it is also a right-to-left language.	(Al-Jarf, 2005)
Digital literacy	usernames and passwords	Many usernames and passwords might be difficult for some users with ASD to remember.	(Burke et al., 2010)
	abbreviations, acronyms and web terminology	The use of abbreviations in technologies, especially in social networks, may not be understood by people with ASD.	("Do You Understand," 2011)
	arabic language using the latin alphabet (Arabizi)	The use of the Latin alphabet for writing Arabic is very popular in social networks, but not all people understand it.	(Palfreyman & Khalil, 2003)
Culture Related Content		The content of technologies could be related to Western culture and not understood by those of other cultures.	(Straub, Loch, Hill, 2002)
Cultural Factors			
Education	lack of public services and welfare	Some countries do not have public services or centres, or they could be hard to access by all people	(Al-Farsi et al., 2011) ("Autism Lacks Awareness," 2012)

¹⁴ FaceTime camera and video calling features are not available on Apple devices sold in some countries in the Middle East such as Saudi Arabia and the UAE. The following links shows the difference between the Saudi Arabian Apple website and the UK website.
<http://www.apple.com/sa/iphone/compare/>
<http://www.apple.com/uk/iphone/compare/>
 [Accessed 18 May 2016]

Factor		Description	Evidence
	literacy and age	Different age groups might interact differently with technology.	(Prensky, 2001)
		Arab adults might be less educated compared to Western adults, especially women.	(Hammoud, 2006) (Hamdan, 2005)
Spoken language		People who do not understand English might find it hard to deal with the technology.	(Al-Jarf, 2005)
Accents		Different accents and vocabulary might not be understood between users.	(Walsh & Barry, 2009)
Social rules	communication with the opposite gender	Communication, interaction and eye contact between males and females are restricted in most Arab countries.	(Al-Saggaf, 2004) (Al-Jarf, 2005)
	friendship and relationships	In some countries, people are not allowed to date or have relationships unless they are getting married.	(Alsheikh et al., 2010)
		Most Arab societies are made up of the family and the local community, which could make it hard to communicate with other people.	(Hock & Lafi, 2011)
	the concept of representation and photography	For some people, photographs of women are not allowed to be displayed to the public, and for others the concept of photography is not accepted, from their point of view.	(Larsson, 2011, p.62).
Conservatism		Some people with ASD and their families could be conservative regarding showing or discussing ASD diagnoses.	(Alqahtani, 2012)
Independence and autonomy		Individuals in most Arab countries do not move out of their parents' house until a certain age.	(Aboul-Enein, 2010) (Haboush, 2007)
Gender differences in technology		Gender differences might affect the	(Amr et al.,

Factor	Description	Evidence
usage	use of technology.	2011)
Music	Some people believe that music is forbidden according to some paths of Islam. Playing music in the technology could pose a problem for them.	(Otterbeck & Ackfeldt, 2012)

In the following sections, an explanation of each of the factors is discussed for clarification and in relation to some of the technologies mentioned in Section 2.3.

3.1 Technological Factors

3.1.1 Internet Access and Cost

In Saudi Arabia, the Internet began to be used in 1994 in educational and medical institutions (*Internet.sa*, c2016). In 1999, it was officially opened to access by the public (Al-Saggaf, 2004). This means that the public in Saudi Arabia started using the Internet late, compared to many other countries worldwide, who have been using the Internet since the mid 1990's (Simsim, 2011). According to Alrawabdeh (2009), one of the barriers to using the Internet in the Arab world is the difficulty of paying the connection fees for some people, especially in non-Gulf countries. This would prevent users in these countries from accessing the Internet and from using various technologies (Al-Jarf, 2005). However, the use of the Internet is growing in Saudi Arabia and in all Arab countries as a result of reduced cost and because of the widespread use of new technologies by teenagers and adolescents (*Internet.sa*, c2016).

3.1.2 The Availability of Web Services

A number of web services have been banned in some Arab countries. For example, in Saudi Arabia, Viber, "an online phone and text messaging

application,”¹⁵ was banned in 2013 because it is hard to monitor (Usher, 2013). Also, Skype, an application for “calling, seeing, messaging and sharing with others—wherever they are”¹⁶ was banned in the UAE until recently, and it is still banned in Oman. In Saudi Arabia, Skype and Whatsapp¹⁷ companies were warned by the Saudi telecoms that they wish to monitor the services, otherwise they will be banned in the country (Usher, 2013); however, the Internet calling via WhatsApp was blocked in Saudi Arabia. In addition, FaceTime¹⁸ feature was disabled on Apple devices sold in Saudi Arabia, the UAE and some other countries in the Middle East (“FaceTime not working,” 2016). However, the FaceTime service was available in Saudi Arabia, using devices purchased from other countries until it has been banned in 2016, in addition to the ban of other call, video and messaging services such as Tango and Line (Alhamdan, 2016).

Banning one service may not pose a huge problem for the users, as many alternative services exist. However, as other communication services were also banned, this could affect people’s online social lives. For example, depending on the features of these technologies, banning them could affect connections with family and friends living abroad (Alhamdan, 2016; Gabr, 2013). Banning one service might not affect the usability of the technology or the usability of another social networking service, but services that could be rendered inactive or banned at any time could prevent the use of the service between users in different countries. In addition, if a person with ASD was accustomed to using a specific application, it could become part of his/her daily routine, and banning the service could cause frustration, as, for a person with ASD, changing the routine or changing even a small element in the environment can cause confusion or depression (Grodén et al., 1994, cited in Gillott, Furniss, & Walter, 2001).

¹⁵ <http://www.viber.com/>

¹⁶ <http://www.skype.com/en/>

¹⁷ <http://www.whatsapp.com/>

¹⁸ FaceTime “Apple’s one-on-one video calling feature, enables you to do video calls with another FaceTime user over a Wi-Fi connection” (“FaceTime not working,” 2016).

3.1.3 Language Medium of Technology

Language might be a main issue leading to differences in the use of technologies between Arab users and English-speaking users. Assistive technologies are not widely used for students with disabilities in Saudi Arabia, because most of these technologies are in English or Spanish languages (Alquraini, 2011). In addition, most of the existing social networks were developed in the English language and are mainly based in the US (Veltri & Elgarah, 2009). This could make it difficult to use; for example, for Arab users the navigation bar and menus on websites would be easier if they were on the right hand side, the same as the direction of the Arabic text, which is the opposite side in the English websites. Written text on the signs or symbols in some technologies may not be understood by Arab users; thus, applying the technologies designed in Western countries to Arab users could have some limitations. For example, in the study of the immersive virtual environment (IVE) by Wallace et al. (2010), in the scenario, the street signs may not be understood by Arab users who do not read English. Moreover, idioms are also culturally specific and may be difficult to understand by people of other cultures and especially those with ASD who tend to understand concrete concepts better than abstract ones (Dodd, 2005).

3.1.4 Digital Literacy

It has been stated that “digital literacy is more than just the technological ability to operate digital devices properly; it comprises a variety of skills that are utilized in executing tasks in digital environments, such as constructing knowledge during surfing the web, deciphering user interfaces, playing digital games, searching in data bases, creating and sharing content on the web, chatting in chat rooms and communicating in social networks” (Eshet, 2012, p.268). The following sections will consider some aspects and skills relating to digital literacy which could form a problem for users with ASD.

3.1.4.1 Usernames and Passwords

In the study by Burke et al. (2010), on the social use of computer-mediated communication, the authors mention that users with ASD may forget website

passwords. While this issue is not specific to this group, it might be more frustrating for them, as individuals with ASD are more vulnerable to depression and anxiety (Stewart, Barnard, Pearson, Hasan, & O'Brien, 2006; White, Oswald, Ollendick, & Scahill, 2009), and it has been pointed out by Eshet ("Digital Literacy," n.d.), that in general, facing ambiguous situations while using technologies can cause anxiety, which can make people feeling insecure. Passwords are created using Latin characters, numbers and/or symbols, so considering this issue in a usability study of Arab users with ASD could require a different perspective. Not all web applications have the same policy for creating a password. The policies could be different with respect to the length of the password or require the use of lowercase alpha, uppercase alpha, digits and special characters (Shay, Bhargav-Spantzel, & Bertino, 2007). These different rules for different accounts requires the user to check the rules for creating the password or to try multiple attempts, every time he/she wants to create a new online account, which could cause frustration for individuals with ASD, and also makes memorising all the passwords difficult, and could force the users to write them down, which causes security risks (Gehringer, 2002).

3.1.4.2 Online communicative language features (Abbreviations, Acronyms and Web Terminology)

Many slang words, acronyms and abbreviations of idioms are widely used when using e-English in computer-mediated communication (CMC) such as chatting and messaging. An acronym is an abbreviation formed by taking the first letter of each word, mainly written with capital letters (Dannélls, 2006), such as LOL: Laugh out loud, OMG: Oh my God, TYT: Take your time, BTW: By the way (Khalifa, 2015). An abbreviation is a shortened version of a word, for example 'St.' which is a shorten form of 'street' ¹⁹. By using social media people become familiar with these words and abbreviations. However, if users do not use English, they may not understand what these abbreviations or acronyms stand for. It might also cause misunderstanding of some of the content written by other users online, for

¹⁹ <http://abbreviations.yourdictionary.com/articles/what-is-the-difference-between-an-abbreviation-and-an-acronym.html>

example LOL could be understood as either “Laugh out loud” or “ Lots of Love” (Gurgenidze, 2012).

Abbreviations or acronyms are used to save time and for shortening sentences (Khalifa, 2015), especially when tweeting on Twitter, as tweets are limited to 140 characters (Jasilek, 2013). For a person with ASD and with an Arabic-language background, this could be confusing, and chatting with people online and communicating in this particular form (via Twitter) could be challenging because of the constraints on how much can be said at one time. In addition, some words that are used on the web, for example, ‘tweet,’ ‘follow’ and ‘follower’ have been added to the *Oxford English Dictionary* and are now considered official words (Jasilek, 2013). For Arab social network users, these terminologies are translated into Arabic when using the Arabic platform, as ‘تغريدة’, ‘تابع’ and ‘متابع’. However, some Arab users use the English terminologies. These different terminologies and abbreviations may not be understood by people who are not familiar with the English language or the web technologies. For users with ASD this could lead to a misunderstanding and could make online communication more difficult and confusing for them.

3.1.4.3 Arabizi (Arabic Language Using Latin Alphabets)

The use of the Arabic language alphabet using Latin letters is known as ‘Arabizi’ (Darwish, 2013). This type of ‘language’ began to be used in the last decade among Arabs, with the widespread use of mobile phones for texting and email purposes, and has become widely used over the Internet (Darwish, 2013; Salhani, 2013). The reason for this innovation was that most mobile phones in the Arab world used to come with an English keyboard and did not support Arabic (Darwish, 2013; Salhani, 2013). The typing of English letters for Arabic words was more useful than writing in English for Arab users and more convenient to them at that time, with the ability to use numbers to present Arabic letters that do not have an alternative letter in English (Darwish, 2013). Arabizi has become the Internet language for many Arabic speakers (Ghanem, 2011; Salhani, 2013). People are also using it to write books and blogs (Ghanem, 2011). Salhani, (2013) points out that most technologies are in English, which makes technologies more

accessible with Arabizi. However, Ghanem (2011) reports that some Arabic-speaking people, such as teachers, prefer not to use this type of writing, as they claim that it could weaken the Arabic language, especially for school-aged children, and it could result in the destruction of the Arabic language, in the longer term. These people prefer to use either Arabic or English when communicating (Ghanem, 2011).

As this new language is widely used online and in technologies in the Arab world, individuals with ASD will come across it when using technologies. The level of understanding and acceptance of this language by this group of people should be established and clarified, to determine whether this type of text could cause a barrier for them when trying to communicate with other people via technologies.

3.1.5 Cultural Related Content in Technologies

It has been pointed out that the majority of technologies and programs for aiding individuals with disabilities are designed with a language and culture that is different from the requirements for Arab users, which could cause difficulties in adopting the technology (Al-Wabil et al., 2010). According to Evers (1997), most software is designed in relation to North American culture, including the icons, text and idioms, which have made most people familiar with this culture and the use of such technologies. Evers and Day (1997) state that many Arab users are familiar with the use of American software; however, their claim was a general one and did not necessarily apply to individuals with ASD. In addition, there are still some people who do not speak English, and their lack of ability to understand everything in the technology could form a barrier.

In a study by Wallace et al. (2010) of an immersive virtual environment (IVE), various scenarios were tested on the participants in three different scenes, a residential street scene, a school playground scene and a school corridor scene. The study was conducted with participants in England, and the scenarios were designed to reflect the lifestyle of people living in the UK. In applying this study with adolescents or adults with ASD in Arab countries, different scenarios should be tested to match their lifestyle (for example, in countries where schools are not

co-educational, the school corridor should be full of students of the same gender as the participant testing the scenario). In addition, street and driving rules differ between the UK and Arab countries, such as the side of the driver, the meaning of road signs and signs' written language.

Additionally, regarding the virtual environment system that was developed by Mitchell et al. (2007), involving a café and a bus, applying the same scenarios may not be understood by all Arab users with ASD. This depends on the lifestyle and cultural rules of the country the user lives in. In Saudi Arabia people are not accustomed to using public transportation, and so the bus scenario could be difficult to recognise for a person with ASD living in Saudi Arabia. For example, queuing to get on the bus is an act that a person living in England should understand, as the '*art of queuing*' is recognised as an important cultural aspect for English people (Fox, 2005), but queuing has a different perspective in Saudi Arabia. For instance, queuing is not sufficiently respected and not everyone is patient in waiting for their turn (Birrell, 2013); moreover, there would be two separate queues, as in most places in Saudi Arabia men and women are segregated, with different entrances, queues and seating areas (Sherman, 2015). In addition, segregation is also applied in restaurants and cafes (Al-Saggaf & Williamson, 2004; "Living in Saudi Arabia," 2013), which could make the method of finding a place at a table in the virtual café different from the perspective of Arab users than that for English users. This could be bewildering for those with ASD as these situations are not part of their everyday settings.

3.2 Cultural Factors

3.2.1 Education

3.2.1.1 Lack of Public Services and Welfare

Various studies (Al-Salehi et al., 2009; Al-Farsi et al., 2011; Samadi & McConkey, 2011; Amr, Raddad, et al., 2012) have indicated that individuals with ASD do not receive adequate support services in Arab countries. This could cause an individual with ASD in an Arab country to be less capable of using different

technologies, as there is a lack of access, training and practice. As mentioned earlier, receiving proper support and providing schools and services for individuals with ASD will help them to have better outcomes (Burke et al., 2010; Levy & Perry, 2011), such as employment, independent living and education (Seltzer et al., 2004), and will help in improving their abilities and provide them the opportunity to join mainstream schools and universities. However, it has been reported in different sources (Aldifyan, 2013; Aljuhani, 2013) that parents of children with ASD in Saudi Arabia were not satisfied with the available services provided for their children. Thus, the level of education and services and its impact on the knowledge of the participants has been investigated as part of the current research.

3.2.1.2 Literacy and age

Some adults in Arab countries may not be well educated. According to John Daniel, formerly of UNESCO, the Arab region had low literacy rates in 2000–2004 (Daniel, 2005). Hamdan (2005) reported that the literacy rate in Saudi Arabia at that time was low, at a percentage of about 62% on average, with the literacy rate lower for women (50%) than men (72%). The relation with age could be due to the fact that the education system is improving over time, and that people who are younger have better opportunities and facilities than before. For example, education in Saudi Arabia was limited at first to informal schools or private home tutorials called “Kuttab”, for teaching the Quran and religious practices for both boys and girls (Hamdan, 2005), which started first in the Western part of the country (Rugh, 2002). However, in 1953 public schools were opened, for boys only, and education for girls was still limited to semi-legal home schools, until around 1960, when legal schools for girls were established (Hamdan, 2005; AlMunajjed, 2009). In addition, besides opportunities and availability of education services in Saudi Arabia, education for women was not accepted, and was indeed opposed, by some people (Hamdan, 2005).

As mentioned in the previous section, regarding the lack of services in Saudi Arabia for individuals with ASD, the services at the present time are improving, and children who are receiving support might have different outcomes in their

future than the adults who did not receive any formal support previously. It has been pointed out by Prensky (2001) that young people are digital natives, as they grew up with digital technologies. They use different communication and language styles from those of the older generations. Therefore, it is important to examine the roles of digital technologies in the lives of particular groups, at least partly defined by age, so that assumptions are not made about what is acceptable and appropriate for them. In this case, adult Arabs with ASD remain a poorly supported group in terms of service provision, and so it is especially important to see whether and how technology may offer some alternative source of support.

3.2.2 Spoken Language and Accents

Section 3.1.3 highlighted that most of the technologies are designed in English, which can make it difficult for non-English speakers to use and understand a certain technology. In Saudi Arabia, such technology-based language barriers could differ from one individual to another, as English is the most widely spoken language in Saudi Arabia after Arabic. However, it does not receive much attention by some of the people in Saudi Arabia, and the teaching process is not always efficient, which could cause poor English results (Khan, 2011).

Although Modern Standard Arabic (MSA), which is easier for users than classical Arabic, is used by most of the people in everyday communication at home, school and work, and also in clinical and speech and language therapy settings (Al-Wakeel et al., 2015), people from different Arabic countries speak Arabic with different accents and with some differences in the vocabulary and dialect (Kalban, 2007), this also applies in Saudi Arabia between different cities and regions. With regard to some Arabic technologies, they could be implemented or translated according to a specific country, which has a different spoken accent or different dialects from other Arabic countries. This could make communication for individuals with ASD harder and could cause confusion, if they are already used to speaking and understanding a specific accent or dialect. Figure 3.1 shows a picture of a translation of 'I don't want' in different Arabic dialects, each written in Arabizi. It is clear from the Arabizi text that the Arabic versions have different spellings and different pronunciations, indicating that different Arabic countries

have different dialects. For individuals with ASD, different accents or unfamiliar dialects could also be confusing for them when using technologies (Walsh & Barry, 2009), for example, when communicating with someone online via chatting or using video calls.

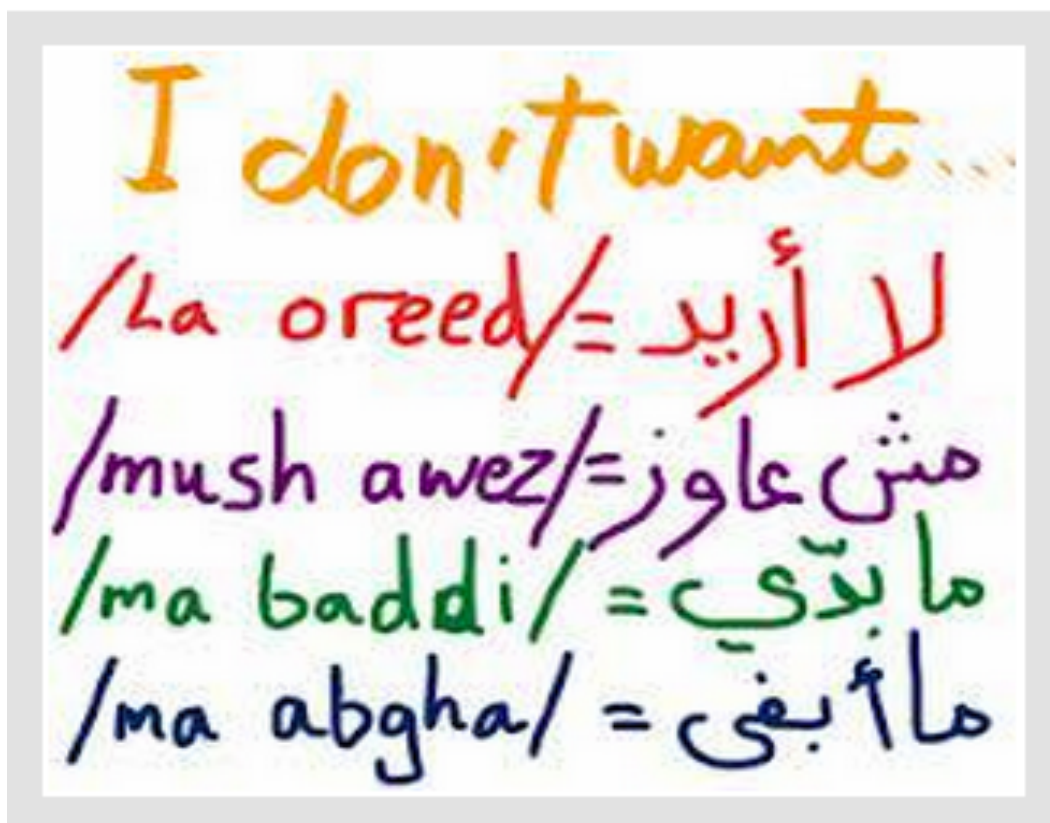


Figure 3.1 Arabizi Text in Different Arabic Dialects²⁰

3.2.3 Social Rules

People in different countries live with different lifestyles and different perspectives (Tighe, 2014), which could be related to the culture of the country or the effect of the traditions or religion. From these factors, the social rules of each society were built, and people follow these rules in their everyday lives, which form their lifestyles. The lifestyle of a person can influence his/her way in living in many situations; it could also influence the use of technologies. People could be restricted to the social rules of their society even if they do not approve

²⁰ <http://arabizi.wordpress.com/>

them. The following are examples of these restrictions that can be found in Saudi Arabia:

3.2.3.1 Communicating with the Opposite Gender

The restriction in interaction between different genders is closely related to the Saudi Arabian lifestyle. Some Arab people are not used to interacting or talking with strangers of the opposite gender. This could make it hard for them to accept the idea of interacting with opposite genders, even online, such as with the on-screen partners, as in the study by Trepagnier et al. (2011), or in any social network or dating site. Private networks such as the social network integrated into the SocialMirror device developed by Hong et al. (2012) could be more acceptable. Regarding the scenarios designed in the VR of the café and the bus (Mitchell et al., 2007), users might be sensitive about sitting next to a person of the opposite gender. It is important to appreciate that this sensitivity is not the same across all Arabic cultures and yet those with ASD may find it worrying where some Arabs find it normal and acceptable to interact with non-relatives of the opposite gender. These restrictions or lack of restrictions may not be clearly understood by individuals with ASD and applying the various cultural rules online may adversely impact on their use of this technology if they were not sure how to react. It has been reported that individuals with ASD in general have difficulties understanding social rules (Bishop, 2003).

3.2.3.2 Friendship and Relationships

Because communication with non-relatives of the opposite gender is restricted in some Arab cultures (Al-Saggaf, 2004; Al-Jarf, 2005), this makes building friendships between different genders difficult (Alsheikh et al., 2010). Relationships and dating are also banned in Saudi Arabia; however, online relationships could be seen as an alternative for Saudi individuals to overcome the restrictions of their traditions (Alolyan, 2015). For those with ASD, as has been mentioned, managing online communication could be difficult or they may be misunderstood and restrictions in interacting with the opposite gender could prevent them from building friendships or even formal communication with

other users. The degree of restrictions depends on the traditions and beliefs of the family and the person as well as the social settings with which he/she is familiar.

The different lifestyles of Arab users and Western users could also be an issue regarding the use of ACEbook, developed by Autism Connections Europe ("ACEbook project," 2011). Meeting in person could be a great opportunity to build and maintain friendships and ACEbook may be useful for building friendships with people who live nearby. However, the application of such a project in Arab countries might be very difficult, because the customs in most Arab countries are stricter with respect to meeting strangers or unfamiliar people in person, especially those of different genders. Travelling to different parts of the country would be particularly difficult for females. In general, mobility rules are stricter towards females in Saudi Arabia, as travelling is restricted by a male relative's agreement (Vidyasagar & Rea, 2004). Although, travelling issues are not only specific to individuals with ASD, this illustrates how the recommendations of some studies in Western countries for ASD individuals could be difficult to apply in a country such as Saudi Arabia. Alternatively, meetings could be arranged via an online communication programme such as Skype to maintain relationships for those who have difficulty in travelling. For meeting in person and obtaining face-to-face interaction, meetings could be arranged for a group of individuals with ASD in common or public areas, rather than two individuals meeting alone, which could help in avoiding awkward or unpleasant situations. Meetings could also be arranged in different cities, as mentioned in the ACEbook project, but instead, a group of adults with ASD could travel together with an organised caregiver to meet another group from a different city and maintain the friendship afterwards via online social networks. This could minimise the problems that could arise from travelling alone, meeting a stranger or meeting a person of the opposite gender alone, which could cause a situation that will not be accepted by the community. Determining the use of social networks by adult Arabs with ASD was part of this PhD research. The restrictive views described above do not apply to all Arab people, as they have different religions and beliefs, and some may be more religious than others. Traditions and culture are also not the same in all

Arab countries, and many differences can be found in relation to their lifestyles, views and perspectives.

3.2.3.3 The Concept of Representation and Photography

Sharing and uploading photographs online is one of the main features on social media (Duggan & Smith, 2013). Users tend to add and share their personal photos or photos of interest with other people or also with the public. In Saudi Arabia, the use of photographs has a different status in general, which is also carried over to social media websites. Debates around taking photos of people or any living beings have always been an issue from a religious point of view (Larsson, 2011, p. 62), and other debates have been conducted regarding forbidding women's photographs and only allowing photos of men and children to be displayed. For example, in the IKEA catalogue 2012 which was produced for Saudi Arabia, the photos of women were removed and only children and men were in the catalogue (Molin, 2012), as shown in Figure 3.2. However, this was changed after IKEA announced their regrets, and currently the catalogue in Saudi Arabia includes pictures of women²¹. In addition, the religious views towards photos can also be shown in the 'Starbucks' coffee shop logo in the holy cities in Saudi Arabia (Makkah and Almadinah). The logo has been changed to a crown instead of the mermaid from the original logo, as shown in Figure 3.3. However, recently the logo was removed completely and only the name 'Starbucks Coffee' is displayed, as shown in Figure 3.4.

²¹ http://onlinecatalogue.ikea.com/SA/ar/IKEA_Catalogue/



Figure 3.2 Left: A woman photographed in the standard version of the IKEA catalogue, Right: the woman is missing from the Saudi version catalogue²²



Figure 3.3 Left: Starbucks original logo, Right: Starbucks logo in the holy cities in Saudi Arabia ²³

²² <http://www.wsj.com/articles/SB10000872396390444592404578030274200387136>

²³ <http://marcelgagne.com/content/ikea-and-starbucks-bow-down-islamic-misogyny>



Figure 3.4 **Starbucks in Makkah, Saudi Arabia** ²⁴

Besides religious issues and the conservatism of attitudes to women photographs, privacy issues regarding photography are also important in legal terms in Saudi Arabia, and posting photos of people online without permission can lead to a penalty and a fine if it violates the privacy of others (*Saudi Gazette*, 2015). Understanding these rules is important to avoid any problems. However, the use of social media for individuals with ASD is aimed to provide a comfortable environment in which it is easy for them to practice their social skills, and not to be confused with many rules to follow. Issues regarding the use of photographs could make the use of social media restricted, especially for female users and may limit them from benefiting from the whole experience. It was important to find out how adults with ASD in Saudi Arabia use social media and their view towards displaying their photos online, with respect to their culture and beliefs.

²⁴ <http://muslimtravelgirl.boardingarea.com/al-abraj-mall-makkah-clock-royal-tower/>

3.2.4 Conservatism

It has been reported that the stigma of disabilities could be different from one country to another, according to the social cultural context, and in Arab countries this issue has been a main concern, as many Arabs believe that the disability is “a punishment as a result of a sin” (Alquraini, 2011; Dardas & Simmons, 2015). This makes the individuals with any intellectual disability avoid making use of health services, to avoid the negative thoughts of the public towards their condition (Dardas & Simmons, 2015). This could also be extended to the online world, and individuals with ASD could be cautious about receiving online support or even having any links to any ASD resources. However, private social networks, such as the Supportive Eyes social network²⁵, the social network accessed using the SocialMirror device (Hong et al., 2012) and the use of circles in social networks for supporting independent living (Hong et al., 2013), could be viewed as more secure than other social media networks, but the use of such private networks could be avoided to avoid the stigma of the disability.

In addition, the Arab culture requires women to have more privacy and be more modest than males, which drives women to use fake names online and hide their identity²⁶. In addition, personal photos of women have always been an issue among the Saudi community, and a concern for many people, as mentioned in the previous section. Even if people have a different belief towards photographs in general or photographs of women being presented in public, they could still be conservatism regarding their own photographs, especially women, as some people in Saudi Arabia belief that women should not be visible in public. For example, cell phones and laptops with built-in cameras are banned in some universities, weddings, at the request of the bride and groom, graduation ceremonies, gyms or any other women-only public places (Mishkhas, 2004; Bashraheel, 2010). It was reported by Basharaheel (2010) that cell phones and laptops with built-in cameras were banned in the female department at King

²⁵ <https://www.miradasdeapoyo.org/acierta/loggined.do>

²⁶ <http://life-in-saudiarabia.blogspot.co.uk/2016/01/why-women-use-fake-names-on-social.html#.VwEpMDYrI2I>

Abdulaziz University, for the reason that there are some students with impolite manners who might take photos of their classmates, who would mostly be without the *hijab* (covering the hair) inside campus, which will invade their privacy. As some women are strict about using their real names, adding their photos or adding videos of themselves in online social networks (Al-Jarf, 2005), this could increase the chance of being fooled by people with fake identities. For Arab users with ASD, privacy could be one of the factors that affect the use of social networking technologies. For example, female users could add their photos online and manage the privacy settings so that not everyone can see the photos, but only a specific group, such as mentioned by a Saudi female Facebook user in the study by Al-Saggaf (2011). However, for females with ASD, managing privacy settings could be difficult for the lack of implications. In addition, if not all users add their photos to Facebook or use their real information, it would be difficult to apply the ACEbook project ("ACEbook project," 2011); beside all the aspects mentioned above, there would be ambiguity, and meetings would be difficult to arrange. This could also affect the use of online dating, chats or any other type of online social network. Testing communication and social technologies with Arab users with ASD could play a key role in identifying the major cultural differences in Arab countries. In addition, it is important for individuals with ASD to know the online privacy rules, in order to prevent them from having any problems.

3.2.5 Independence and Autonomy

The SocialMirror device (Hong et al., 2012), which was explained in the literature review (Section 2.3.2), was developed with the idea of helping an individual with ASD who may be capable of independence to live independently. Independence and autonomy are important for an individual with a disability, but the concept differs between cultures (Robertson, 2003). In most Arab countries, the culture prevents single individuals from moving out of their family homes unless there are specific reasons, so the chance of moving out is less than in other countries, especially for women (Aboul-Enein, 2010; Haboush, 2007). In addition, this aspect could result in individuals being less independent and could prevent them from gaining extra knowledge. Therefore, technologies such as the SocialMirror

device, which seek to promote autonomy and independence developed in Western countries may be of much less relevance to individuals with ASD in Saudi Arabia.

3.2.6 Gender Differences in Technology Usage

The use of technology, especially online social networks, could differ between men and women. It has been reported that women, in general, share less information with strangers online than men do, but share more pictures and photos (Al-Mukhtar, 2013). In Arab countries, differences in the usability of online social networks between the two genders could be related to religious or cultural issues. As reported by Mortada in *Al Arabiya news* ("Arab users," 2012), cultural norms and restrictions can still make the participation of women in social networks harder than it is for men. As mentioned by Rachel Thomson²⁷ at the 'Innovative technologies for autism – critical reflections on digital bubbles' seminar (2016), allowing a child to use the Internet could be seen in a similar way as when the child is given permission to go out with friends. In a country like Saudi Arabia, girls could have limited freedom of mobility compared to male individuals, and are also restricted in having to get permission from their male guardian (Deif, 2008; Le Renard, 2014, p.86; Alolyan, 2015, p.22). This could also be implied in an online context, and girls could be more restricted by rules when using the Internet than boys. These differences could allow male users to have more freedom online when it comes to photos, personal information, adding friends and expressing themselves online, as men are judged less on their behaviours (Zaki Fadi, 2009)²⁸. This could be a reflection of the fact that Arab users have high masculinity, according to Hofstede's model (Al Omoush et al., 2012), as mentioned in Section 2.4. However, it has been reported that the Internet and the use of social media helps females in Saudi Arabia to evade social and cultural restrictions (Al Omoush et al., 2012; Alolyan, 2015). These differences and restrictions for female users towards the use of social media

²⁷ http://digitalbubbles.org.uk/?page_id=830

²⁸ The blog and the username of the blogger are called Zaki Fadi (written in Arabizi)

could also impact online communication for females with ASD, and prevent them from having the same benefits from the technology as male users.

3.2.7 Music

Listening to music or performing music has always been a debatable topic in some Muslim countries such as Saudi Arabia (Alamer, 2015). Some people in Saudi Arabia are prohibited from listening to music for religious reasons, depending on their beliefs and the path they follow; a discussion regarding music in Islam can be found in (Otterbeck & Ackfeldt, 2012). It was reported that, in Britain, some Muslim pupils have been withdrawn from Music classes in response to their parents' request, because they believe that musical instruments are forbidden according to Islam (Clark, 2012). However, this is not the case for all Arab users, as they differ in their beliefs and traditions. Therefore, music was identified as a factor that could have an impact on the use of social media, and whether music affects their use of the technologies. Many of the software programs, educational and social apps and even online resources available use music for entertainment, in addition to therapy for ASD (Gold, Wigram, & Elephant, 2006). For individuals with ASD, music can be used to help calm and relax behaviour and it has been reported in a study by Allen, Hill and Heaton (2009) that adults with HFA in the UK listen to music for many purposes such as, mood management, personal development and social integration. Banning music for these individuals could result in preventing them from benefiting from the available resources. There is also the issue of certain types of sound upsetting those with ASD so care needs to be taken when introducing media elements online (Leekam, Nieto, Libby, Wing, & Gould, 2007). Given the almost complete absence of research on the use of technologies by adult Arabs with ASD it is, therefore, important to begin to explore the ways in which any of the identified factors may influence the use and acceptability of digital technologies by individuals with autism in an Arab context.

3.3 Summary

This chapter has identified and illustrated various factors suggested by the researcher that could influence the use of technologies by Arab users with ASD. The choice of factors was based on the literature and the researcher's own personal knowledge of cultural aspects in Saudi Arabia and the consensus among resources. A description of each factor was provided to clarify the possibility of its influence on Arab users. The factors are related to cultural and traditional issues in regard to the technical, cultural, personal or social aspects related to the technologies, as summarised in Table 3.1. However, Arab countries differ in their culture, traditions, religion and also in their level of economic growth (Amr et al., 2012). There is also limited understanding and awareness about supporting adults with ASD in Saudi Arabia. Therefore, very little is known about whether any of these factors are likely to influence the use and acceptability of technologies by Arab adults with ASD; an investigation into the applicability of these factors is presented in the following chapters. The first stage of this research fieldwork was designed to find out more about autism in Saudi Arabia by meeting and talking to people who are experts in the field of autism, in addition to meeting individuals with ASD and exploring their personal use of social media. The methods, procedures and design of this research are presented next in Chapter 4, and findings from the fieldwork of the first stage are described Chapter 5.

Chapter 4

Research Methodology and Design

This chapter provides an overview of the design and implementation of this research study in the aim of clarifying the objectives of the research and the research questions for achieving these objectives. It also illustrates the methods used for sampling and recruiting the participants, and the methods for collecting the data, in addition to considering ethical issues regarding this research.

In Chapter 2, the literature review covered an overview of ASD and its core features, in addition to a number of studies concerned with using the Internet and computer-mediated communication for helping individuals with ASD to overcome their difficulties. As demonstrated, there is little research regarding ASD in Saudi Arabia, and the role of technologies in their lives. Therefore, this current research focuses on this aspect, in particular exploring and studying the use of social media by adults with ASD in Saudi Arabia. However, by looking at the literature regarding technologies for ASD in Western countries, it has been noticed that cultural aspects could form an issue for Arab users if the same studies were applied in an Arabic country. In addition, from studies applied on Arab participants in general or in Arab countries, cultural factors in addition to technological factors were indicated that could form a problem in online social communication. So from this, it was important to study and investigate these factors that could form a barrier for ASD individuals, or affect their access or use of social media. So the first research question was proposed:

RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?

As the goal is to improve their social interaction and communication skills, their online contact with their families was important to be investigated. In order to achieve and answer this question, the cultural and technological factors that

could influence the use of social media by people living in Arab countries were identified, and presented as the FAASCIT framework in Chapter 3. From the synthesis of information covered in Chapters 2 and 3 there are identifiable gaps in knowledge that this thesis aims to address. As it has been presented in the literature review, the use of visuals had a positive effect on individuals with ASD, eased their communication and was an element of interest for them, the focus on the role of photographs in their communication needed to be investigated, and the second research question was design as:

RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?

With the restrictions of cultural aspects in Saudi Arabia in general, the cultural aspects that are shaped towards photographs online was important to be investigated, and to see if it affects the use of social media by the participants, which formed the third research question:

RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult Arabs with ASD?

In order to answer these questions, it was important to understand the concept of usability in the context of this research and focus on both the impact of the cultural aspects on the users and the usability of the social networks. For investigating the usability of social networks, It will be referred back to the definitions of usability presented in Chapter 2. The definition adopted in this research was “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” (ISO 9241-11, 1998). This is because this definition, as mentioned earlier, was designed with the perspectives of experts in the field of HCI (Abran et al., 2003), and for its focus on the performance of the end users, in this research, ‘Arab users with ASD’. According to Speicher (2015), as mentioned in Section 2.5, additional elements (level of usability metrics, product, users, goals, and context of use) are important aspects to be added to this definition, and

should be indicated to clarify the characteristics of usability. In this research these additional elements are specified as follows:

<i>Level of usability metrics:</i>	In-use metrics (the use of social networks by adult Arabs with ASD within their cultural context).
<i>The product:</i>	Social networks
<i>The users:</i>	Adult Arabs with ASD
<i>The goals:</i>	Communicating within social networks, using photographs on social networks, exploring cultural aspects.
<i>The context:</i>	Tablet, mobile phone, everyday life.

4.1 Research Philosophy

A paradigm is a “philosophical model or framework originating in a world view and belief system based on particular *ontology* and *epistemology* and shared by a scientific community” (Holloway, 1997, p.114). It is the way the researcher conducts the research, based on how he/she views the world (Creswell, 2013). *Ontology* refers to what is reality; *epistemology* is the theory of how we know the reality (Creswell, 2013). According to the philosophical worldview of research, there are two widely used philosophical concepts in conducting research, which are positivism/postpositivism, and constructivism/ interpretivism (Creswell, 2013).

Positivism or postpositivism is an approach where researchers believe there is only one truth which will be objectively measured based on suggesting a hypothesis, and the results are obtained from a wider range of participants, using quantitative research methods representing numeric measures and statistics in order to validate the hypotheses. This was not the approach followed in this current research. On the other hand, *constructivism or interpretivism* is seen as a descriptive approach for qualitative research, and its overview is that reality has a different meaning from the perspective of different people in different life settings; thus the reality is constructed in the context, which requires the researcher to understand and rely on the views of the participants (Creswell, 2013). This current research involved exploring the views of the adults with ASD

on the use of social media in a specific country and according to their culture. For this reason, interpretive, was used in this research, in order to describe what is happening in reality from the perspectives and experiences of the participants.

4.2 Research Approach

As mentioned, this research included an exploration and description of the social behaviour and the use of technology by the target participants (adults with ASD in Saudi Arabia), which led this research to be empirical. Empirical research “seeks to explore, describe, predict, and explain natural, social, or cognitive phenomena by using evidence based on observation or experience” (Sjoberg, Dyba, & Jorgensen, 2007). This required exploring and investigating this phenomenon in a descriptive approach. However, in order to explore and understand the research concept further and to obtain a deeper insight about this group, it was necessary to consider the personal views and experiences from the perspectives of the participants. Moreover, the proposed thesis topic was concerned with exploring a new phenomenon that has not been addressed with the chosen sample before (Creswell, 2013), so for these reasons a qualitative research approach was followed.

Another type of research is quantitative research, in which the data is usually collected in the form of numerical data, and analysed by applying statistical analysis methods (Sjoberg et al., 2007). It is “an approach for testing objective theories by examining the relationship among variables” (Creswell, 2013, p.4), therefore this was felt to be hard to achieve with the type of analysis being undertaken in this research. If both qualitative and quantitative research methodologies, known as a mixed methods approach is used, in order to have a full understanding of the problem (Creswell, 2013), there would be a need for a statistically viable number of participants in the case of this research (Driscoll, Appiah-Yeboah, Salib, & Rupert, 2007). Therefore, a qualitative research approach was considered as more suitable. Qualitative research is “a form of social inquiry that focuses on the way people interpret and make sense of their experiences and the world in which they live” (Holloway, 1997, p.1). Qualitative studies aim to generate descriptions of a particular subject about the people’s

social lives and their culture. Such approaches allow for more talking and in finding out detailed information. As noted by Myers (1997), “The motivation for doing qualitative research, as opposed to quantitative research, comes from the observation that, if there is one thing which distinguishes humans from the natural world, it is our ability to talk!” (p.3). Consequently, the qualitative approach described below were vital for exploring a hitherto un-researched, or dramatically under-researched, field, in order to provide some in-depth insights and perspectives from those directly connected to the adult Arab with ASD field in Saudi Arabia.

4.3 The Methodology

In conducting an empirical research study, designing the research strategy and deciding how it will be implemented are important aspects. Methodology is defined by Rajasekar, Philominathan and Chinnathambi (2006) as “a systematic way to solve a problem. It is a science of studying how research is to be carried out. Essentially, the procedures by which researchers go about their work of describing, explaining and predicting phenomena are called research methodology” (p.5). It is also defined as “the study of methods by which knowledge is gained. Its aim is to give the work plan of research” (p.5), whereas, research methods are defined as “the various procedures, schemes and algorithms used in research” (Rajasekar et al., 2006, p.5).

On the other hand, a research design provides directions to be followed in order to complete the procedures of the research (Creswell, 2013). Each approach has different designs, or strategies (Creswell, 2009) and there are many types of research designs in qualitative research (Creswell, Hanson, Plano & Morales, 2007). Moreover, depending on the discipline some could have different terminologies, and each researcher uses different approaches, techniques and methods (Myers, 1997). There are no special designs that are explicit for HCI, but the designs or methods are implemented and adapted from other disciplines (Blandford, 2013). The main qualitative research designs used by researchers in disciplines such as philosophy and social science are Case Study, Grounded Theory, Phenomenology, Action Research, Narrative Research and Ethnography

(Myers, 1997; Creswell et al., 2007). However, it was decided that the most appropriate design to be used for this research is a semi-structured qualitative study (SSQS), which could lie between ethnography and survey studies (Blandford, 2013). SSQSs are used by starting with the purpose of the study and then completing the study by collecting information from the available resources to reach the best possible study, and then reporting the final findings of the study with its strengths and limitations (Blandford, 2013). It is defined as a qualitative approach which involves “interviews and observations, that have some explicit structure to them, in terms of theory or method, but are not completely structured” (Blandford, 2013, p.2). The SSQS is also used as a method for addressing questions, rather than testing hypotheses (Blandford, 2013). This research considered studying the practice and use of interaction technologies (social media technologies) by adults with ASD in Saudi Arabia, and understanding their needs when using the technologies, in addition to investigating the impact of the cultural and technological factors on the use of social media by the target users, the collection of the data was from the available possible resources such as the literature, from the experts, interviews with the participants and observations of online social sites, in order to reach the best study about this specific topic. As the semi-structured design is appropriate for a research that could involve surveys, interviews or observations, these were the methods used in this research, because these methods allow the researcher to learn more about the participants and their unique experiences from their own perspective. An in-depth description of the data collection methods is presented in Section 4.6.

An addition, as the aim was to investigate the factors of FAASCIT, which have already been identified in the previous chapter, and the study was to support these factors, the approach for collecting and analysing the data in this study was a deductive approach. Analysing data in a *Deductive approach* is ‘when the researchers look back at their data from the themes to determine if more evidence can support each theme or whether they need to gather additional information’ (Creswell, 2013; P.186), which in this study it is the evidence to support the factors that were identified in the framework. Whereas, *Inductive*

analysis involves ‘working back and forth between the themes and the database until the researchers have established a comprehensive set of themes’ (Creswell, 2013; P.186); this could be when identifying new themes that emerged from the collected data.

4.3.1 Data Collection Methods

This research is a qualitative descriptive study, using qualitative data collection methods. The forms of research question in the current study are: ‘What and In what ways’, which all need to be answered with the use of descriptive reasoning (Bickman & Rog, 2008). In qualitative research the data collected can be in the form of text, images or sounds (Sjoberg et al., 2007), and is in-depth and rich, being collected mainly from a small sample (Holloway, 1997), to provide insights into personal experiences, practices and views within specific contexts. It has been mentioned by Brantlinger et al. (2005) that descriptive information collected from qualitative research provides the ability to understand individuals with disabilities, their family and the people they work with.

Choosing the appropriate methods for collecting the data depends on the different aims and requirements to be achieved by the research (Silverman, 2006). As explained in the literature review, more information was needed in order to explore and understand the proposed concept of this research, and in order to answer the research questions. The *target users* of this study were young individuals and adults with ASD (High-Functioning or Asperger Syndrome) in Saudi Arabia. Qualitative research methods, such as semi-structured interviews with experts in the field of ASD have been implemented for data collection. Additionally, a survey for caregivers was distributed online to reach a wider sample of participants for the study. After obtaining the caregiver’s approval, a personal semi-structured interview was conducted with the participants “adults with ASD”. Those participants who are eligible to use social media were then observed online for their activities. The reason for using these methods for collecting the data is to get in-depth information from the participants regarding the factors required, whilst allowing for a flexible approach with a group of individuals who might have poor communication skills and very differing social

behaviours. In addition, it is important to ensure the validity of the collected data, which in qualitative research can be reached by triangulation, which is using one or more data sources, investigators, theories or methods (Brantlinger et al., 2005). In this research data triangulation was applied by collecting the data from the literature, experts and individuals with ASD, and methodological triangulation by interviews and observations with the same participants (Brantlinger et al., 2005).

Qualitative interviews happen to also be an effective method for research with people who may have problems with eye contact and face-to-face interactions, so require extra support in these situations. This is possible where carers are often attendant with vulnerable participants. Lloyd, Gatherer and Kalsy (2006) also state that interviews provide a chance for participants' voices to be heard, which makes interviews in this research valuable, as it is important for the participants to show their own experience of using social media, and how they use it, and also to give them the chance to express themselves regarding cultural issues from their perspective, and to capture how culture can have an impact on them personally. The data then were analysed qualitatively by using thematic and content analysis methods, using codes and themes, and have been used to address the research questions and to report and describe the findings. Figure 4.1 shows the methods used at different stages.

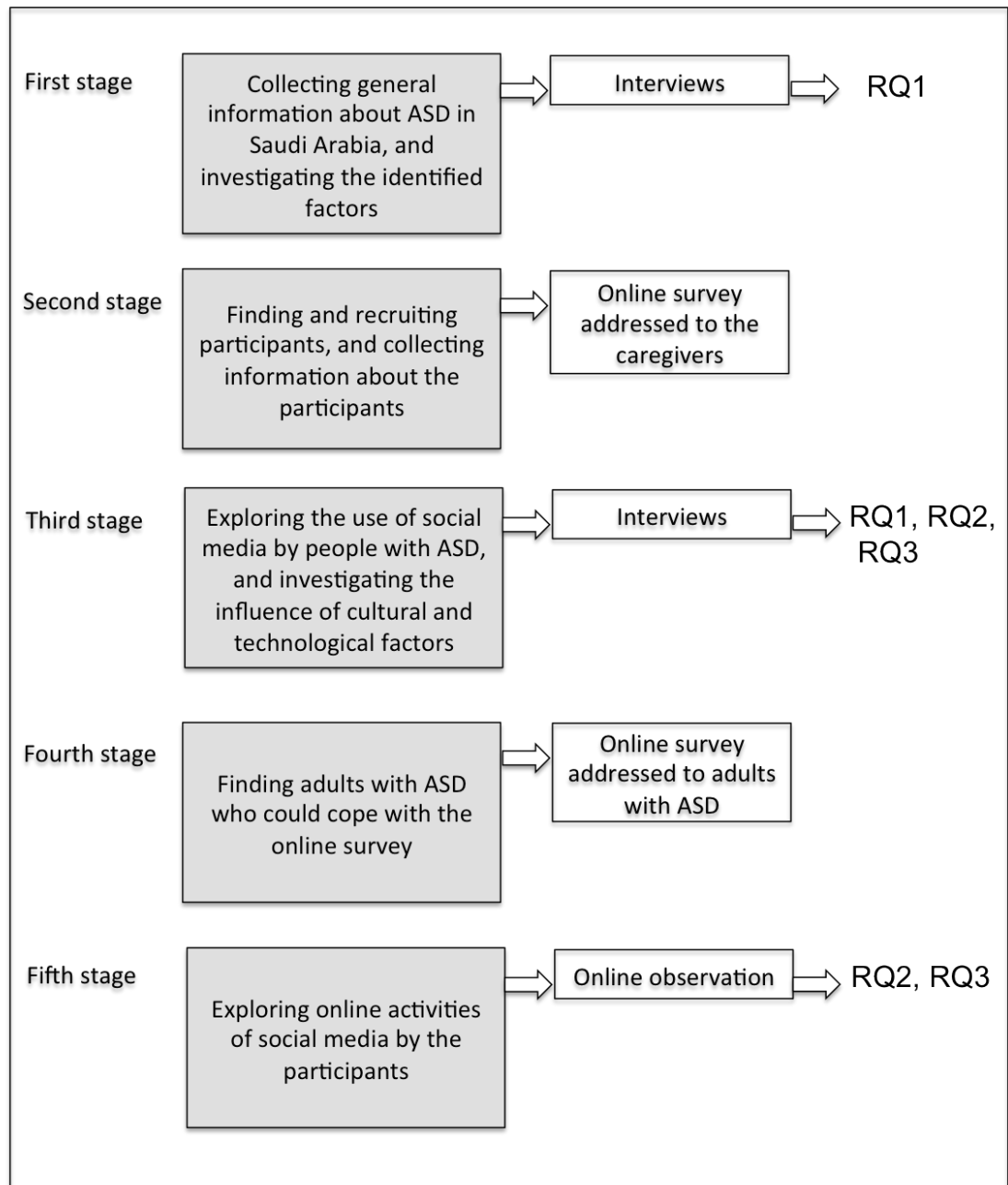


Figure 4.1 **Research methods for different stages of the research**

Each stage of the research used a different method, depending on the type of data required in order to answer the research questions. Table 4.1 shows the research questions, each assigned with the objectives required to answer the question, in addition to the methods used to collect the data required for reaching each objective.

Table 4.1 The Objectives of the Research Questions and the Data Collection Methods

Research questions	Objectives	Data collection method
RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?	Collecting general information about ASD services in Saudi Arabia.	Interviews with the experts
	Determining which cultural factors are important and could be limiting the use of technologies by individuals with ASD in Saudi Arabia	
	Evaluating the suggested cultural and technological factors in relation to Arab users with ASD.	Interviews with the adults with ASD
	Determining the extent to which these factors affect the usability and accessibility, and whether any of the factors prevent the users from using any features of the social network.	Interviews with the adults with ASD
RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?	Determining the extent to which individuals with ASD interact concerning photos on social networks via comments and conversations.	Interviews with the adults with ASD
		Online Observation
	How photos displayed on personal social media accounts can improve communication skills and family relations for Arab adults with ASD.	Online Observation
RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult	Supporting the identified factors of FAASCIT with Arab adults when using social media technologies and how these factors can affect their usability and sociability.	Interviews with the adults with ASD
		Online Observation
	Determining which factors have an influence on the usability of social	Online Observation

Research questions	Objectives	Data collection method
Arabs with ASD?	media technologies when evaluating the photos.	

4.3.1.1 Semi-Structured Interviews (with experts)

In order to obtain a wider insight into the status of ASD in Saudi Arabia, experts in the field of Autism were interviewed. In addition, three adults with ASD were interviewed. The interviews were audio-recorded, as this is an important part of a qualitative study (Silverman, 2006), which offers greater reliability to the data being collected, together with handwritten notes. Some of the factors identified in the FAASCIT framework are related to the formal services provided, which made interviewing these experts and specialists important, as they are aware of the problems facing individuals with ASD in Saudi Arabia. A detailed discussion about the interview method and findings is presented in Chapter 5. However, having the perspectives of the experts alone cannot be enough, as they see the reality from their perspectives and not from the perspectives of the individuals with ASD themselves. Both sets of perspectives were important for the current study.

4.3.1.2 Online Survey (for the caregivers)

As this research is about adult Arabs with ASD (high-functioning autism or Asperger syndrome), the target users are so specific that it was difficult to find participants easily. It is felt that this could be because adults with HFA or Asperger syndrome fail to receive support in the supportive centres, and due to the fact that they may have reasonable levels of literacy and an ability to communicate, with the potential to choose social media. Without having a special organisation or a centre, which would simplify gaining access to the specified sample, an online survey had to be undertaken in order to reach the caregivers and thus find the participants. The range was expanded to include other Arab countries in addition to Saudi Arabia, as individuals with ASD are hard to reach in Arab countries, because they could be hidden, undiagnosed or do not admit the disability (Nasr, 2008).

The implemented survey was directed to the caregivers in order to collect information about the participants, to help in the implementation of the study. This survey was used to select the participants for the further phases of the study. The questions also covered information regarding the use of social media and other questions related to the factors of FAASCIT. In Chapter 6, the survey method is discussed and detailed. After collecting the data from the surveys, the following steps were carried out and arranged with the participants who met the targeted requirements.

4.3.1.3 Semi-Structured Interviews (with adults with ASD)

This study was focused on the use of social media by Arab adults with ASD, the issues they face when using online social networks, and whether cultural rules and views could have an impact on the conversations over the use of photos and, particularly, on sociability via social networks. Before the implementation of the interviews, an existing social networking site had to be selected for the study. Figure 4.2, shows the main idea of the study's main components and their relationship.

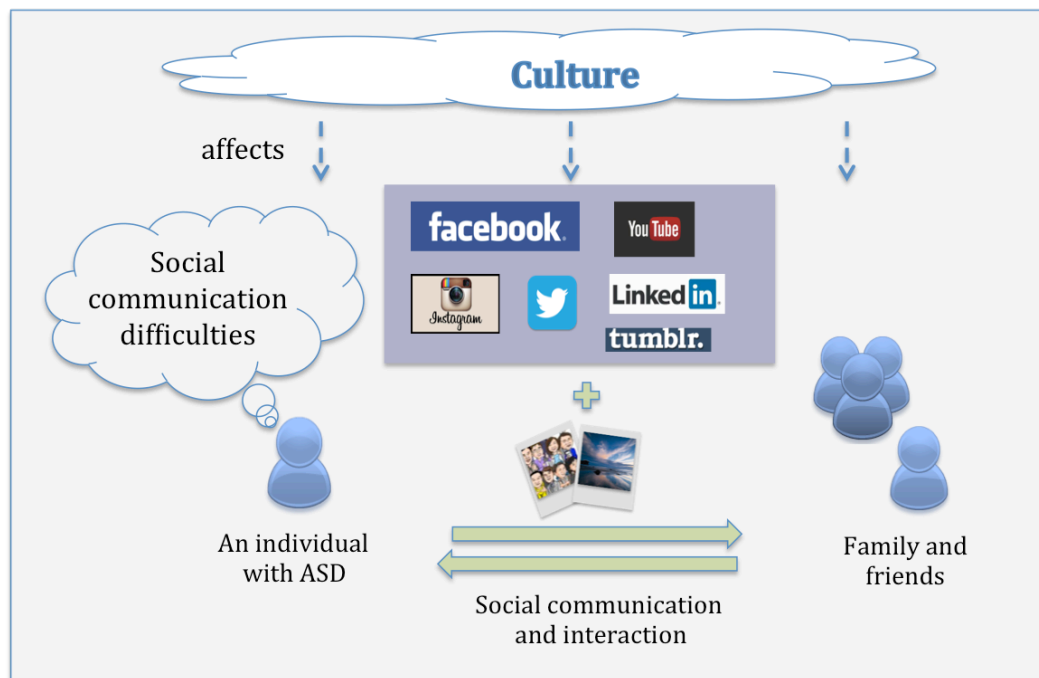


Figure 4.2 Main components and relationships of the research

Before deciding which social network would be used, the idea of creating a social network specific to the study and for the target users was considered. However, this idea was not pursued because due to the need for the individuals with ASD to be integrated into conversations with other people and to grow their communication links with a wider audience. It was felt that it was important not to segregate individuals with ASD and treat them differently, but rather to help them be part of society and within the same networks and community as everyone else. Moreover, having a special network for individuals with ASD may not attract all individuals with ASD in Arab countries, because, as mentioned before, in Arab countries people are more likely to hide their disability (Al-Gain & Al-Abdulwahab, 2002; Nasr, 2008). However, there remained the possibility that they would provide fake identities whether the social media was private or public.

Among the many available social media networks, it had been reported that Facebook was the most popular one worldwide, with a percentage of 71% of online adult users (Duggan & Smith, 2013). A study also showed that Facebook, Twitter, YouTube and LinkedIn were frequently used in Saudi Arabia in 2012, with around six million people using Facebook ("The State of," 2014). In addition, Facebook has an Arabic interface, which could be more useful for the participants, as Arabic is the first language in Saudi Arabia and some users might have insufficient knowledge of English, because teaching of this language in Saudi Arabia may not be as important in the curriculum as in other countries, where English is a second language (Khan, 2011). Twitter had three million users in Saudi Arabia in 2013 ("The State of," 2014) and also has an Arabic interface (Salem & Mourtada, 2012). With regard to the Arab world, in the *Arab Social Media Report* it has been reported that the percentage of Arab Facebook users was higher than the percentage of Twitter users (Salem & Mourtada, 2012) (see Figure 4.3). In 2015, it was reported that Facebook and WhatsApp²⁹ were the

²⁹ <http://www.whatsapp.com/>

WhatsApp "is a cross-platform mobile messaging app that allows you to exchange messages without having to pay for SMS. In addition to basic messaging WhatsApp users can create groups, send each other unlimited images, video and audio media messages".

most used social media applications in Saudi Arabia, with Facebook the most used across the Arab world ("Arab Social Media Report," 2015).

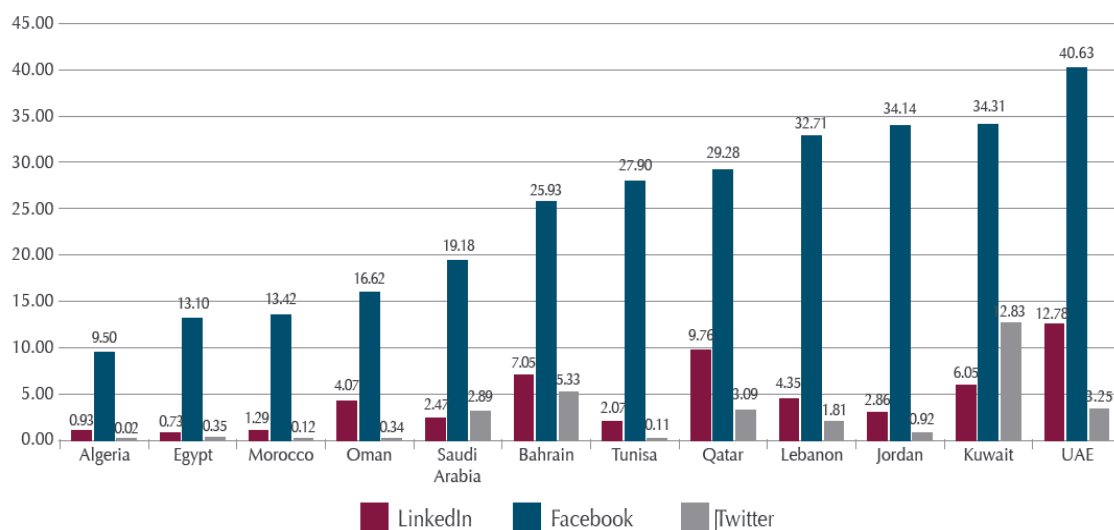


Figure 4.3 Penetration of Social Media Use in Selected Arab Countries at the beginning of the study (June 2012)³⁰

From the online surveys completed by the caregivers (see Section 6.2), it was shown that, when asked what social network site was being used by the person with ASD, none of the caregivers chose any social network from the list provided, nor even named any other site being used. Thus, it was concluded that none of the participants were using a social network, and it was proposed to use Facebook as the social network site for this research study, because it is available in Arabic and was the most widely used social media in Saudi Arabia, and as already mentioned has the potential to increase social skills. In addition, it gives the users the opportunity to add their personal information to their profiles, such as their occupation, their religious and political views and their interests, and it would be visible to the researcher. In addition, Facebook allows users to reveal their thoughts on their status and post photos, web links or videos on their pages and make them public to their friends or through a private messaging system or

³⁰ Arab Social Media Report (Salem & Mourtada, 2012).

instant messaging. It also allows users to 'like', 'comment' on and have discussions about the posted photos. This will help users to interact and communicate with each other, as it has been indicated that the 'like' feature on Facebook is a popular communication feature that helps people communicate online, which in turn strengthens offline friendships (Eftekhar, Fullwood, & Morris, 2014). Comments about photos also help users to stay in touch with their friends' interests and activities and could give users the opportunity for an extended conversation with other users (Mendelson & Papacharissi, 2010). Therefore, the implementation of the semi-structured interview questions for the adults with ASD was first designed based on Facebook.

After recruiting the participants, the individuals who were eligible to use social media, and who met the requirements, were interviewed. The interviews were casual one to one conversations with the participants, with the involvement of the caregivers for some of the interviews. However, during the interviews it became clear that some participants were aware of social media and used it in different ways and had different preferences, the focus had to be changed to include all social networks, depending on what each participant was using, and not only focused on Facebook. The suggested FAASCIT factors were taken into account, to determine whether they actually pose an issue or not for Arab individuals with ASD when using technology, and how aware the participants regarded these cultural issues. However, technological factors (see Table 3.1) could be out of the person's control, which means that these could have a different effect when measuring their influence on the communication and interaction aspects. A detailed description and analysis of these interviews is provided in Chapter 6.

4.3.1.4 Online Survey (for adults with ASD)

After interviewing the participants, there was a possibility that some adults who are eligible to answer the online survey by themselves might have been excluded, as reaching participants online was initially addressed to caregivers. Thus, in order to make sure that a wider group of relevant participants could be reached, another survey was implemented, asking adults with ASD to complete it online.

Three forms were completed, however, only one participant was eligible to be included in the study, as he was able to use social media. One form was completed by the caregiver, and the third individual was not happy to participate. Details of the data from the survey which included the one participant is presented in Section 7.4.

4.3.1.5 Online Social Networks Observation (participants using social media)

As it was required to investigate the use social media technologies in relation to visual displays (photographs) and the comments on these photos by the participants, observing the online account of the participants was considered. This method for collecting additional data was conducted to assure the reliability and validity of the results from previous stages. The observation focused on how comments, tags and conversations about a photo represented on a social media network affect family relations among Arab adults with ASD and improves their social and communication skills, as well as the extent to which cultural and traditional factors were involved in situations regarding the images and regarding the network in general. However, the limitation of this method was that not all accounts are public and some participants could not be observed online, as they did not have an online account to be observed or they did not use social media regularly. However, five of the participants were using social media and their accounts could be observed, they had different uses and preferences of social networks, and there was one girl within this group who also allowed her activities to be observed. The details regarding the observational stage can be found in Chapter 7.

4.3.2 Sampling

The required participants for this study were Arabs with ASD (high-functioning or Asperger Syndrome). The age range was from 15 years and older and from both genders. Ethical approval for interviewing adults and adolescent participants was given from the University of Southampton (ref ID= ERGO/FPSE/11614 & ERGO/FPSE/6030), and caregivers were accommodating the participants during the interviews, see section 4.7. High functioning adults

with ASD in general are hard to reach, as their condition may not be visible to the society (Simm et al., 2014). It was also challenging in Saudi Arabia as not only their invisible condition was the issue, but also for the fact that some could be hidden or could be not diagnosed, as mentioned earlier (Nasr, 2008). Because of the sensitivity of the topic and the limited number of the defined population who are not hidden, a Snowball or Chain sampling technique was used (Bricki & Green, 2007; Browne, 2005; Patton, 1990). This technique is used when the research requires specific individuals or groups which cannot be easily found within the society (Browne, 2005). However, a disadvantage of this technique could be that people who are not within the friendship group could be excluded (Browne, 2005), therefore, an online survey was also implemented to reach more people. However, finding the participants for the study, with the required number of cases, was a major challenge, when trying to recruit the participants, and some caregivers were hard to deal with. For example, a mother who also works and owns a centre for autism refused to be interviewed as a specialist, claiming that she had no time, after spending an hour discussing different subjects, and even though there was an appointment set in advance. She asked to have the interview questions sent to her by email, however, she ignored the email and the phone calls, and so there was no chance of interviewing her son. Another caregiver agreed for her sister to be interviewed; however, after the researcher arranged the time and travelled to the city that they live in, she cancelled without notice. While it is of course acceptable for participants to withdraw at any stage without giving a reason, these failures to communicate or cooperate inevitably had an impact on the overall scale of data collection.

In short, it was very hard to reach participants, as the majority of caregivers did not respond to emails, or text messages, so phone calls were the best way to reach them, but it was also challenging to obtain the phone numbers. In addition, not all people who were called were open to the idea of their son or daughter being interviewed and some ignored further calls. Some autism centres on the other hand said that “families are tired of filling surveys, and asked what would they receive in return when participating”; what they meant was a tangible device or a method to be used by individuals with ASD. At the end some

participants with ASD were reached via some personal contacts or via the experts who were interviewed in the first stage of this research, while others were reached by the online surveys implemented in the second stage as will be explained.

For the first stage, the required sample consisted of experts or specialists in the field of autism, who were contacted by finding autism support centres in different areas of Saudi Arabia, and calling them to arrange an interview. However, finding adults with ASD was also considered, but the number was limited at this stage, as the centres did not have the target sample for the study. Twelve experts were interviewed from 11 centres in Saudi Arabia, and only three adults with ASD. At the second stage, an online survey was designed and distributed online on different social media networks, such as Twitter, Facebook and WhatsApp, in order to recruit participants. It was also sent to people by text messages and emails. The target users for completing the survey were the caregivers, in order to reach the sample for my research. These approaches were not limited to finding participants in Saudi Arabia only, but the survey was also sent to organizations and groups in other Arab countries, such as Kuwait, Jordan and the UAE. However, as there was no personal contact with people in the other countries, the participants who could be reached were only from Saudi Arabia.

When starting the interviews in the third stage, recruitment of participants continued to be carried out until the end of the interviewing stage. Further caregivers were contacted via the initial caregivers who were reached previously, and well-known people in the field of autism were also been contacted for assistance in reaching participants. At this stage 13 participants were interviewed. Stage four in the study was implemented after finishing the interview stage; the purpose was to find the participants who might have been able to respond to the survey by themselves and not via the caregivers. Only three participants completed the online survey, but only one was eligible for this study, as will be discussed in Section 7.4.

4.3.3 Evaluation Approach

It has been identified by other studies that, although there are many methods for measuring and evaluating usability, there is no specific framework designed for each method (Seffah, Donyaee, Kline, & Padda, 2006), in addition to the absence of defined metrics of online social interaction or user experience (Shankar, 2011). Therefore, in this current study the Goal Question Metric (GQM) technique was proposed to be used, in order to define what data to be collected. This goal-oriented measurement technique was promoted by Basili (1992), for the purpose of defining a number of goals for a specific project that would be evaluated by using metrics. The metrics can be objective such as time or number of errors, or it may be subjective where there is no exact measurement such as experience or usability (Basili, 1993; Wohlin et al., 2012). In this research, the aim of using of the GQM procedure was to evaluate the factors of FAASCIT. Prior to the interviews, the metrics were identified to be objective, as it was planned to ask the participants to complete a number of tasks on Facebook, and to measure for example the time and number of attempts. However, as mentioned the questions had to be changed, and the interviews focused on investigating the use of different social networks used by the participants. But as circumstances changed in the latter part of the research this approach was not considered a good fit, and has therefore not been used as prescribed by Basili (1992), but as a method to define the data to be collected.

The structure of the GQM approach is a hierarchal top-down structure, starting with a main goal that can be divided into sub-goals (Basili, 1993). Each goal is defined by a question or a set of questions, and these questions are to be answered by a set of metrics (Basili, 1993), as shown in Figure 4.4.

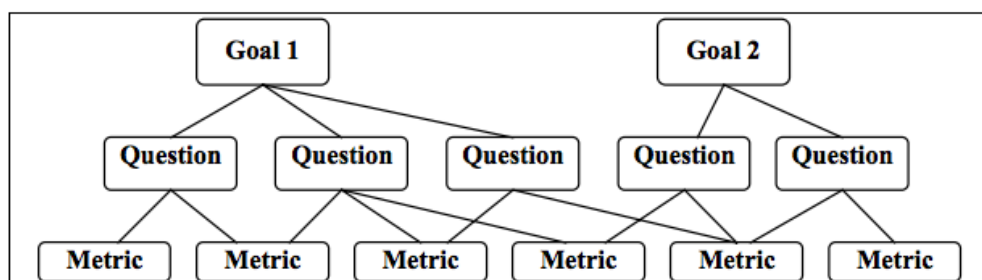


Figure 4.4 Goal/Question/Metric approach

This approach has been adapted in this current study for data collection, by setting each factor of FAASCIT as a goal, and identifying what questions will help in supporting the goal, and then metrics were allocated to define what data to be collected for answering the questions and reaching the required factor. This approach had been used for identifying the data to be collected in the interviews presented in Chapter 5 and 6, and in Chapter 7.

4.3.4 Data Analysis

To analyse the collected data from the interviews and surveys, thematic and content analysis were used, by coding the data into themes using Nvivo software. After transcribing and translating the data. The themes were identified deductively from the data, and were related to the cultural factors from the FAASCIT framework. However additional aspects, which emerged during the data collation process, were reached inductively. Data Analysis of each collection method is described in the related following chapters.

Figure 4.5, shows the whole overview of the methodology and the steps starting from the literature review, then forming the framework (FAASCIT), the research questions and the different methods used for answering the research questions.

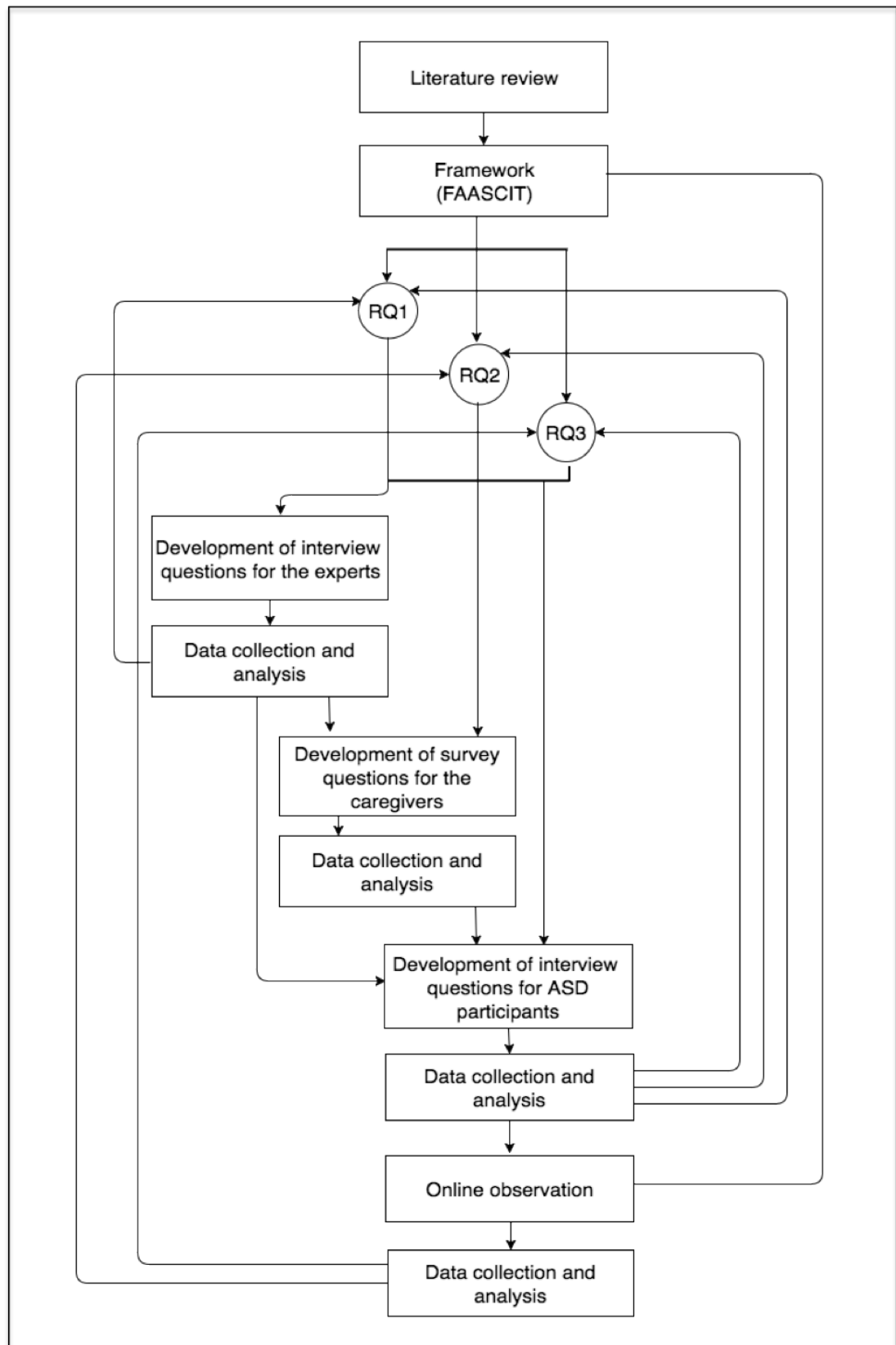


Figure 4.5 Research methodology diagram

4.3.5 The Inclusive Design

Designing technologies which are suitable and accessible for everyone is a goal to achieve by developers and designers. As described in Chapter 1, an inclusive design tool kit was designed by the University of Cambridge, to help researchers, developers and designers to achieve the goal. The design includes several phases (Manage, Explore, Create and Evaluate), see Figure 2.1. This research contributed in adding knowledge and covering the 'Explore' phase, which includes (create stakeholder map, observe users, generate personas, describe user journeys and capture needs list) activities. These activities have been covered in this research apart from 'Generating personas'. Figure 4.6, shows in which parts each activity was covered in the current study.

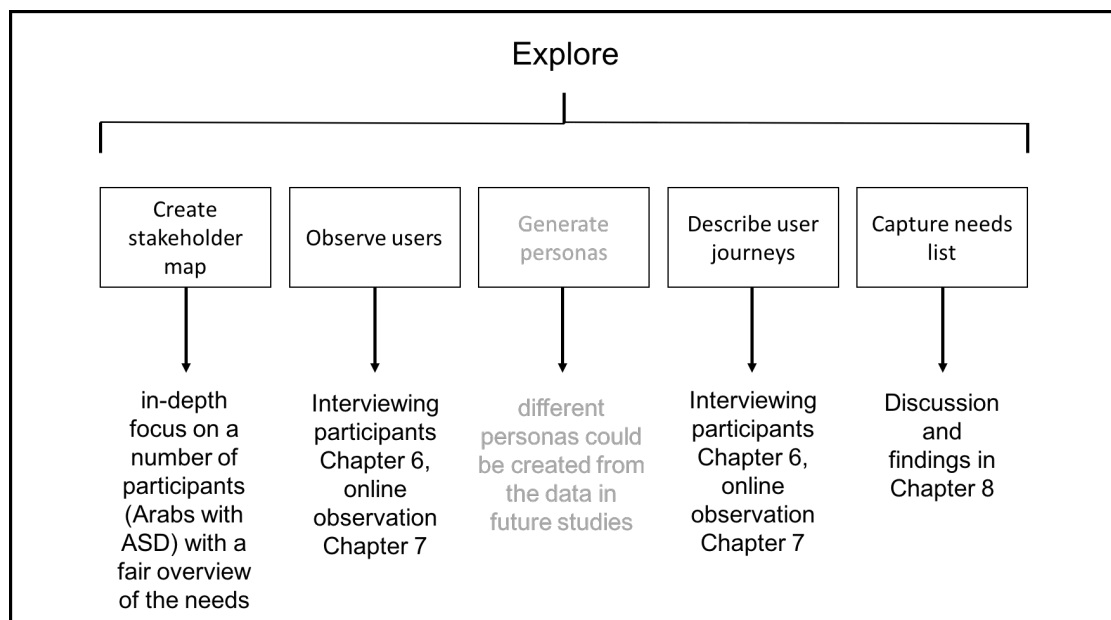


Figure 4.6 Addressing the 'Explore' phase of the Inclusive Design

The study focused in-depth on a number of participants (Arabs with ASD), which were considered as the 'stakeholders' for the investigated design, with some differences and similarities in their needs, which could also give a fair overview of the needs for this focused group, and different personas could be created from the data provided in this study to follow up in future studies. In regards to the 'Observe users and Describe user journey', these are covered in interviewing the

participants and the online observation in Chapters 6 and 7, by investigating the users needs and activities when using social networks. 'Capturing the needs list' is covered in the dissection and findings in Chapter 8. By considering these activities for Arab adults with ASD, it will help in providing developers with useful information regarding this group that would help in updating existing social media to include this group, and also include their needs in other upcoming social technologies. Moreover, simulating different ideas and developing contextualised concepts for technology use has been addressed through the creation of the FAASCIT framework. Other phases for building and applying the inclusive design framework can be implemented as future work.

4.4 Ethical Issues

4.4.1 Ethics Committee Approval

This study was approved by The University of Southampton Research Ethics Committee under the study's reference (ID= ERGO/FPSE/11614 & ERGO/FPSE/6030), and compliance with the University of Southampton's data management policy³¹ was established, before starting the fieldwork.

4.4.2 Potential Ethical Issues

Questions had to be asked carefully, avoiding causing depression and anxiety, which could affect the person during the interview or even afterwards (Bricki & Green, 2007). As this study is about adults with ASD, it was taken into account that both participants and also their caregivers could be sensitive regarding speaking about ASD diagnoses, as mentioned before that some parents have experienced a stigma toward ASD (Nasr, 2008; Woodgate, Ateah, & Secco, 2008). Ethical issues were a concern during the implementation of this study, in terms of

³¹ <http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html>

privacy and confidentiality. The participants were given the choice of providing their names or not, as some people could be sensitive about talking openly about autism diagnoses. They were informed that the personal data would be anonymous. It was essential that the interview venue and time was suitable for the participant and agreed by the caregiver, as it was important to make sure that the participant was relaxed and willing to complete the interview. In addition, there were some other concerns, such as having the consent of the caregiver, the adult participant or both and also having the participants' permission before seeing any of their personal social media accounts. Additionally, enabling the own voice of individuals with ASD to be heard is important in research (Brownlow & O'Dell, 2002), so interviews were directed to the participants themselves, to make sure the collected data represent their views and ideas; however, caregivers were also involved during the interview, if required. Additionally, issues regarding online research and vulnerability issues were a concern, so it was appropriate to consider getting the permission from the caregiver before asking the participants to go online. Besides these issues, it was important to make sure that the research was benefiting the participants, which could be by helping them using social media and by listening and viewing their perspectives, and that it would not do any harm to them or anyone else (Sharf, 1999, p.253).

4.4.3 Informed Consent Form and Information Sheet

For the first stage of the research, experts and the caregivers of the three interviewed participants with ASD were contacted in advance. Before starting the interview, they were given a '*participant information sheet*' and were asked to sign a '*consent form*' to confirm their agreement to participate. The information sheet and the consent forms were part of the required ethical approval application by the University of Southampton. The '*participant information sheet*' described the idea of the study with all the details related to the interview, such as the time, the audio-recording process and the confidentiality of the data; one version was for the participants with ASD, and the other version for the

caregivers (see Appendix A). The '*consent form*' asked for their confirmation to participate in the study, their agreement to the recording and informed them that participation was voluntary (see Appendix B). They were also informed that if a participant changed his or her mind for any reason or was not able to complete the study, they had the right to withdraw from the study.

For the subsequent stages of the study, the online survey was created using the survey system of the University of Southampton, 'iSurvey', and the participants completing the survey were asked for their consent on the survey welcoming page (see Appendix C). Within the survey, the caregivers of the participants were asked if they agreed for the participant to be interviewed in the next stage. The participants and their caregivers were given an explanation of what the interview would be about and were also given the participant information sheet as well. Caregivers signed the consent form on behalf of the participants, when the participants are not capable of giving consent for themselves.

4.4.4 Confidentiality

Information collected from the participants was saved securely. All data were anonymised, and saved on a secure computer or a locked cabinet. After the completion of the research the data will be destroyed in line with the University of Southampton's data retention policy.

4.5 Summary

This chapter has described the methodology followed for conducting this PhD study. It first described the main worldview philosophical concepts in research, and explained the reason for following the *interpretive* philosophical overview, which is the approach more often used in qualitative research. This research is a descriptive qualitative study, as the goal was to focus on a specific group, which is adults with ASD, in a specific context, which is Saudi Arabia, and the cultural factors that may apply for this specific group regarding online social network use. A snowball sampling technique was applied in recruiting these hard-to-reach

participants, in addition to distributing online surveys to a wider potential group. The different research methods used for collecting the data in this study have also been explained and are described in more detail in the following chapters.

Chapter 5

Collecting General Information about ASD in Saudi Arabia

This stage of the research was important for understanding more about the specific contexts of technology use for adult Arabs with autism in Saudi Arabia. For this stage, the research was operationalised by the implementation of interviews. A number of autism support and research centres in Saudi Arabia were visited in order to obtain an overview regarding the main status of ASD around the country, and how adults on the autistic spectrum were living and supported. In addition, the interviews were considered as part of the process of answering the first research question of this thesis:

RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?

As mentioned in Chapter 4, these interviews were conducted to meet the following objectives in this research:

- Collecting general information about ASD services in Saudi Arabia.
- Determining which cultural and technological factors are important and could be limiting the use of technologies by individuals with ASD in Saudi Arabia.

5.1 Interviews

Twelve specialists in the field of ASD and three adults with ASD were interviewed. It was important to see the services that centres provide to adults with ASD and to examine the factors identified in the FAASCIT framework from the perspectives of these local experts. Table 5.1 presents the Goal/Question/Metric (GQM) approach designed, identifying what data to be collected for exploring the factors of FAASCIT at this stage.

Table 5.1 **GQM approach for collecting the data regarding the factors of FAASCIT**
(Interviews with experts and ASD participants)

Goal (Factors from FAASCIT)	Questions (To achieve the goals)	Metric	
		(Identifying what data to collect from the experts)	(Identifying what data to collect from ASD individuals)
Internet access	Is the Internet available and easy to access for individuals with ASD in Saudi Arabia? Do supportive autism centres provide Internet for the individuals with ASD?	- Internet availability at autism support and research centres - Internet usage restrictions for individuals with ASD at the centres	- Availability of Internet at home
Language medium of technologies	Are individuals with ASD in Saudi Arabia using social skills and communication technologies? Are adults with ASD in Saudi Arabia facing difficulties with the language when using technologies?	- Language used at the autism supportive centres - Technologies used at the centres by individuals with ASD	- Language used when using technologies by the individuals with ASD
Digital literacy	Are adults with ASD in Saudi Arabia acknowledgeable regarding the use of computers and the different functionality?	- Technologies used at the centres by individuals with ASD	- The use of social networks - Technology used by adults with ASD - Communication method used by adults with ASD - Having an email account - Understanding Arabizi by adults with ASD

Education	Are adults with ASD in Saudi Arabia receiving proper education to reach the standard level of literacy?	<ul style="list-style-type: none"> - Cost of joining the centre - Age accepted at support autism centres 	-Education received by the participants
Spoken language	Does the lack of English language cause any barrier for understanding and using the technology?	- Language used at centres for communicating with individuals with ASD	- The ability to understand English
Social rules	<p>What rules are applied at centres regarding communication and interaction between genders?</p> <p>Are individuals with ASD in Saudi Arabia aware of or taught cultural rules?</p>	<ul style="list-style-type: none"> -Age of attendees at centres - The gender of attendees at the centres - Age of segregation at the centres 	- Participant's interaction
Conservatism	<p>Are individuals with ASD in Saudi Arabia conservative about the ASD diagnosis?</p> <p>Do parents accept the diagnoses of their children?</p>	- Parents accepting or denying ASD diagnosis	- Online representation
Music	Does the use of music present a problem for individuals with ASD in Saudi Arabia when using technology?	- The use of music at the centres	- The view of the participants and the caregivers towards music

At this stage the use of social media by adults with ASD was not addressed in any depth as this focus was planned for the subsequent stages of research. This first stage was intended to explore the more general, service- and culture-related aspects of FAASCIT, although some brief insights about social media were reported from the participants with ASD. Social media, and other factors in FAASCIT are explored in more depth in Chapter 6.

Two types of interviews were designed, each specified for a particular group of participants: (1) a group of experts or staff members specialising in the field of autism and (2) a group of adults or adolescents (15 years old or older) with ASD. The questions were semi-structured questions. Table 5.2 illustrates the questions asked to the experts, and Table 5.3 illustrates questions asked to the three individuals with ASD.

Table 5.2 Interview questions asked to the experts and/or specialists in the field of Autism

Questions for experts
What is the age range of people joining the centre?
Is the centre for males, females or both?
If it is for both genders, what is the age of separating males and females in the centre?
Is the centre for several types of disabilities or is it only for individuals with ASD?
What is the number of individuals joining the centre each year?
What is the number of individuals with Autism Spectrum Disorder (ASD) joining the centre each year?
What is the number of adults with ASD in the centre?
What language is used for communication in the centre (Arabic/ English/ or both)?
Is the Internet available in the centre to be used by students?
What is the background degree subject of the teachers at the centre?
What technologies are individuals with ASD in the centre using to improve their social and communication skills (Hardware/Software)?
Does the centre teach or allow individuals with ASD in the centre to use social media?
Do individuals with ASD use social media in their own time?
What does the centre use for development of communication and interaction skills?
Is the centre private or public? How much does it cost per year for joining the centre?
Does the centre face problems with parents accepting the fact that their child is diagnosed with ASD?
Does it make a difference if the parents are educated or not?
Does the centre find problems with individuals with ASD regarding different Arabic accents?

Does the centre face problems with individuals with ASD and their caregivers regarding the use of music?

Table 5.3 **Interview questions addressed to the adults with ASD**

Questions for adults with ASD
What is your age?
Gender?
What language/s do you speak?
What is your level of education?
Are you employed?
Do you have Internet connection at home?
Do you have an email?
What types of technologies do you use (hardware)?
What types of technologies do you use (software)?
Do you add your personal pictures or information online?
What language do you use with the technology?
Do you know Arabizi? Can you read the example?
How are you using the technologies? (I will ask the participant to show me how he/she uses the technology if possible).
What do you prefer to use for interacting with other people?
What technologies are you using to improve your social and communication skills?
Do you like listening to music?

The flexibility of semi-structured interviews was useful in this study, as it gave interviewees the freedom to explain and discuss their thoughts; in addition, the conversational aspect allowed greater depth regarding the proposed issues. The interview questions were open-ended. However, some questions were modified during the interviews, and some were not asked depending on the interviewee and the situation. Interviewees were given the opportunity to speak as much as they wanted; some provided detailed answers, while others were very precise

and straightforward. In Table 5.4, the main interview questions are listed and grouped under different categories according to the main factors that being considered.

Table 5.4 **Mapping Interview Questions to FAASCIT factors**

Factor	Questions for the experts	Questions for the adults with ASD
Internet Access	Is the Internet available in the centre to be used by students?	Do you have Internet connection at home?
Language medium of technologies	What technologies are individuals with ASD in the centre using for improving their social and communication skills (Hardware/Software)? What language are you using for communication in the centre (Arabic/English/both)?	What language do you use with the technology?
Digital literacy	What technologies are individuals with ASD in the centre using for improving their social and communication skills (Hardware/Software)? Do individuals use social media in their own time? What do they use for communication and interaction skill development?	What types of technologies are you using (hardware/software)? Do you have an email account? Do you use social media technologies? What method do you prefer to use for interacting with other people? How are you using the technologies? Do you know Arabizi? Can you read the example?
Education	What is the age range of people joining the centre? Is the centre for several types of disabilities, or is it only for individuals with	What is your level of education? Are you employed?

Factor	Questions for the experts	Questions for the adults with ASD
	<p>ASD?</p> <p>How many adults with ASD are in the centre?</p> <p>How many individuals with autism spectrum disorder (ASD) join the centre each year?</p> <p>What are the majors of the teachers at the centre?</p> <p>Is the centre private or public? How much does it cost per year to join the centre?</p>	
Spoken language and accents	<p>What language are you using for communication in the centre (Arabic/English/both)?</p> <p>Do you find problems with different accents?</p>	What languages do you speak?
Social rules	<p>Is the centre is for both genders, what is the age at males and females are separated?</p> <p>Is the centre for males, females or both?</p>	--
Conservatism	<p>Do you face problems with parents accepting the fact that their child is diagnosed with ASD?</p> <p>Does it make a difference if the parents are educated or not?</p>	Do you post your personal photos or information online?
Music	Do you face problems with the students regarding music?	Do you like listening to music?

Twelve staff members and experts participated in this contextual review from eleven centres in different Saudi Arabian cities. Five of the centres were in Jeddah, a city in the western part of the country, and three were in Riyadh, the capital city of Saudi Arabia, located in the middle of the country. One centre was in Makkah, and one was in Al-Madinah; both are holy cities in Saudi Arabia and located in the western part of the country, where people may be stricter regarding their religious views. One of the centres was in Dammam, located in the eastern region of Saudi Arabia. Table 5.5 lists the age range and the gender of the individuals with ASD at each centre. It shows that only three centres actually accept adults with ASD. One centre stops providing services at the age of 14, and one stops at the age of 16. All the other centres are only for children and do not have any facilities to support adults.

Table 5.5 **Age range and gender at centres in Saudi Arabia**

Centre	City	Gender	Age
Centre A	Makkah	Both	3–any age
Centre B	Al-Madinah	Male only	5–20 or any age
Centre C	Jeddah	Both	3.8–16
Centre D	Jeddah	Both	2–9
Centre E	Jeddah	Both	any age–14
Centre F	Jeddah	Both	0–any age
Centre G	Jeddah	Both	1–12
Centre H	Riyadh	Both	Boys: 4–8 Girls: 4–13 Vocational rehabilitation: boys 9–20
Centre I	Riyadh	Both	Depends on the study they are implementing (research centre) Main age is 4–9
Centre J	Riyadh	Both	Depends on the study they are implementing (research centre) All are young children now
Centre K	Dammam	Both	3–8

The aim of including centres in different cities was to gain insight into the potential cultural and social differences between the different regions that could affect the usability of social media technologies, such as rules for communication with the opposite gender, personal information restrictions, rules about using social media, language and accent differences and family relationships.

With regard to the interviewees, eleven of the experts were female, from centres in Makkah, Jeddah, Riyadh and Dammam, and the only male expert was from the centre in Al-Madinah. Additionally, three participants with ASD were interviewed. These were male adults, aged 20, 21 and 24, respectively. Two of the participants were from Jeddah, and the third was from Riyadh. The experts were contacted personally by phone, and a one-to-one interview time was arranged, and the interviews took place at the centres in Makkah, Jeddah and Riyadh. One of the experts from Dammam was interviewed by phone, and another, the male participant, answered the questions and emailed the answers back along with the signed consent form. Using telephone or online resources for interviews can save time and simplify reachability (Robson, 2002). In regard to the adults with ASD, each participant was supported by either a parent or a teacher.

An audio recorder was used to record all the interviews, which were transcribed afterwards. Some notes were also taken during the interviews. Most of the interviews were in Arabic, and they were translated into English in preparation for the analysis. The interviews were analysed using content and thematic analysis. After translating the interviews into English, they were saved as document files and imported into Nvivo software as internal sources for the data analysis, to organise and categorise the data appropriately.

5.2 Analysing the collected Data

For the next step, data from the transcripts were coded and categorised under different 'nodes', a feature of NVivo. Each node represents a theme; the themes were identified according to the factors from FAASCIT, this categorisation is shown in Figure 5.1. The use of NVivo simplified accessing and categorising the data under a specific theme. It also helped in organising the data.

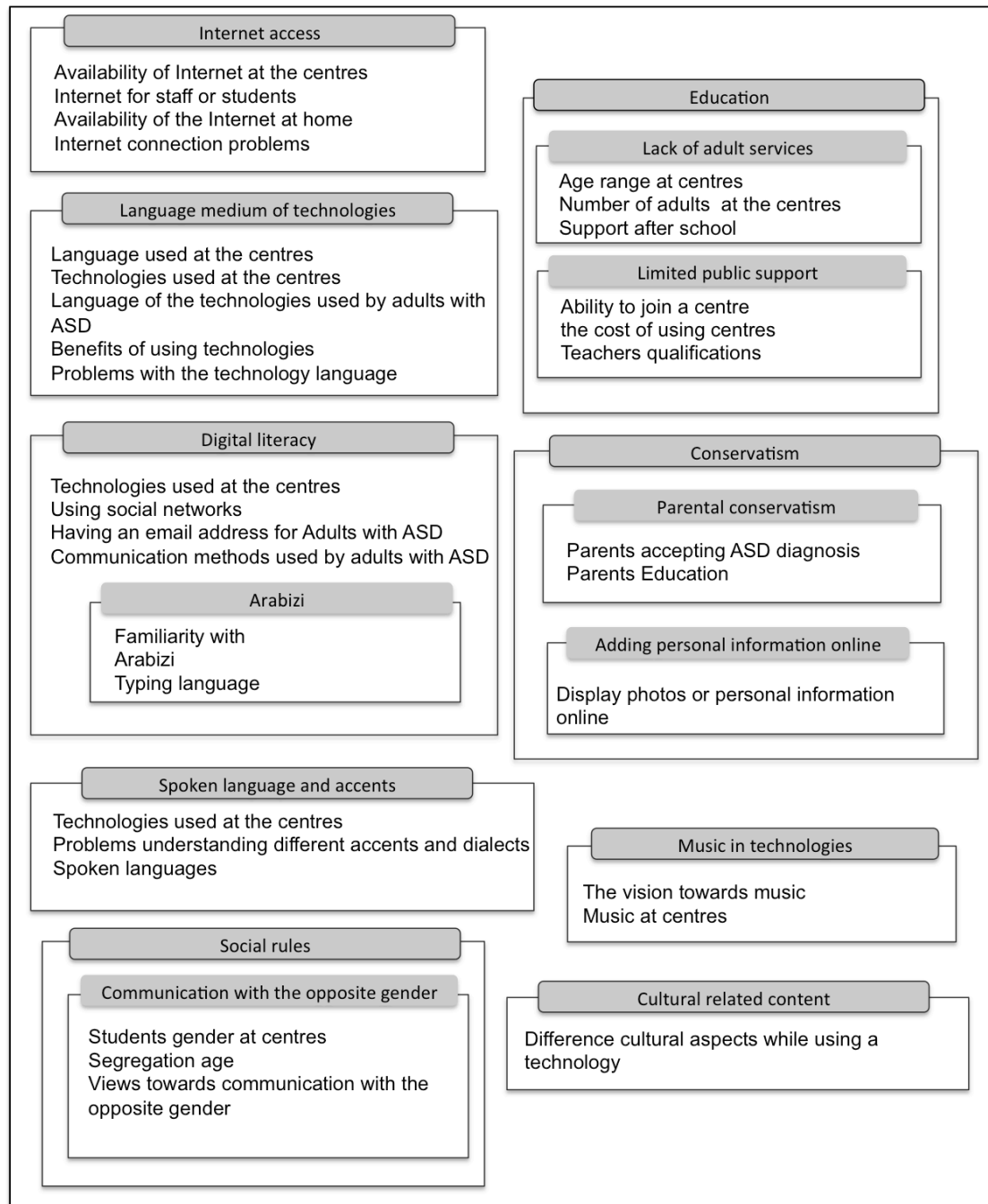


Figure 5.1 **Thematic Analysis: Coding the data under the themes**

In addition, Table 5.6 shows the content analysis for the occurrence of issues relating to the factors that were mentioned during the interviews, to support the FAASCIT identified factors. Using content analysis helped in the reduction of the collected data, and ensured the themes were more focused on the factors for the FAASCIT, and it was a useful method for analysing the data and interpreting the meaning of the data (Elo & Kyngäs, 2008; Elo et al., 2014). In addition, content

analysis was used to ensure the trustworthiness of the data in this study (Elo et al., 2014).

Table 5.6 Content Analysis: The number of experts or participants facing issues regarding the factors

Factors	Sub-category	Number of experts/participants affected by the factor
Internet access	Limited internet access at autism supportive centres for attendances	3
	Limited internet access at autism research centres for attendances	2
	Poor Internet connection	1
Language medium of technologies	Arabic speaking and Arabic technologies used only	6
	Lack of technologies in Arabic	5
	Issues with changing the language at home	1
	Issues when using English technologies	1
Digital literacy	Inability to recognise social media accounts	1
	Do not have an email address	2
	Unfamiliar with Arabizi	2
Cultural related content in technologies	Cultural differences in technologies	1
Education	No services provided for adults	7
	Teachers from different background degrees	2
Spoken language and accents	Issues with different accents or dialects	2
Conservatism	Educated parents are more likely to deny ASD diagnosis	5
Music	Religious issues towards music	3

Figure 5.2 shows the factors of FAASCIT from Table 3.1 in Chapter 3, covered during the interviews at this stage. The factors coloured in grey are the factors

that were investigated at this stage, and the white factors are the ones, which have not been yet investigated at this stage.

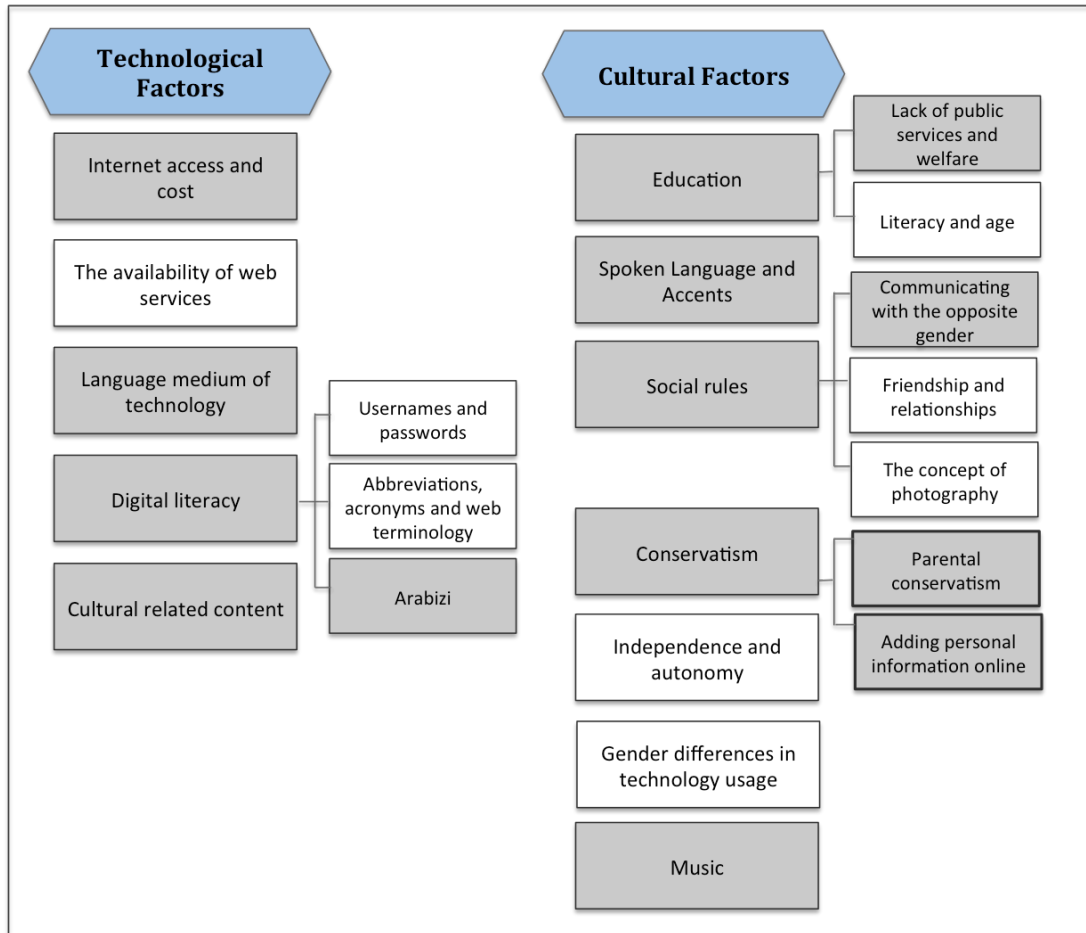


Figure 5.2 The factors explored from FAASCIT at the first stage

5.3 Findings and Discussion

In the following sections the data collected from the interviews are discussed. Some sections provide more details, depending on the amount of discussion of each factor during the interviews.

5.3.1 Interviews with Experts

Technological Factors

5.3.1.1 Internet Access

Centres B, C, F, H and K allowed children to access the Internet and go online during computer classes. The specialist at Centre E believed that children should be able to use the Internet, as it is their right to do so. She stated:

‘Children use the Internet, they go online, they go on YouTube, they watch their favourite cartoons and they also have educational programs for teaching reading online called Headsprout [it is now called Mimio], which was developed by a behaviour analyst’.

In contrast, Centres A, D and G did not provide Internet access for the children. Even if there was Internet access at the centre, it was for staff use only. Centres J and I acted more as research centres, and they did not provide Internet access for the children; however, Centre J offered a service to download useful educational apps on the children’s tablets. At Centre A, they had a child with high cognitive abilities, and he always tried to access the Internet by starting to type “www...”; when he realised that it was not working, he became anxious. At the centre, teachers had thought of offering the Internet only for him because he desired to use the Internet, and his English was good, but for various reasons, they did not offer Internet access for the children. One of these reasons was that Internet access could be cut off at any time, as they did not have good Internet access at the centre, or it could happen due to power outages. The specialist reported:

‘Providing the Internet with poor access and speed could drive the child to exhibit greater behaviour problems. We decided to explain to him that, at the centre, there is no Internet and that he only has access at home’.

However, using the Internet and satisfying the children’s desire could be more motivating and beneficial for those with ASD, and it could help them in improving

some of their skills. Preventing the students from using the Internet or accessing technologies could be a reason for their limited digital literacy in the future.

5.3.1.2 Language Medium of Technologies

Most of the available technologies are in English, which could be a problem for people who do not speak or understand English. An overview of what language was used for communication at each centre was covered during the interviews, as the interviewees were asked whether the centre uses only Arabic, only English or both. Four of the centres (E, F, G and J) had both Arabic and English sections; children who spoke Arabic joined the Arabic section, and children who spoke English joined the English section. The other centres used only Arabic and did not have any English sessions. This required them to use Arabic programs to teach the children the skills they need.

It was reported by Centres C, E, I, J and K that there is a lack of technologies for individuals with ASD in the Arabic language. However, they were using existing apps which could help in teaching Arabic speaking children; for example, at Centre J, they used 'matching and naming' apps to teach the Arabic-speaking children vocabulary. They also used an app called iCommunication for Arabic-speaking children; this app allows the users to add the pictures they like and a recording for each picture. This helps them to learn words that are suitable for their culture and in their spoken language. The specialist from Centre E mentioned that they use a software package in Arabic called Alnoraniyah but, unfortunately, it only teaches letters without any further teaching of the language, and there are no animations or visual features that could be useful for the child.

The specialist at Centre E also reported that she recommended that parents choose the English section at the centre for their child. This would mostly result in giving up the Arabic language in general, as the child would mainly understand and learn English. The specialist at Centre I reported knowing that many families had to change languages for their child to English, and even at home, they tried to change their language, as a result of the lack of Arabic technologies for individuals with ASD. This claim by the specialist will be considered during the

further implementation of the study, to support the claim and to determine the extent to which this situation applies. However, it has been noted that, generally, in Saudi Arabia and in some other Arab countries, some people tend to speak and communicate in English more often instead of Arabic, even at home, for the sake of appearing trendier (Kalban, 2007).

On a blog post regarding bilingualism and autism, the writer referred to a study by Kremer-Sadlik (2005), who indicated that giving up the mother language of a child with ASD could cause difficulties for the child when communicating with the family and possibly prevent him/her from integrating into the family's conversations. In addition, Mumy (2013), reported that the native language is mostly the language that the child will be more efficient and stronger in using, as communicating with the parents is easier using the native language no matter how familiar they are with the community language, especially when it comes to grammar skills and vocabulary.

Kremer-Sadlik (2005) also points out that children with autism could be bilingual and have more vocabulary compared to monolingual children. Moreover, Peña (2013) views that there could be a difference between children learning a second language at an early age and children learning a second language at a later age, as well as in how they can explore the new language and maintain and develop the first language. Peña's (2013) view suggests that the advice of the specialist at Centre E would be more suitable for children who are young and can more easily learn a new language, but if the child is at an older age, the centre should use the language that the child is more familiar with. This is not an easy choice for all families: although the use of English is becoming more common in Saudi Arabia, Arabic is still the first language, and it is generally used everywhere.

The specialist interviewed from Centre I was working on a project to develop the Arabic version of 'Tap to Talk', an augmentative and alternative communication (AAC) app, which is 'a portable and customisable communication app for autism, Down syndrome, apraxia, cerebral palsy, aphasia and any non-verbal condition,

suitable for all ages and with all languages'³². This app was evaluated later by Al-Wakeel et al. (2015), as mentioned in Section 2.3.2. It was stated by the interviewee, who was the project developer, that:

'We conducted the study on 50 children; from the pilot study, we concluded that children who may benefit from the Arabic version are the children who are not mentally retarded, who do not have ADHD, who are not hyper active and who have cooperative parents'.

She also claimed that the app yielded improvements and better use of language, saying:

'Among the participating children, children who used to pronounce words incorrectly became better at pronunciation and less distressed... These improvements in pronunciation and in the use of language resulted in better social communication'.

At Centre K, they used smartboards for drawing, maths, and teaching shapes, numbers, colours, words and other skills. The interviewee from the centre explained:

'The smartboards that we use have some light effects, which could be interesting for some of the children but not for all.... The programs on the smartboard are not specific to autism, but they are Arabic programs'.

The interviewee from Centre K stated that they use various programs for the children at the centre, such as matching, classification, games and understanding various concepts, such as up, down, right and left. However, all the programs that the children can use on computers at Centre K were English language programs. The teachers at the centre turned off the sound of the English programs so the children would not become confused. Centre K's specialist explained that:

'We teach the child a certain word, and then if he/she hears something different, it will cause distraction. We also do not use any apps on iPads for the kids. We do not have iPads; most of the mothers ask us not to show

³² <http://www.taptotalk.com/>

their child an iPad or an iPhone, as they are addicted to it and might not concentrate on any other stuff’.

This highlights a frequently occurring theme in the discussions with the experts at these support centres.

5.3.1.3 Digital Literacy

Most of the attendees at the centres were children and, according to the expert interviewees, they were generally not allowed to use social media networks or they were not knowledgeable about how to use them. The findings regarding whether centres were using technological methods to improve the social and communication skills of individuals with ASD at each centre are summarised in Table 5.7.

Table 5.7 **Technology used at Autism centres in Saudi Arabia**

Centre	Technology	Internet (Staff/ individuals with ASD)
Centre A	Computers*	Staff only
Centre B	Computer programs	Both
Centre C	Computer programs	Both
Centre D	Computer programs, iPad applications	No Internet
Centre E	Computer programs, iPad applications	Both
Centre F	iPad applications	Both
Centre G	--	Staff only
Centre H	Computer programs, iPad applications	Both
Centre I	--	--
Centre J	iPad applications	Staff only

* Computers can be used by children at these centres not for social and communication skills but for only basic computer skills. Centres I and J are research centres, so they do not provide all services for the children.

Centre	Technology	Internet (Staff/ individuals with ASD)
Centre K	Smartboards, computer programs	Both

Table 5.7 shows that technology was used at some centres in Saudi Arabia to improve social and communication skills. However, it was noted from the interviews that they relied more on the use of non-technical methods, and computers were mainly used in the computer class, and iPads were mostly used as reinforcement. In addition, the specialist from Centre F stated that they did not allow the children to use social media at the centre; however, she pointed out that older people, aged 20–26, might be using Facebook at home and are capable of sending messages on their own.

5.3.1.4 Culture Related Content in Technologies

As discussed in Chapter 3, technologies are designed according to the culture of the developers, which is mainly the Western culture, so other users from different cultures could face some issues when using the technologies. During the interviews, at Centre J, the expert showed an iPad application that they were using with the children. The application had some pictures and a word describing the picture. While she was demonstrating the application with examples, a picture of a ‘taco’ and a picture of ‘ham’ appeared by chance. These two pictures would not be familiar to some people in Saudi Arabia, especially as ‘ham’ does not exist in Saudi Arabia, and is in fact forbidden for religious reasons. The taco would only be familiar to people who go to Mexican restaurants. When the specialist was asked about the ‘ham’ picture, she said we just tell them it is meat. This could cause confusion for the children, as they are told this is meat, but the word which is displayed is ‘ham’. This is only one example of how the culture of the designed technology could form an issue when it is used by users of another culture. However, these issues could be more noticed while practicing and using the technology and observing the use.

Cultural Factors

5.3.1.5 Education

- **Lack of Adult Services**

This study focuses on adults on the autism spectrum; however, only four of the centres (Centres A, B, C and F) provided services for adults; all the other centres accepted only younger children. Centre H accepted males between nine and 20 years old in the vocational rehabilitation section, and they were also planning to provide this service in the following year for females. However, in their everyday sessions, they were only accepting girls between four and 13 years of age and boys of four to eight years of age. Centre C only supported students until the age of 16; after that, the students had to leave and seek another place to receive support. This is just at the age when a person requires more care and assistance, as noted by the specialist from Centre E. However, at Centre E, they did not provide services for older children, as they did not have the facilities for them. The specialist reported that this centre was intended to serve people who could not find services elsewhere, who were not accepted at schools or who were not receiving a mainstream education. In other words, the service was not for high-functioning children who could find more services available for their level. However, they still did not provide any services for adults; the maximum age they accepted was 14 years old, but older individuals with ASD would still require support. Additionally, Centres I and J are research centres, so the age of the people they support depends on the research they are conducting. At the time when the interview took place, they were working with younger children; they were not conducting any research on adults at that time. Consequently, there remains a significant gap in the provision of services and in research regarding the needs of adults on the autism spectrum in general (Edwards et al., 2012).

Families in Saudi Arabia struggle to find suitable education for their children with ASD, especially when they need higher education. According to the specialist from Centre E, there should be intensive home services for educating parents in how to deal with their child after he/she leaves the centre. She also mentioned that some parents are not capable of taking care of their child, and this can have a negative

impact on the child's life. Table 5.8 shows the number of adults served at each of the four centres. However, one of these centres raised the issue of ending support for children who are 12 years old and older, which caused a problem for many parents (*AlMadina*, 2014).

Table 5.8 **Number of Adults Served at Each Centre**

Centre	Number of adults served
A	6
B	6
C	2
F	4

It is clear from the literature that limited support after leaving school is not an issue only in Saudi Arabia, as families in the UK also face this problem with their children after leaving school. As mentioned by Gentleman (2011), according to *Ambitious About Autism*³³, only 19% of children with ASD continue with their education after they leave school. Those who do not have access to after leaving school education will be left with the options of either living with their parents or joining day-care centres and trying to cope with being amongst people who are much older than they are, which has resulted in a large number of unemployed adults with ASD in the UK (Gentleman, 2011). It has also been stated regarding planning for the future and adulthood of people with disabilities in the UK that there is a lack of support for these people, limited employment opportunities and poor health services for the transition from childhood to adulthood (*Department for Education, 2011*). This is where technology could be useful in the lives of individuals with ASD. Specifically, technologies and social media services can be an alternative for individuals with ASD in working on their social skills (Hong et al., 2012) and in maintaining and developing the skills they have worked on at school. A large number of individuals with ASD require support throughout their lives, even though they are high-functioning (Burke et al., 2010).

³³ <https://www.ambitiousaboutautism.org.uk/>

- **Limited Public Support**

There are limited public services for individuals with ASD in Saudi Arabia (Almasoud, 2010), which do not cover the high number of individuals diagnosed there. From visiting the centres, it appears that most of the centres are full and cannot accept more children, and some do not have enough facilities to provide the proper support. People are queuing on the waiting lists in the hope of finding a place or being sponsored. Additionally, not all families can afford the fees and all the related expenses of using the centres, especially when there is more than one child with ASD in the family. Most of the centres cost around 30,000 riyals per year, which is almost £5000. Centre E provides intensive therapy, which could cost around 150,000 to 200,000 riyals, (equivalent to about £25,000 to £33,000 per year). Alnuaim (2013) reported that a large number of employees in Saudi Arabia receive low salaries, 13% of Saudis in both private and public sectors receive a monthly salary of about SR1500 or less (equivalent to about £250), 44% receive SR3000 or less (equivalent to about £500), and 56% receive more than SR3000. This shows that not all families would be able to cover the high cost of the services for their children. However, at the time of writing this thesis, the research centres I and J provided their services free of charge besides working on achieving significant results in their research. In addition, Centre B was free, and they also provide a monthly allowance for each child, which is equal to £50.

Moreover, there was a limited number of students at each centre, which could result in a large number of people waiting for an available place, causing a delay in receiving services and care for the children. In regard to the people working at the centres and taking care of the children, they should be qualified and well educated about ASD to provide efficient support so the children can benefit from the centre ("Children with autism," 2013). At Centre A, the teachers were from different background degrees, such as physics, early child education or other fields. They were trained and were obliged to attend workshops and classes to become qualified to obtain the job. The centre did not have any teachers with a major in special education, because this subject was not available at the university in their city; however, some had taken a special education diploma

course. Specialists from other centres also stated that their teachers were well qualified, and they had specialists in special education with different career paths.

Furthermore, the interviewed specialist at Centre E reported that they had dealt with many cases where a person applying for a job at their centre had a degree in special education but was not actually well qualified for supporting individuals with ASD; she added that extra training was required. However, support and service provision overall are still very limited and do not cover all the expenses to cover the needs that a person with ASD requires. In this case, the use of technology in providing support for individuals with ASD could solve some of the financial issues that pose a problem for many families in Arab countries and other countries around the globe.

5.3.1.6 Spoken Language and Accents

During the interviews, it was pointed out that, at Centre A, they had faced some problems with children speaking with different accents, such as with a Palestinian child and a Sudanese child. The specialist stated that they used Arabic with a Saudi accent and dialect for communication with the children, but they also tried to adapt the words from the students who are from other Arab countries. She stated,

“They just told me that we had a child from Palestine and the teacher was speaking to him and asking him to give her the “strawberries”, which is in Arabic “فراولة” (“farawla”), but he was not responding and he did nothing. They then used another word for strawberries, which is “فريز” (“fraise”), and he handed them the strawberries’.

These differences were experienced with some children, but they also had children from Egypt and Syria without experiencing similar problems with understanding. This could depend on how long the family had lived in Saudi Arabia or how much they had been influenced by the Saudi accent.

One of the specialists from Centre J reported that they faced some problems regarding different accents when communicating with children from different

Arabic regions; for example, some people call a watermelon 'حبيب' ('habhab') and some call it 'جج' ('jokh'), while others call it 'بطيخ' ('bateekh'). Additionally, specialists from Centres I and J both mentioned that they believed they should adopt the child's accent and use of words to be able to communicate. Children with ASD usually speak using formal Arabic, as they learn it from cartoons on TV, according to the specialist from Centre I. Other centres' specialists suggested that accent differences were not an issue for them; they sometimes might find some differences, but they did not find it a problem. Centre H did not really face this kind of problem, as they claimed that the priority at their centre was Saudis, so they did not have children from other Arab countries, and most of the children were from the city in which the centre is located.

5.3.1.7 Social Rules

- **Communicating with the Opposite Gender**

One of the main issues regarding Arabic culture is communication between different genders (Al-Saggaf, 2004; Al-Jarf, 2005). In online social networks, people generally are able to communicate with whomever they want, just as in real life, or even with fewer restrictions. However, many Arab cultures, especially in Saudi Arabia, have restrictions about communicating with people of the opposite gender (Al-Saggaf, 2004; Al-Jarf, 2005). Such communication restrictions could also be followed online; however, in some cases, people use online social networks to communicate with those of the opposite gender, breaking the conventions of the Arab world (Al Omoush et al., 2012).

However, families differ in Saudi Arabia; some are stricter than others regarding conversations between different genders—even in family gatherings, they stay separate—while other families do not segregate and gather the whole family together. This could be because of the traditions of different cities in Saudi Arabia or the family's background. However, people's attitudes towards the opposite gender depend not only on family traditions but also on the segregation between males and females in schools, starting in first grade and extending through university, except for medical degrees (Al-Jarf, 2005). The segregation between the genders, which is applied physically, socially and psychologically (Al-Saggaf &

Williamson, 2004), can cause a communication barrier between the two genders. In working life, the situation is different: in private companies and hospitals people of both genders work in the same departments, whereas at universities and in government departments, they are still segregated at work.

Among the 11 centres, only one of them was for males only, and all the other centres were for both male and female children. However, there was a segregation age at each centre, at which they separated the boys and girls, at least in classes. At Centre G, they segregated the children at the age of five or six years, which is a very young age. Centre H segregated at age eight and Centre C at age nine. At Centres A and F, the age for segregation was 13 years; however, the specialists from both of these centres noted that it does not always need to be done at this particular age—it depends on the child. The specialist from Centre A reported that it depends on the male child's emotions, behaviour and cognition, saying,

'We have a child who is 13 years old, but you feel that he is younger. Every time we think of moving him to the evening male section, we feel that he is still not ready; he still needs more women's care'.

In contrast, at Centre F the boys had to leave the centre at the age of 13, and they did not yet have a section for older boys. The interviewee from Centre F reported:

'13 years old is the age of segregation, but it depends on the abilities. The ministry does not allow older boys. Next year, we are hoping to have an afternoon shift for boys and segregate them from the girls'.

Segregating boys and girls may cause barriers between the two genders and may be one of the obvious reasons for individuals finding it difficult to engage and communicate with people of the opposite gender offline or online. However, this situation cannot be generalised to all people in Saudi Arabia, as it differs between families, as mentioned by Layan (A, 2013). Some people are completely open about communicating with those of the opposite gender, while others are very strict..

5.3.1.8 Conservatism

- **Parental Conservatism**

The verification of conservatism towards ASD could be determined by the response and reaction of parents to the diagnosis of their child and how they coped with accepting this fact. From the interviews with the specialists, it appeared that many parents do not accept that their child has been diagnosed with ASD, regardless of their level of education. Unexpectedly, the specialists from Centres C, E, G, H and K mentioned that educated parents were more likely to deny the diagnosis and find it harder to accept than less educated parents. As reported by the expert at centre C:

‘We had a mother who was working here with us and her son is 14 or 15 with ASD, and she is not accepting of this fact at all. She was well educated and used to live before in the USA’.

The expert added:

‘Another mother that we are dealing with believes that her son is affected by the evil eye or by a shock. She does not want to attend any of the workshops or sessions, and she even does not bring her son every day to the centre’.

The specialist at Centre E said that a large number of parents are in denial: they bring their children to receive treatment without admitting their diagnoses. Additionally, the expert at Centre H stated:

‘Some families deny the fact that their child has ASD, due to the concern of the community and their social reputation. Mostly well-educated parents—actually the more they are educated, the more they do not accept it’.

At Centre K, the specialist faced a problem with the mother of a child who was hiding the fact that her son had been diagnosed with ASD, even from her own daughters, stating:

‘The mother was really struggling with this issue, lying to her family that her son is going to a mainstream school and hiding his books and everything related to autism. We tried to solve this problem and started providing extra awareness sessions for her; we then convinced her to tell her family about the son. Now the child is much better; he improved with the help of his mom and his sisters’.

The specialist also reported that, whilst this mother did not go to university, she was knowledgeable generally and had a good knowledge about autism. She read a great deal and conducted searches online to gain knowledge. In contrast, another mother who only attended school until primary school, was very proud of her son who had been diagnosed with ASD, and she did not feel ashamed to take him out in public. In addition, she stated:

‘One of the known reasons for denying and hiding the diagnosed child is because the mother believes that no one will marry her other daughters if they have a brother or a sister who is diagnosed with any type of disability. This is an issue here; sometimes people do not marry from a family that has a disabled child, thinking that it could affect their children if it is related to a genetic factor’.

This could be a bigger issue in the Eastern region than in the other parts of Saudi Arabia, as mentioned by the expert who was originally from the Western region. Families in Saudi Arabia and across the Middle East are ashamed of the disability of their children and try to hide them from the community (Al-Gain & Al-Abdulwahab, 2002; Nasr, 2008).

In addition, the specialist at Centre I reported that they were dealing with 300 children with ASD, two girls and 298 boys, which is a very low percentage of females compared to males, even less than the ratio of 4.3:1 that is known commonly (Park et al., 2012). She stated:

‘I really do not know exactly why we have this low rate of girls. Is it because she is a girl and disabled so it’s not important to medicate her, just hide her at home, but the boy breaks their heart and needs to be treated to gain support...? Here, they like boys more than girls’.

However, in the other centres the difference in the number of females compared to males was not as large. Lack of acceptance, hiding the child from the community and gender inequality are all reasons for not obtaining proper support for a person with ASD in Saudi Arabia, which could result in affecting the person's behaviour and personality, which will be reflected in his/her communication and social activities. However, technology could help in supporting people who do not want to show their difficulties to society. Instead of being totally isolated from the community, social media could help in communicating with family members and friends, with more control and at the user's own pace and level (Golan & Baron-Cohen, 2006; Wainer & Ingersoll, 2011). Using social media could help individuals with ASD to gain support and improve their social skills, without the pressure of facing society at large. In addition, social networks can be used as a support tool for adults on the autistic spectrum who do not receive proper support in their daily lives.

- **Adding Personal Information Online**

Another cultural aspect that might pose a problem when using technologies is displaying personal information online. As mentioned in Section 3.2.4.3, people in Saudi Arabia tend to be strict when it comes to displaying their names, photos and contact details, especially women: some people prefer to use pseudonyms or initials instead of their real names (Al-Jarf, 2005). In addition, men used to feel shame when their friends knew their mother's name, as well as the names of their wives or sisters ("In the name of," 2011). Some people are very private about the women in their family and try to keep details about them secret (Al-Mukhtar, 2013). However, this is not the case for all people in Saudi Arabia or even in other Arab countries. As life has changed, people become more relaxed about this situation and knowing the names of their female relatives is not considered a huge problem. However, some might still reject the idea of posting their personal photos online to be viewed by the public.

5.3.1.9 Music

Finding out whether music in apps causes a problem for the children, adults or their parents was considered during the interviews. This helped in determining

whether it is an issue that prevents people from using technologies that include any type of music. The results from these interviews showed that music was not a significant concern for these participants. The specialist from Centre C claimed that some students liked listening to music and played their favourite songs on YouTube; teachers at the centre had taken advantage of this and used it for reinforcement. At Centre A, they did not have any problems with the children listening to music, despite the fact that some may have hearing sensitivity towards sounds. They usually ran music for 30 minutes in sport classes and had not received any complaints about it. One of the specialists at Centre J said that she never personally faced any problems with the children regarding music, while the other specialist declared that, in the apps they use, there is no music and only sound effects are played as reinforcement when a child provides a correct answer. She added that they preferred to avoid music for both religious reasons and mainly to prevent children from becoming distracted.

The specialist from Centre B stated that they sometimes faced problems with music, depending on the children's religious views. The specialist from Centre H also claimed that music does not pose a problem for them, but they sometimes encountered parents who did not want their children to listen to music or any type of songs.

5.3.2 Interviews with adults with ASD

Technological Factors

At this stage three adults with ASD were interviewed. Finding participants who used social networks was very challenging, as not all adults with high-functioning autism are familiar with the use of social networks. A detailed discussion of the findings from this stage of the research is provided.

In regard to the interviewed participants with ASD, it appeared that all three participants had Internet connections at home. When it comes to the use of social media networks, Arab users can use Facebook with the Arabic language interface (Malin, 2010). However, Facebook might not be used easily by individuals with ASD because of its large number of applications and features that make it difficult

to understand, as stated by Participant 2. Additionally, it is clear that, when switching Facebook to the Arabic interface, it becomes confusing, as there is still some text in English. Generally, most of the icons and symbols used in technologies are in English or related to Western culture, mostly North American culture (Evers, 1997). Although cultural differences in technologies could pose a usability problem, Evers and Day (1997) claimed that many Arab users are familiar with American software. However, Arab users could be familiar with the American software when it comes to the use of icons, language and the technical aspects of the technology, while cultural aspects and social usage of the technology could still pose an issue for Arab users.

In addition, during the interviews with the adults with ASD, the intention was to determine whether they used any of the common social media platforms, such as Facebook or Twitter. Participant 1 said that he did use Twitter and Facebook, and he viewed photos of his relatives and their friends on Twitter. When he was asked about his account and how he logged in, it appeared that he Googled the word 'Twitter' and searched for the names he required; he did not actually have a Twitter account, a Facebook account or even an email account. Participant 2 said that he did not have a Facebook account because he did not know how to use it. The only one who had an email was Participant 3, which seemed to be his fathers.

Participants 2 and 3 used WhatsApp, perhaps because it is a very simple app for chatting and sending photos. This app allows them to communicate with their family members and friends, but still it depends on how they use it and how broad their contact lists are. In addition, WhatsApp gives them the opportunity to communicate using their mobile phones in a simple and easy way, in either Arabic or English. Integrating the relevant features of WhatsApp, such as communicating with family members and friends by instant messaging, group chatting and sharing photos, could be useful for individuals with ASD. However, the participants seemed more interested in the used of the Internet for basic activities, such as Google searches, YouTube or viewing photos of people on Twitter. When the three participants with ASD were asked whether they understand text written in Arabizi, it appeared that Participant 3 was familiar with it, and he was able to read a given example correctly, whereas Participants 1

and 2 only used Arabic typed letters. Using different ways of typing to communicate in the same language could cause a distraction and be confusing to the user, especially since there are no strict, fixed letters for Arabizi, and every user may type words in a slightly different way. However, understanding Arabizi could help in communication and interaction online, so for individuals with ASD their familiarity with Arabizi could be helpful.

The three participants were asked to choose their preferred communication method: in person, phone calls, text messages, instant messaging via WhatsApp, social media communication via Facebook or email. Participant 1 preferred phone calls, whereas Participant 2 chose in-person communication, phone calls, text messaging and instant messaging, and Participant 3 chose all methods apart from social media. However, their choices were made after only a short explanation of each method, and then they replied yes or no. They also did not have a clear understanding of social media, as they were using instant messaging on WhatsApp, which is a type of social media, but they did not use or know how to use messaging via Facebook, for example.

Cultural Factors

In regards to the educational opportunities of the interviewed adults, participant 1 only studied first and second grade and then he joined an autism support centre. He had to stop receiving services at the age of 16, but he started working at the same centre as a sport trainer after that. Participant 2 was attending a mainstream (general education) school, and participant 3 was doing the foundation year at the university, however, he had five years gap between graduation and going to university. However, from the three adults with ASD only participant 2 and 3 had some knowledge of English.

During the interviews, views towards communication with the opposite gender were not clearly perceived from the participants' own point of view. However, the father of Participant 3 mentioned that his son does not speak to females who are strangers when we discussed WhatsApp. However, Participant 3 and his father both willingly accepted being interviewed by the researcher of this study, suggesting that some female strangers would be appropriate to speak to. In

addition, the father was monitoring his son in every activity, including the use of WhatsApp³⁴ on his iPhone. Excessive monitoring could make it more difficult for a person with ASD to gain greater independence. In the UK, many parents have concerns regarding their child's independence and autonomy, because, if the child depends on the parents, their deaths will one day leave the child without any help, which could result in the child living in residential care (Gentleman, 2011). Nevertheless, the intention of using technologies for individuals with ASD is to improve their social skills, in addition to becoming independent and capable of taking care of themselves throughout their lives (Hong et al., 2012). However, the use of technologies should also not cause the person to become addicted to them or to rely completely on them (Bishop, 2003; Bolte et al., 2010).

The three interviewed participants with ASD were asked whether they would post any pictures of themselves. Participant 1 did not seem to have a problem with this; however, Participant 2 said that he did not want to post his photo online. This was interesting, because it was noted that he did display his photo as a profile picture on WhatsApp, and he was once interviewed on a programme on TV, which is now displayed on YouTube, and he did not have any problems with being shown in public. The third participant was also accepting the idea of presenting his photos online; he was also agreeable when his father offered to take a picture of him on the day he was interviewed. However, men in Saudi Arabia usually do not have a problem with publishing their personal data online. Determining how women with ASD behave with regard to publishing their personal information online will require meeting with women diagnosed with ASD in Saudi Arabia. In Chapter 6, the issues of displaying personal information and the use of photographs by a female with ASD will be discussed.

Finally, when Participant 3 was asked about music, he said that music is forbidden. However, from interviewing the specialists and the three participants with ASD, it was noted that there could be some people who are not happy listening to music, but it does not really cause a significant problem to play music within the software, especially for reinforcing the children's behaviours.

There could be more than one reason that might prevent individuals with ASD from using social media. One could be because people in Saudi Arabia have not become accustomed to using computers at school at a very young age, unlike children in Western countries. However, this could change in the future with younger people in Saudi Arabia, according to Saqer (2010), who reported that Ghonim (a marketing manager in the Middle East and North Africa) said that the percentage of people using the Internet in Arab countries is increasing, mostly among young users. Additionally, a study calculated the statistics of social media users (Facebook, Twitter, YouTube and LinkedIn) in Saudi Arabia in 2012 and concluded that Facebook, Twitter and YouTube were frequently used. For example, there were over six million Facebook users, 90% of whom use it in the Arabic language; there are three million active Twitter users (an increase of 3,000% from 2011 to 2012); and more than 90,000,000 YouTube videos are viewed each day ("The State of, " 2014). These high rates could indicate that, as the use of social media is developing in Saudi Arabia generally ("Arab Social Media Report," 2015), it could also be growing among individuals with ASD. However, the result at this stage was derived from interviewing only three participants, and the situation could be very different for other adults on the autistic spectrum. There is no intention to generalise these findings, but merely to illustrate both the wider and more specific, individual contexts of social media use.

However, addressing RQ1, from interviewing the experts and the three adults with ASD, the main factors that showed a possibility to have an effect on the use of social media by the participants were restrictions of accessing the Internet and the limited English abilities. As preventing or limiting the use of the Internet or technologies at the centers will not help the students to gain and learn digital skills. In addition, the centers had problems in using technology programs for the Arabic speaking students at their center, which could give the students a less opportunity of learning digital skills than the English speaking students. Moreover, cultural restrictions have been pointed out during the interview, for example, when Participant 3 said that music is forbidden, and also when his caregiver said that his son is not allowed to speak to girls on WhatsApp. In addition, the caregiver of Participant 3 was always monitoring his son, which

shows how individuals with ASD in Saudi Arabia are affected by the cultural rules.

5.4 Summary

The findings from the interviews confirmed initial impressions about the availability of support for adults with ASD. Services for adults with ASD in Saudi Arabia are limited and there is almost no provision. Most of the support centres are for children, although the number of children diagnosed with ASD is higher than the capacity of the centres. According to the experts, this means that children could be prevented from receiving support due to queuing in waiting lists or the unaffordable costs of receiving support. The useful programs used for children at the centres are in English, which allows only children who speak English to benefit from them. For Arabic-speaking children, general literacy programs are used, which are less advanced than the available English-medium programs. Clearly, adults do not receive as much support and attention in service provision as children, and this means that adults with ASD are difficult to locate. Among the small number of interviewed participants with ASD, they were not all familiar with the use of online social networks.

Chapter 6

Exploring and Investigating the Use of Social Media

The main aim of the second stage of the study was to find and recruit participants who were the main target of this study, in other words adults with ASD, in order to interview them and investigate their use of social media. However, as it was hard to find the participants directly, an online survey addressed to caregivers was implemented to recruit the target participants, and gain their permission for their sons or daughters to participate.

6.1 Recruiting Participants by Personal Contact

As mentioned earlier, it has been reported that in Arab countries people do not reveal the disability of their child and will more likely hide it and isolate the person from the community (Nasr, 2008). This point was reiterated by the expert participants and is reported in Chapter 5. This has been a challenge when trying to reach the participants: after the recruitment and contacting people to reach the appropriate participants, only a limited number of caregivers agreed to participate in the study. First, caregivers were contacted via phone calls to get their permission. They were asked about their willingness to allow their son or daughter to participate in a study regarding the use of social media networks. The caregivers were reached through personal contacts, as shown in Table 6.1. Participants 1, 2 and 3 were the participants interviewed in the first stage (see Chapter 5).

Table 6.1 The initial number of participants who agreed to participate after being reached by personal contact

Participants	City	Gender of participant	Age of participant
Participant 1	Jeddah	Male	20
Participant 2	Jeddah	Male	21
Participant 3	Riyadh	Male	24
4	Riyadh	Male	29
5	Riyadh	Male	19
6	Jeddah	Male	17
7	Jeddah	Male	27
8	Jeddah	Female	25

The participants contacted were all from Saudi Arabia, but since the number of participants was limited, and not all could be eligible to participate, an online survey was designed in order to reach more participants in Saudi Arabia or even from other Arab countries. However, from the participants in Table 6.1, only two (participant 1 and 2) were interviewed in the third stage of the study. Other caregivers apologised and others changed their mind.

6.2 Recruiting Participants (Online Survey)

Given the limit in the number of people showing their interest in participation, an online survey was designed and distributed online from the 27th October, 2014 for three months. It was distributed to Autism groups and individuals on Twitter, Facebook and WhatsApp. It was also sent to experts from Autistic centres in Saudi Arabia by text messages and by email. In addition to Saudi Arabia, participation from other Arab countries, such as the UAE, Qatar, Kuwait and Jordan was also open for the online survey and autism centres and groups were also contacted by emails, in order to try to extend the potential pool of participants. However, from the completed survey forms, only one was from Kuwait and all other forms were completed by caregivers in Saudi Arabia.

There was no personal contact with people in the UAE and Jordan, and there were no participants from these countries. In an autism conference in Kuwait, people from different Arab countries were attending, which made it a good chance to reach a number of parents, however, it was not easy just to go and search for parents without the help of a professional who was working with them and knew the caregivers. Two people were helpful and provided their guidance and also provided some additional contacts, but they were also from Saudi Arabia. Only two of the contacts were not from Saudi Arabia, and they were happy to give their contact information, but when asked to answer the survey by email afterwards, one filled in the survey and chose not to participate further; the other one did not complete the survey or reply to the email which was sent twice. Additionally, meeting experts from different autism centres was a great chance to explain the study and the importance and challenge of finding the applicable participants in order to implement the study. A member of a centre claimed that the families were tired of filling in surveys and not receiving any benefits afterwards; they wanted to see some benefit. However, contact information was collected and three of the centres in Kuwait were emailed with all the information they needed to know about the study, and the only thing required from them was to get in touch with the families of the people with high-functioning autism or Asperger syndrome. Unfortunately, there was no such contribution, not even a reply from the centres. One centre replied after three months saying they had sent their own form to ask the parents if they were willing to participate or not, and no further information was provided. So even though participants from all Arab countries were welcomed to participate, the majority were from Saudi Arabia.

This level of detail about recruitment efforts is provided here to illustrate the challenges involved in researching this area in Saudi Arabia. Despite extensive efforts in disseminating information and networking via personal contacts, and more widely, very few families came forward for participation. It is also clear that centres who provide support for individuals with ASD were reluctant to contact families or put them in touch with the researcher. This lack of response could be because of the confidentiality and the sensitivity of the subject. Speaking to different people confirmed the fact that there are people who do not mention the

diagnosis of their child, and even regard it as unacceptable to talk about ASD, even within the family. It is felt that this is one reason why disability research in Arab countries is limited. On the other hand, people in Arab countries might also be less knowledgeable regarding different types of research and the fact that research may not always bring a direct physical benefit or a reward. Some people may not accept research that is aimed at adding to the sum of knowledge and shows evidence which in turn leads to another study and further research. This study did not aim to present a new device or software: instead the aim was to explore the use of social media by individuals with ASD in Saudi Arabia. Those participants who might have been able to help with research were perhaps not aware that social media has the potential to encourage valuable communication skills and provide the opportunity to enhance social behaviour. The study also aimed to support the work of social media developers and encourage them to include Arabic ASD participants in their inclusive design (see Section 4.3.5). Finally, the research has the potential to provide valuable indicators for professionals and carers involved in making choices about technologies and the use of social media for adults who have ASD.

6.2.1 Survey Questions

In addition to recruiting the participants, the online survey included questions to collect data about the participant in order to establish whether the participant was eligible to participate. It included 14 main questions, in addition to sub questions. The majority of questions were focused on the participant with ASD with a few questions asked about the caregiver. The survey was provided in both the Arabic and English languages, (see Appendix C for the full list of questions). It also asked the caregivers to provide their contact information, in order to be reached and interviewed afterwards, with the assurance that all the personal information would be secured and protected. The survey was validated by seven PhD students at the University of Southampton who come from Arab countries. They were asked to pilot test the survey and check the content and also the Arabic language text. It was concluded that the survey was clear and easy to understand. They provided some comments, which were considered in constructing the final version.

6.2.2 Analysing the Survey

After the completion period of the survey, the number of completed forms was 28; of these one was not answered, and one was duplicated, leaving 26 caregivers completing the survey. Two caregivers of the interviewed participants (Participant 2 and Participant 3) from the first stage (see Chapter 5) also filled in the survey. All forms were completed online, except one, which was completed manually by printing the survey and handing it to the parent. The average time to complete the survey was 10 minutes. Table 6.2 summarises the information collected from all the 26 caregivers who completed the survey. As the survey contained some quantitative data, SPSS was used in order to analyse the data. For describing the qualitative data and analysing it, NVIVO was used and the surveys were added as internal documents into the software.

Table 6.2 **Information from the 26 Completed Forms**

Country	Saudi Arabian Cities: Jeddah 10 Riyadh 7 Makkah 2 Dammam 1 Taif 1 AL-Hasa 2 Hafar Al-Batin 1 Other cities: London 1 Kuwait 1				
Gender	<table border="1"> <tr> <td>Male 22</td><td>6 males under the age range of this study 16 males in the age range of this study</td></tr> <tr> <td>Female 4</td><td>1 female under the age range 3 females in the age range</td></tr> </table>	Male 22	6 males under the age range of this study 16 males in the age range of this study	Female 4	1 female under the age range 3 females in the age range
Male 22	6 males under the age range of this study 16 males in the age range of this study				
Female 4	1 female under the age range 3 females in the age range				
Acceptance to participate	<table border="1"> <tr> <td>Said "YES" 13</td><td>6 Participants are applicable 7 are not applicable or did</td></tr> </table>	Said "YES" 13	6 Participants are applicable 7 are not applicable or did		
Said "YES" 13	6 Participants are applicable 7 are not applicable or did				

	Said "NO" 13	not provide contact information
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From the 26 completed forms, the number of males was 22, and only 4 were females. As reported by Wright et al. (2011), this could be for the reason that more males are diagnosed with high-functioning autism than females. However, in this current study, it also could be because caregivers of females with ASD are more conservative about the diagnoses of the females than males, which is related to their culture, as mentioned by (Amr et al., 2011). However, none of the caregivers selected any social media application being used by the person with ASD. Only 13 caregivers from the 26 completed forms agreed to participate further in the study (see Table 6.2). Only seven of the individuals with ASD (all male) were eligible to be included in the study (P1-P7), the other six were excluded due to being under age or missing contact details, (see Table 6.3).

Table 6.3 Information regarding individuals who agreed to participate from the survey

Participant	Age	Gender	City/Country	Level of ASD	Education	Contact Information provided
P1	30	Male	Al-Hasa/KSA	HFA	Employed	Mobile Email
P2	23	Male	Al-Hasa/KSA	HFA	University	Mobile
P3	22	Male	Jeddah/ KSA	HFA	Mainstream School	Mobile
P4	19	Male	Jeddah/ KSA	LFA	Mainstream School	Mobile
P5	17	Male	Jeddah/KSA	Severe	School for individuals with Autism	Mobile
P6	30	Male	Makkah/KSA	LFA	Home Education	Mobile

Participant	Age	Gender	City/Country	Level of ASD	Education	Contact Information provided
P7	25	Male	Riyadh/KSA	LFA	University	Mobile Email
P8	14	Female	Riyadh/KSA	LFA	Mainstream School	Twitter
P9	20	Male	Riyadh/KSA	HFA	Mainstream School	Not provided
P10	16	Male	Jeddah/KSA	HFA	Mainstream School	Not provided
P11	10	Male	Riyadh/KSA	LFA	School for individuals with Autism	Mobile
P12	6	Male	Hafar Al-Batin/ KSA	LFA	Home Education	Not provided
P13	5	Male	Riyadh/KSA	LFA	School for individuals with Autism	Email

As shown in Table 6.3, the participants who were described by their caregivers to be low-functioning or having ASD with severe learning disabilities, were not excluded from the study at this stage, as the level of functioning was not clear. For example, although P4 and P7 were said to be low-functioning, P4 was in a mainstream school and P7 was studying at a university. P6 was also said to be low-functioning but only received home education. The type of education of the participants is shown in Table 6.3, but still the ability to participate could not be confirmed. However, it was decided that the participation of the person would be dependent on their ability and willingness to use social networks and to be part of the study during its implementation. However, from those who were reached from the survey, only P1, P2, P3 and P4 were interviewed, as will be explained in Section 6.3.2. From the participants within the age range of this study whose caregivers

did not agree to participate, three went to universities and three to mainstream schools and could have been eligible to be included in the study.

Table 6.4 Caregivers supporting the use of social networks

Support the use of Facebook for ASD	Agreed to participate?		Total
	Yes	No	
Yes	7	8	15
No	1	1	2
Do not mind	5	4	9
Total	13	13	26

In regard to the idea of using social networks for adults with ASD, not all the caregivers who agreed to participate were positive about using social networks for individuals with ASD, as shown in Table 6.4. However, in the following section, an in-depth description is given of the interviews with the participants.

6.3 Exploring and Investigating FAASCIT Factors Associated with the Use of Social Media

There is substantial diversity and heterogeneity among those diagnosed with an ASD (Tincani, Travers, & Boutot, 2009), and there is limited information about such individuals in Saudi Arabia. In order to seek in-depth information about the participants, face-to-face interviews were implemented. This method was essential for establishing the individual contexts, preferences and nature of use of social media for a group of people about whom very little is known. In addition, it contributed in covering the ‘Observe users’ and ‘Describe user journeys’ activities of the Explore phase in the inclusive design tool kit presented in Section 4.3.5. In this section the interviews were designed in order to answer the research questions and specifically with regard to the following objectives (as shown in Section 4.6):

RQ1 What technological or cultural factors are important for the usability and

accessibility of social media technologies for adult Arabs with ASD and their families?

- Evaluating the suggested cultural and technological factors in regard to Arab users with ASD.
- Determining the extent to which these factors affect the usability and accessibility, and whether any of the factors prevent the users from using any features of the social network.

RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?

- Determining the extent to which individuals with ASD interact with photos or videos on social networks via comments and conversations.

RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult Arabs with ASD?

- Supporting the identification of the factors of FAASCIT with Arab adults when using social media technologies and how these factors can affect their use of social media, especially the use of visuals.

6.3.1 Designing Interview Questions

The caregivers who had agreed to participate from the personal contact and the online survey were contacted and were asked to help in creating a Facebook account for the participants prior to the interviews. Caregivers were also given information via emails and messages regarding the steps of the study and were asked to be involved in the implementation of a number of tasks, such as adding photos or commenting on photos on the created Facebook account. Their contribution was to make the communication easier for the participants with ASD when using social media, and also to help by watching the activities of the participant when applying any online activity, for the research to be documented. The contacted caregivers had previously agreed to participate when completing the online survey. However, none of the caregivers responded to the email or the WhatsApp messages. As a result, it was necessary to interview the participants

with ASD and to make direct contact with them regarding their communication technologies and the techniques they used for communicating, and to ask the ones who did not use Facebook if they would like to create an account during the interview with the help of the researcher.

The interview questions were first designed in relation to the use of Facebook. The questions were semi-structured and were in general addressed to the participants, but the caregivers were also involved during the interview if needed. However, when starting the interviews, it appeared that some of the participants were already using social networks, which was not what their caregivers had declared in the survey, as mentioned before in Section 6.2.2. It appeared that three of the participants were using Facebook but none of the other participants had created a Facebook account prior to the interview. The participants who were already using social networks appeared to prefer other social media networks rather than Facebook. Therefore, questions were changed during the interview period and had to be amended accordingly. This is an example a semi-structured interview being used in a flexible way, allowing the interviewer to modify, delete or add questions as appropriate (Robson, 2002).

For identifying what data to be collected during the interview regarding the factors of FAASCIT, the Goal/Question/Metric approach defined in Chapter 4 was also used, as shown in Table 6.5. In Section 6.3.4, each factor was analysed and discussed according to the interviewed participants. Thus, the main goal of the interview was to explore the use of social networks and the questions were related to this aspect.

Table 6.5 **GQM approach for collecting the data regarding the factors of FAASCIT** (Interviews with ASD participants)

Goal (Factors from FAASCIT)	Questions (To achieve the goals)	Metric (Identifying what data to collect)
Internet access	Is the Internet available and easy to access for individuals with ASD in Saudi Arabia?	- Availability of Internet at home - Availability of mobile data - Availability of Internet at the

Goal (Factors from FAASCIT)		Questions (To achieve the goals)	Metric (Identifying what data to collect)
			work/university/centre - Restrictions of using the Internet - Connection problems
The availability of web services		Are individuals with ASD able to use the communication technologies they desire in Saudi Arabia?	- The desire of an unavailable web service
Language medium of technologies		Are adults with ASD in Saudi Arabia able to use social media technologies developed in English? Do social media developed in English present a problem for Arab adults with ASD?	- The platform language used on the device/s - Language used when typing on social media - Problems understanding English within the technology
Digital literacy	usernames and passwords	Do Arab adults with ASD face problems remembering usernames and passwords? Are Arab adults with ASD able to access their online social accounts easily?	- Ability to access the personal account - Ability to remember their usernames or passwords - Saving the username and password
	abbreviations, acronyms and web terminology	Are Arabs with ASD familiar with, and do they understand the use of Internet language, abbreviations and social network terminology?	- The ability to read a given example - The ability to understand terminologies of the social networks used - Understanding and using abbreviations
	Arabizi	Are Arabs with ASD familiar with Arabizi? Do Arab adults with ASD use Arabizi when using online social media?	- The ability to read a given example - The use of Arabizi
Culture related content in technologies		Do social media technologies developed in Western countries and according to the Western	-Misunderstanding cultural content in technologies

Goal (Factors from FAASCIT)		Questions (To achieve the goals)	Metric (Identifying what data to collect)
		culture present a problem for Arab adults with ASD?	
Education		<p>Are adults with ASD in Saudi Arabia receiving proper education to reach the standard level of literacy?</p> <p>Did adults with ASD in Saudi Arabia have good quality services and education from early childhood?</p>	<p>- Type of education received by the participants</p> <p>- Quality of education received</p> <p>- Literacy from earlier ages</p> <p>- Cost of services and other expenses</p>
Spoken language		<p>Does the language cause any barrier in communicating via social media for adults with ASD in Saudi Arabia?</p> <p>Does the lack of English language cause any barrier to adults with ASD in Saudi Arabia for understanding the technology?</p>	<p>-Spoken language/s</p> <p>- Language used online</p> <p>- Problems understanding English within the technology</p>
Social rules	communicating with the opposite gender	Do adults with ASD in Saudi Arabia face restrictions when communicating with people of the opposite gender when using social media?	- The users whom the participants communicate with
	friendships and relationships	Do individuals with ASD able to communicate with people online and build relationships?	<p>- The users whom the participants communicate with</p> <p>-Having a relationship</p>
	the concept of representation and photography	<p>Are individuals with ASD free to display their photographs online?</p> <p>Do photographs present a problem for the participants?</p> <p>Are Arabs with ASD conservative about their photos appearing online, especially females?</p>	<p>- Interest in photos</p> <p>- Type of photographs they like</p> <p>- Type of photographs they post online</p> <p>- Photo displayed on their profile</p> <p>- Taking personal photos</p>

Goal (Factors from FAASCIT)	Questions (To achieve the goals)	Metric (Identifying what data to collect)
Conservatism	<p>Are adults with ASD in Saudi Arabia able to add their personal information and real names online on social networks?</p> <p>Are individuals with ASD in Saudi Arabia open about their diagnosis online?</p>	<p>- Name and details displayed on their profile</p> <p>- Type of photos displayed on their profile</p> <p>- Talking about ASD</p>
Independence and autonomy	Are adults with ASD in Saudi Arabia able to use social media on their own?	<p>- Restrictions on accessing the Internet</p> <p>- Ability to create and access personal accounts</p> <p>- Family members having access to the participants' accounts</p>
Gender differences in technology usage	Are males and females with ASD in Saudi Arabia using technology in the same way?	<p>- Restrictions on using the Internet</p> <p>- Education received</p>
Music	Do videos or audios containing music posted on social networks cause a problem for Arab users with ASD?	<p>- Type of music they like</p> <p>- Music videos posted on their accounts</p>

The interview questions that were asked in order to investigate these factors and the use of social media by adults with ASD in Saudi Arabia are shown in Table 6.6.

Table 6.6 **Interview Questions for Participants with ASD**

Questions for adults with ASD
What is your age?
What language/s do you speak?
What is your level of education?

Are you employed?

How often do you use the Internet?

Do you have an email?

What types of technologies are you using (hardware/ software)?

What language do you use with the technology?

Do you use social media technologies?

What social media accounts do you have?

Do you add your personal pictures or information online?

Do you know Arabizi? Can you read the example?

Do you have friends (with ASD or without) online or offline?

What method do you prefer to use for interacting with other people?

Do you like listening to music?

6.3.2 Procedure

The interviews were arranged to take place between 6–30 April 2015. The seven caregivers who had completed the online survey and agreed for their son or daughter to participate in the study and whose sons or daughters were in the target sample (see section 6.2.2) were contacted in advance to arrange the time and place for the interviews. As mentioned in Section 6.2.2, all seven participants were males from Saudi Arabia, two from Al-Hasa, three from Jeddah, one from Makkah and one from Riyadh, all of whom were known to be diagnosed with an ASD. However, when the interview period started, only four were interviewed from the seven participants who had been reached and agreed previously via the survey, in addition to one from the personal contact, two from Al-Hasa and three from Jeddah, two of whom were interviewed at stage 1 (Participant 1, 2). In regards to the other participants, one of the caregivers after agreeing to participate and also completing the online survey said that his son (P7), who was interviewed in the first stage (Participant 3) would not be interested in being interviewed again, which resulted in only six participants left. The caregiver of P5 apologised

for being out of the country, and the caregiver of P6 ignored the calls. The interviews took place according to the availability of the participants during the interview process period, and at the place and time suitable for the participants. Some were interviewed at their home or centre, while others were interviewed at a café or in a hotel lobby, according to their preferences.

As mentioned in the previous section, the family was supposed to be involved to prevent online bullying or any unpleasant behaviour. However, it appeared that the caregivers were not interested in reading the information or instructions nor in taking part in this process. One of the mothers tried to be involved with her son and helped him create an Instagram account. The idea of having steps and asking the caregivers to complete them was unsuccessful. The caregivers welcomed the idea of interviewing the person with ASD, but without them spending too much effort. Some families were interested in receiving general advice or help rather than taking part in the study or trying to take advantage of using social media.

During the interview period, other caregivers were contacted and reached through personal contacts of the existing caregivers, as there was a lack of participants, so the snowball sampling technique was useful in such a case, where people are hidden, and it is more possible that they could be known by people who are in a similar situation. Personal contacts allowed the researcher to reach more participants, which resulted in interviewing eight more participants, giving a total of 13 individuals with ASD interviewed in Makkah, Jeddah and Al-Hasa. Another caregiver from Riyadh wanted to participate and was willing for her sister to be interviewed; the caregiver was contacted for a meeting, which was cancelled by her after making the arrangements. In Riyadh no participants were interviewed. However, contacting caregivers by phone could not establish the severity of the ASD and the eligibility of the participants for this study. In addition, the snowball sampling technique could not be considered as representing the whole population addressed, as it is not a random sampling system (Sadler, Lee, Lim, & Fullerton, 2010). This is why in this study online surveys were used for recruitment in addition to snowball sampling to include the maximum possible number of the target population, and in order to avoid bias within the population.

Participants were interviewed in the following cities:

Al-Hasa: Two participants

Makkah: Three participants

Jeddah: Eight participants

The interviewed participants' age range was between (15-30) years old, all were accommodated with a caregiver. Three of the participants were female and the others male. All were diagnosed with ASD, at different levels, as shown in Table 6.7. The participants are coded with P and a number (i.e. P1, P2, P3, P4), where P1, P2, P3 and P4 are the participants who were reached from the online survey (see Table 6.3 in Section 6.2.2), and Pbn5-13 are the participants who were reached by the snowball sampling. However, due to the differences in their level of functioning, only seven of the participants (P1, P2, P3, P4, Pb5, pb10 and Pb13) were able to contribute during the interview, one of whom was female. The other participants had less verbal abilities, and the caregivers were interviewed instead. P11 was not involved very much, but his mother created an Instagram account for him after the interview; however, most of the online activities were applied by her and not the participant. The interviews were audio recorded and were all conducted in Arabic, apart from the interview with Pb10, which was conducted in English. Table 6.7 shows the final participants reached from the recruitment survey and from personal contacts, with the seven most eligible participants highlighted in grey. Participants (P2, P3, P4, Pb5, Pb10 and Pb13) are the ones who were using social media, and were then included in the online observation stage described in Chapter 7. However, Pb13 was less able to use social media than the other participants. P1 was high-functioning, and his caregiver created an Instagram account for him during the interview, he was not interested in using social networks and he needed further assistance.

Table 6.7 **Interviewed participants' personal information**

Code	Age	City	Gender	Diagnosis according to the caregiver	Interviewee	Observational Study
P1	30	Al-Hasa	Male	ASD	participant and caregiver	No
P2	23	Al-Hasa	Male	ASD, hyperactivity and depression	participant and caregiver	Yes
P3*	22	Jeddah	Male	ASD, Learning disabilities and hyper activity	participant and caregiver	Yes
P4	19	Jeddah	Male	ASD	participant and caregiver	Yes
Pb5*	23	Jeddah	Male	ASD, Asperger syndrome	participant and caregiver	Yes
Pb6	16	Jeddah	Male	ASD	caregiver	No
Pb7	25	Jeddah	Male	ASD, intellectual disability	caregiver	No
Pb8	19	Jeddah	Female	ASD	caregiver	No
Pb9	15	Jeddah	Female	ASD,	caregiver	No
Pb10	15	Jeddah	Female	ASD, Asperger syndrome	participant	Yes
Pb11	28	Makkah	Male	ASD, and epileptic seizure	caregiver	No
Pb12	15	Makkah	Male	ASD with speech difficulties	caregiver	No
Pb13	18	Makkah	Male	ASD, language difficulties and delayed mental development	participant and caregiver	Yes

* P3 is 'Participant 2' who was interviewed at stage one

* Pb5 is 'Participant 1' who was interviewed at stage one

6.3.3 Analysing the Collected Data

As mentioned earlier, the goal was to create a Facebook account for each participant, and to ask a family member to take part in the study by helping in achieving the tasks (see Section 6.3.1). However, it was difficult to ask all participants to join Facebook. Three of the participants already had a Facebook account. P2 said he had a Facebook account, but he could not access it. Pb13's Facebook account could not be found, and only P4 had an account which was used and active. Other participants preferred to use other social networks, so instead of confusing them and making them use Facebook, which they might not be interested in, they were interviewed and observed on their activities on the social networks they were already using.

As discussed in Chapter 4, this research is qualitative research, and the data collected from the interviews were analysed qualitatively. The interviews were audio-recorded and then transcribed and translated into English, in addition to the documented written notes. After transcribing the interviews, the next step was to start analysing the data. All interviews were coded using NVIVO 10 qualitative analysis software. The data was related to the identified factors together with some additional aspects that emerged through the discussion with the participants; thus the analysis was both deductive and inductive. The data collected from the interviews was analysed as described in the following sections.

6.3.3.1 Thematic Data Analysis

After coding the collected data, the codes were categorised into themes assigned to the identified factors. In Figure 6.1, the coding of the data and its categorisation under the factors presented as themes are shown. The deductive themes were created according to the factors of FAASCIT, and the other emergent categories of data that were collected inductively are presented as blue labels for clarification, and the codes are shown under each theme, as shown in Figure 6.1. The coding and categorising were changed and refined, and went through an inclusive and comprehensive process in order to achieve coherence and consistency. Some of the themes were classified as subthemes under a main theme, and some codes were also moved under different themes, to make better sense of the data, so that it

could be presented in a way which serves the purpose of this research. For detailed categorisation of the themes, see Appendix D.

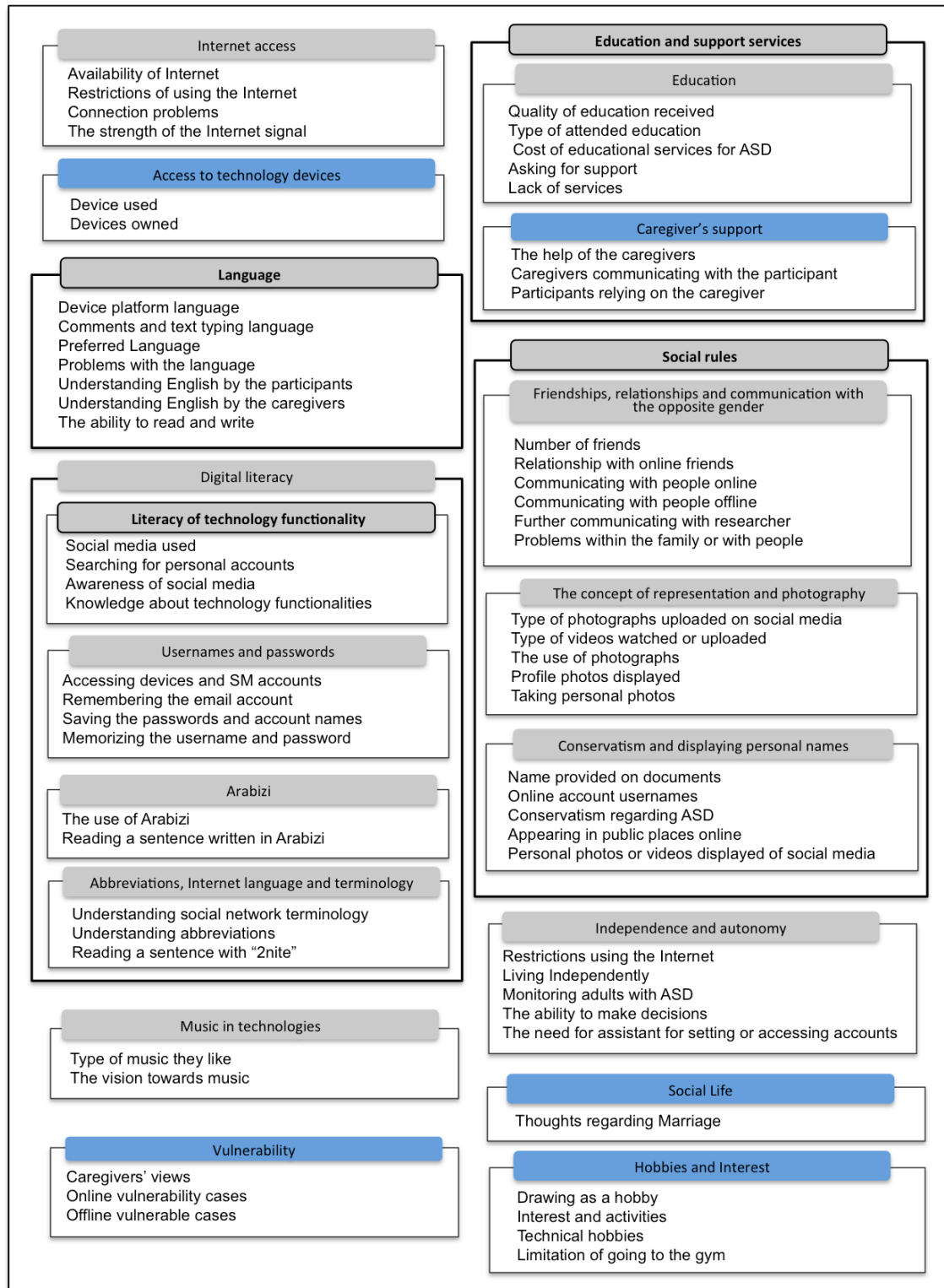


Figure 6.1 Categorising the coded data to themes

The mapping of the data regarding the factors collected from the interviews to the FAASCIT factors is presented diagrammatically in Figure 6.2.

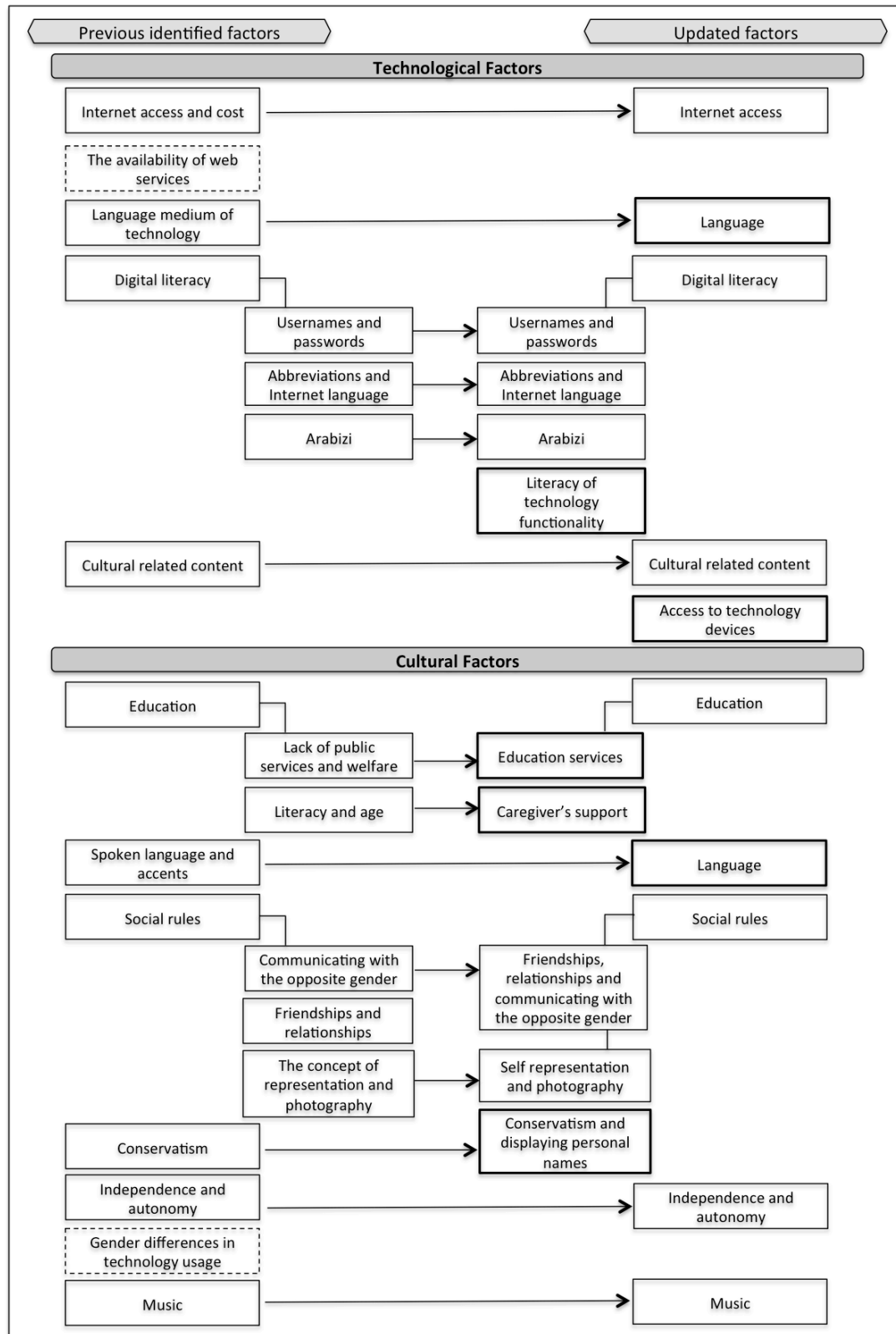


Figure 6.2 The modification of the identified factors

Changes in the main factors were made for some of the factors such as for the language, at the beginning there were two factors considering language, one for the spoken language and the other one for the language related to technologies. After analysing the interviews, the data regarding the spoken language was related to the language for technologies, as the focus was on the English language literacy and how it affects the use of technologies. Therefore, the two factors were grouped under 'Language'. Other categories were added or changed, as would be expected, depending on the data collected, and were placed under the most closely related factor. For example, conservatism was changed under social rules, as the data regarding conservatism of displaying personal names was also related to the conservatism of ASD, which all could be considered as social aspects. In addition, the availability of web services and gender differences in the use of technology were not investigated and no data collected was related to these factors. For example, Web services was not investigated enough because during the interviews the participants did not show any need, and did not even mention any problems with accessing certain social media services that were subsequently forbidden in Saudi Arabia. At the time of the interviews there were several options for contacting friends and family, but it is felt that there would be a very different reaction to the restrictions that now occur due to the recent increase in services that have been banned in Saudi Arabia (Alhamdan, 2016).

6.3.3.2 Content Data Analysis

In this research, the intention was to find to what extent identified factors affected the usability and accessibility of social media by the target users. However, it was more practical to determine the occurrence of the aspects related to the factors during interviewing the participants. This was by counting the issues which might have an impact on the participant and his/her use of social media that could prevent them from using social media or the technologies properly. As this is qualitative research, and the collected data is descriptive, a content analysis approach was applied, with categorisation of themes resulting from the literature reviews. The analysis was carried out according to each participant by including any issues he or she faced related to the factors which are in accordance with the themes from the previous section. If the same issue was repeated more than once

by the same participant, it was only counted once. See Appendix E for complete analysis. The number of participants who faced situations related to the identified factors is shown, and results are summarised in Table 6.8.

Table 6.8 Content Analysis: A summary of the number of participants affected by each factor

Factors	Sub-category	Cases affected by the factor
Internet access	Connection problems during the interview	7
	Connection availability	5
	Mobile connection problems	2
	Restrictions of using the Internet	1
	Inability to connect to the Wi Fi network	1
Access to technology devices	No devices owned	1
	Restrictions on using the devices	1
Digital literacy	Literacy of technology functionality	8
	Understanding terminologies or abbreviations	5
	Arabizi	2
	Lack of digital support	2
Username and passwords	Inability to access personal accounts	4
	Inability to retrieve the password	2
	Remembering login information	6
Education and support services	Poor quality of education	2
	Lack of services for ASD	7
	High cost of education or services	5
Caregiver's support	Limited technology consideration by the caregivers	3
	Assistance limitations	2
	Online communication between the caregiver	2
Language	Limited reading and writing literacy	1
	Problems with typing and pronunciation	1
	Difficulties with Arabic language	1
	Difficulties with English vocabulary	1
	Limited English abilities	6
Social rules	Limited number of friends	4
	Restrictions with online contact	1

	Conservatism in displaying personal names and reputation concerns	2
	Conservatism in displaying personal photos	1
Independence and autonomy	The need for permission	2
	Need for assistance for online tasks and accessing SM	8
	Depending and relying on the caregivers	5
	Saving login information	3
	Need assistance to log in	4

However, it should be noted that these numerical results were gathered as the interview transpired with each participant and did not just depend on the questions asked but also on the participants' reactions and how they approached the questioning.

According to the participants who were using or able to use social networks (P1, P2, P3, P4, Pb5, Pb10 and Pb13), the main aspects that they faced in using social networks and which impacted on usability and accessibility, are those shown in Table 6.9.

Table 6.9 Content Analysis: The impact of factors on the usability and accessibility of social media technologies by the eligible participants

Factors	Sub-category	Participants who are more able to use SM	Cases affected by the factor
Internet access	Connection problems during the interview	P1, P2, P3, P4, Pb5, Pb10	6
	Connection availability	P1, P3, Pb5, Pb10	4
	Mobile connection problems	P3, Pb5	2
	Restrictions of using the Internet	Pb13	1
	Inability to connect to the wireless network	P2	1
Access to technology devices	No devices owned	P1	1
	Restrictions on using the devices	Pb13	1

Factors	Sub-category	Participants who are more able to use SM	Cases affected by the factor
Digital literacy	Literacy of technology functionality	P1, P2, Pb5, Pb13	8
	Understanding terminologies or abbreviations	P2, P3, P4, Pb5, Pb10	5
	Arabizi	P3, pb10	2
Username and passwords	Inability to access personal accounts	P2, Pb13	4
	Inability to retrieve the password	P2, Pb13	2
	Remembering login information	P2, P3, Pb10, Pb13	6
Cultural related content in technologies	Culture difference in technologies	Pb10	1
Education and support services	Poor quality of education	Pb13	1
	Lack of services for ASD	Pb13	1
	High cost of education or services	Pb13	1
Caregiver's support	Assistance limitations Limitations	P1	1
	Online communication between	P2, Pb13	2
Language	Limited reading and writing literacy	Pb13	1
	Problems with spelling and pronunciation	Pb10	1
	Difficulties with Arabic language	Pb10	1
	Difficulties with English vocabulary	Pb10	1
	Limited English abilities	P1, P2, P4, Pb5, Pb13	5
Social rules	Limited number of friends	P1, P2, Pb10, Pb13	4
	Restrictions with online contact	P2	1
	Conservatism in displaying personal names and reputation concerns	P2	1

Factors	Sub-category	Participants who are more able to use SM	Cases affected by the factor
	Conservatism in displaying personal photos	P2	1
Independence and autonomy	The need for permission	Pb5, Pb13	2
	Need for assistance for online tasks and accessing SM	P1, P2, P3, Pb13	5
	Depending and relying on the caregivers	P1, P3, Pb10, Pb13	4
	Saving login information	P3, Pb10, Pb13	3
	Need assistance to log in	P1, P2, P3, Pb13	4

It is important to keep in mind that some of these issues occurred due to the participants' abilities rather than being related to the usability or accessibility of social media or the interview setting.

6.3.4 Discussion of the Results Regarding FAASCIT

The main focus was to explore whether the identified factors in FAASCIT were relevant to this study's core participants i.e. adult Arabs with Autism in Saudi Arabia. Thus, after coding the collected data and grouping the codes according to the related themes, they were presented and discussed further below. The discussion is divided into three sections, according to the participants. The group of participants who were using social networks (P2, P3, P4, Pb5 and Pb10), the participants who could use social networks but needed extra help and assistance (P1, and Pb13), and the group of the participants who are lower functioning and could not use social networks (Pb6, Pb7, Pb8, Pb9, Pb11 and Pb12). However, different aspects of the factors are discussed in relation to all the participants, with more focus on those participants who were capable of discussing their use of social networks.

6.3.4.1 Participants Using Social Networks (P2, P3, P4, Pb5, Pb10)

This group of participants were the ones who were using social networks during the period of the study, and who were recognised as more highly functioning than the other participants. A dissection regarding their use of social media is discussed in details in the following section.

Discussion of the Technological Factors

In this section the impact of the technological factors on the use of social networks in regard to this group of participants is discussed according to the different situations that accrued during the interviews or as a result from the participants' answers.

- **Internet Access**

Affording or owning devices for the group of higher functioning participants who were using social networks did not seem to be an issue, Table 6.10 shows the devices they owned and the social media applications they were using.

Table 6.10 **Technology devices and their usage by the participants**

Participant	Gender	Devices	Used Social Networks	Social Networks Created for the Study
P2	Male	Smartphone iPad PC Laptop	WhatsApp, (Facebook and Twitter, but couldn't access it)	Instagram
P3	Male	Smartphone Galaxy 5S laptop (broken)	WhatsApp, Snapchat	Instagram
P4	Male	iPhone 5S	WhatsApp, Snapchat, Instagram Facebook, Twitter, Keek, Path, BB messenger	None
Pb5	Male	iPad 2	WhatsApp	None
Pb10	Female	xbox, playstation3, playstation4,	YouTube, Tumblr	None

		iPod, iPhone, wii, wii U, PC, laptop, graphic drawing tablet		
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In addition, in regards to accessing the Internet, they all had a Wi-Fi connection at home but not everyone had a mobile Internet service: P3 did not have mobile Internet access, but he accessed the Internet on a daily basis. P2, P4, Pb5 and Pb10 had a mobile service. P2 reported that he used the Internet for four hours per day, while P4, Pb5 and Pb10 reported that they used the Internet every day at any time. When Pb10 was asked how often she accessed the Internet she replied “Daily, I don't have anything else better to do”.

During the interview, P2 had problems trying to connect to a wireless network; he had difficulties entering the password, as he was typing his Facebook password instead of the provided Wi-Fi password. However, having once connected to the Internet, there were more issues for the individuals with ASD to stay connected, due to poor Internet signal. At times while interviewing the participants, there were some situations where the Internet signal was poor or was not reachable in certain areas, for example, P3 was interviewed at his home and when he wanted to download Instagram he had to go to the second floor of the house, because the connection was better there; afterwards, when he tried to download Facebook he did the same, but could not even download it there, due to the poor Internet connection. His mother said that the Internet was not very good at their location. Another situation occurred with Pb10, where the room in which the interview was held did not have a good Internet connection. However, in all the interviews a portable Internet device was also available, but once again the signal was dependent on the phone network in the area.

These connection problems could be frustrating when trying to connect with someone for a specific reason at a specific time, especially when using synchronous communication, which could cause delay during a conversation. For example, PARLE (see Section 2.3.2), the on-demand learning technology which helps users with ASD with suggested responses during a conversation, would be useless with poor or no internet connections. Another example would be when using

SocialMirror (see Section 2.3.2), where a poor Internet signal could lead to a delay in asking a question and in receiving a response, if the person wanted a response at the current time.

- **Digital Literacy**

This group of participants were using different social media accounts for different purposes and different motivations. However, some participants were more aware than others of the different features of the technologies they were using, for example, Pb10 had several different devices and had been familiar with technology since childhood. She used to have a Gameboy and a computer in the early 2000's. Her good knowledge of English, also helped her use the technologies more easily. Moreover, P4 was very active online and had a personal account on different social networks, and used these networks with their different features, which showed his ability to use these networks. He and P3 used Google translation app to translate the words from English to Arabic if they did not know the meaning. During the interview, P4 was aware of how to accept a "follow request" on Instagram, without any problems. However, he was also asked about how to find his personal information on Facebook, but he did not understand how to find it, and he said "I do not know", but he was aware of how his account can be found online: "You write in Arabic my name, and you will find me in the search".

Participants (P2, P3 and Pb5) were able to use different online applications once they got used to using them. However, they needed to be taught how to log in and to receive an explanation regarding creating and accessing their accounts. Not everyone knew what to do, even in minor situations: for example, P2 could not log in to his Facebook account, could not remember his account name, could not retrieve the password, did not know his email address and also thought his sister's Twitter account was his account. He also was not able to connect to the wireless connection, with a given network name and password. P3 on the other hand, was still not using Facebook, since the time he was met in the first stage, but knew the Facebook icon. At this stage, he was using Snapchat and was used to posting his photos on it; however, when he was asked to add a friend, he did not know how to do it, even though he asked how the name was spelled, so that he could search for

it by the username. However, he did not have a problem downloading the Instagram app, apart from the Internet connection, and he was aware of the meaning of “skip” while setting up the Instagram account. Pb5 knew Facebook and Instagram but did not use either of them: he used WhatsApp, but was not previously aware of how to add his name or profile status.

- Usernames and passwords

This group of participant faced problems when trying to sign in, or said they could not remember their login details. P2 took many attempts trying to log in to his Facebook account; he was also unable to change the password because he did not know his email password either. When he was asked to access his email, he was trying to enter the email details from the Facebook page; however, the email address was typed incorrectly with “hotmel” and with spaces. P3 said he needed his sister’s help when he forgets the username or password, he said he used to save the email login information to access it easily. However, he could download “Instagram” without any help, and he also had a password for his mobile phone. Pb10 kept her YouTube account open so that she could access it whenever she needed to use it. When asked if she could remember her passwords, she said, “I don't remember very well. I have a memory loss. I blame my grandma”. On the other hand, P4 said he remembered his password for Facebook and could log in again if he was logged out. The inability to remember the usernames and passwords or mistyping them prevents the users from accessing their accounts, especially if they do not know how to use their email or how to retrieve the passwords.

- Arabizi

Of the five participants (P2, P3, P4, Pb5 and Pb10) who had better reading abilities, not all were familiar with Arabizi. As revealed during the first stage of the research, P3 and Pb5 were not familiar with Arabizi. At this stage, the participants were asked to read a small sentence written in Arabizi: “Kaif 7alak?” meaning “How are you?” The “7” is written instead of the Arabic letter “ح”, as there is no letter in the English alphabet which has the same pronunciation, “H” is the closest letter for “ح” when writing English, even though “H” is more like the letter “هـ”. In Arabizi it is

changed to the number “7” to differentiate between the two letters. P2 and P4 could read the sentence correctly and easily. P4 used Arabizi in most of his comments and understood Arabizi text better than English. P3 did not understand it, he was provided with an explanation and examples of how the numbers can be used instead of the Arabic letters, like “7” instead of “ح” and “3” instead of “ع”. Afterwards, when he was asked to create an Instagram account, he chose his username account and wrote “3” instead of “ع”, “0” instead of “س” and “2” instead of “ي”, even though “0” and “2” are not commonly used in this way. When he was asked about the numbers, he replied the shapes are similar to the “س” and “ي”. Pb5 said he could not read it, and Pb10 exclaimed “How am I supposed to read it! ke ke Kf seven ala, K K, what the heck is that?”.

Participants who tended to use or understand Arabizi were the participants who understood English to a certain level. The other two participants who were not able to read it at all were, Pb10 the English-speaking participant, and Pb5 the Arabic speaking participant. As there is no rule for using this way of typing, it could be confusing for the users with ASD to understand what is meant: for example, some letters are changed to numbers which have a similar shape, while others are not. P3 understood the concept and thought it was the same for all the letters. This is a skill that can be learned by practising and by getting used to reading and communicating with people who use Arabizi. However, although not knowing Arabizi does not prevent people from using social media, and individuals with ASD who do not understand Arabizi can still use Arabic or English text, it would be useful to know it to avoid any misunderstanding, as it is used by many Arabic users online.

- Online communicative language features (Abbreviations, Acronyms and Web Terminology)

Misunderstanding abbreviations and Internet terminology could lead to the lack of understanding conversations online or the meanings of what people are saying. This could result in awkwardness and for people with ASD, as misunderstanding

could cause confusion and could put them at risk³⁵. Not all of the participants were aware of Internet abbreviations and terminology. However, this was according to the examples they were asked about, and different examples could be understood or known in a different way. For social media terminologies, when they were asked about those with regard to the program they were using, P3 was asked to go to his "story" on Snapchat, and he did. He was provided with an explanation about adding a photo and then either "Like" or "Comment", but he did not know what they mean. When asked if he knew what "Like" means, he said "Like means the same". However, he knew what "follow" means on social networks. P2 and P4 did not understand "tag" and "timeline" in Facebook's terminology. Pb5 was only using WhatsApp, so he did not know "tag", "comment", "timeline" or "Like". Pb10 was using YouTube and Tumblr; on YouTube, she was aware of the meaning of people commenting and subscribing. Watching the number of people who had viewed her videos or subscribed to her YouTube channel made her excited.

In regard to abbreviations and Internet language, the intention was to check their main understanding, so they were asked to read the sentence "What will you do 2night?" P2, P3 and Pb10 could read it correctly and understood the meaning. Pb10 was also asked about "OMG" which she had written in one of her comic strips, and whether she knew what it means; she said, "Yes, I am a teenager, of course! Oh My Globe". She heard it from a show on YouTube, but she did not know that it also stands for "Oh My God", which is the meaning more commonly intended. P4 did not read it as "tonight" but instead he read it "enti" or "2nti" meaning "You", so he read "2" as "ء" as it is used in Arabizi, as P4 uses Arabizi in writing his comments online as explained in the previous section. Pb5 could not read the sentence because he did not know English. It was noticed from the examples, that the participants who had English language abilities but who were not familiar with Arabizi understood the example of the Internet abbreviation. However, the participant who was familiar with Arabizi was confused and did not read the example correctly, but instead he used Arabizi to read it, even though he knew a little of English. These situations showed that abbreviations and terminology could cause confusion for

³⁵ <http://www.autism.org.uk/staying-safe-online>

Arab individuals with ASD, especially that the misunderstanding was also associated with the lack of English language.

Discussion of the Cultural Factors

The factors and issues which has been found during interviewing the participants who were using social media, that are considered to be regarding cultural aspects are discussed in this section.

- **Education**

Individuals with ASD need to receive good education and special support to help them develop their abilities and skills (Lord & McGee, 2001). This requires good autism education centres with good facilities, in order for individuals to be equipped to live their daily lives, in which technology is now a part. In addition, parents need to help with the devices and learn what programs could be useful for their children (Habash, 2005). When it came to educational services, the participants had different opportunities, which could be as a result for the available or affordable services. During the time of the study, participants P3 and Pb5 were working; P2 was going to college while P4 and Pb10 were attending mainstream schools. Pb10 was receiving her education in English, and had more opportunities and support to be familiar with technology: she had many devices and her parents supported her video recording and her hobbies. However, she sometimes tried to play games requiring advanced English skills, which her mother could not help her with. This is an example of the claim by the specialist at centre I in Section 5.3.2, as she reported that parents prefer to choose to teach their children English for having better opportunities, and change the language at home to English to communicate with their child. However, Pb10 was speaking English with her mother and a little of Arabic, but she prefers using English and her mother's English was limited.

However, it has been shown that caregivers provided support for the participants. The mother of P2 said she used WhatsApp to communicate with her son. She was also using it to help him learn grammar correctly: she said, "I write mistakes when I type to make him correct it, you see". P3, P4 and Pb5 had their caregivers on

their social networks. Pb5 communicated with his parents via WhatsApp. His mother had an Instagram account but he did not have one.

- **Language**

In the literature review (Chapter 2), it was noted that the majority of technologies and programs for assisting individuals with autism are in English and there is a lack of technologies in the Arabic language. Experts interviewed in the first stage of this study also highlighted the lack of Arabic language technology, as mentioned in Section 5.3.2. When interviewing the participants, only one participant out of 13, Pb10, understood English properly and preferred to use English over Arabic. As mentioned in the previous section, she spoke English fluently and preferred to type in English but had problems with spelling, which made her avoid using Facebook or WhatsApp, and she also sometimes had problems with pronunciation. When she was asked about using Facebook she said “No, I don't like Facebook. I am more like a video fun person, Tumblr person”, then she explained that she does not like Facebook because her spelling is not good and she is somewhat dyslexic. Then she was asked about Instagram she said “I am not a cliché of the generation”. She spoke in an ‘*Idiosyncratic*’ language, using quotations from TV commercials or movies and also from video games, which some individuals with ASD have been reported to use (Varnagy-Toth, 2015). For example, she said “You’re not the police are you? You’re not the popo? I can’t go to jail I’m a minor,” which is a quote from a video game she used to play.

Moreover, as mentioned earlier, P2, P3 and P4 had some English abilities for example P2 could read correctly the provided example in English, but he had spelling mistakes when typing his email address, he entered “hotmel” instead of “hotmail”. He also typed “Burj Khalid” as a comment for a photo on Facebook, but what he meant was “Burj Khalifa”, which is the Khalifa Tower in Dubai. Typing “hotmail” incorrectly would prevent him from accessing the email account or any other account that requires the email to sign in, as discussed in the ‘usernames and passwords’ section. P3 preferred writing in Arabic rather than English, and P4 used both Arabic and English for his online comments when using social networks. As mentioned earlier they both used *Google translate app* to translate the English

written words to Arabic, for a better understanding. For the language used in their devices, P2, P3 and Pb5 were using Arabic platforms; whereas, P4 and Pb10 were using English platforms.

However, even with English language abilities, language difficulties could also form a problem for individuals with ASD in Saudi Arabia, as English is not their first language and unknown vocabulary could make it difficult for them to understand the required application or technology. For example, Pb10 was using her iPad to play a game about the UK political system: she could not understand the meaning of several words and while she was trying to play the game she was asking about everything. She also said that her mother did not know English well enough to help her understand the difficult words. This could also be a problem of cultural-related content, as the UK political system will be better understood by individuals from the UK. As noticed from the previous example, some parents could have limited English abilities, which makes the possibilities of receiving support regarding understanding English text or vocabulary limited for the individuals with ASD at home.

- **Social Rules**

In regards to communication rules in Saudi Arabia, as mentioned in Section 3.2.3.1, communicating with the opposite gender is not accepted in every case according to the Saudi culture. It has been suggested that cultural restrictions could have an impact on the use of social networks by Arab users (Askool, 2013), and for individuals with ASD understanding social rules could be difficult, so in this research online social culture rules, specifically contacting and communicating with non-relatives of the opposite gender was a factor to be explored. During the interviews the ability to explore this factor was limited especially for online activities. However, when interviewing the participants, no problems accrued regarding this factor when communicating offline. Some situations accrued, for example, when P2 was asked by his mother why he did not greet the researcher, he replied “I cannot shake her hands”. This shows that he was aware of the Arab culture’s social rules, but it could also be difficult for him to understand and decide how to react depending on the person he is dealing with. However, the aim was to

discover if online communication with the opposite gender raises any issues. When asking regarding their online contacts, P2 had friends on Facebook, mentioning only male names. He said he had three friends on Facebook who were his friends from college. However, his mother and siblings were not friends with him on Facebook, as he mentioned. WhatsApp was used by the family more than other social media applications: he had a family group on WhatsApp consisting of five members, who were his parents and siblings, and he also had contact with his uncles and his friends from college on WhatsApp, in a private chat, but no online contact with his cousins, as stated by his mother.

P3, P4 both had male and female online contacts, P3 had about 50 contacts on Snapchat mainly his relatives, and he did not have any concerns about contacting his female relatives. He had only two of his friends on Snapchat, and he said he spoke with his friends when he met them in person but not via Snapchat. On WhatsApp he also contacted his family and relatives, and had WhatsApp chat groups with his aunts from both of his parents' sides. P4 reported that he had 161 friends on Facebook, who were relatives and friends, and on Instagram he had 1,232 followers and was following 2059 people. He also had friends at school, but said he only had one friend out of school. However, although he might not know the people in the entire list in person, he was communicating with his friends via social networks, mainly Instagram. These online contacts show who participants were contacting in online communities, that could indicate their level of sociability (Preece, 2001).

Participant Pb5 was working at the centre which he used to attend. He still had friends there and was also still in contact with his old friends. The centre is mainly managed by female employees but there are few male teachers for example for sports, so female teachers had to wear hijab at the centre. However, participant Pb5 was used to communicate with the female teachers even via WhatsApp, therefore this might not form a problem for him even online in any case. However, there was no other indication of any other contact with other cousins or non-relative female. He reported that he chatted online with his male cousins, and also with his friend P3, who was at the same centre he attended. He texted him on

WhatsApp during the interview, but then he said that P3 was at work and did not have Internet there, so he would not reply.

In addition, Pb10 was in a girls only school, and she only had one friend at school, she reported that she talked with her in English. If she wanted to speak with her out of school she just made a normal phone call. Pb10 have not mentioned any contact with a non-relative male contact online. However, she was communicating with the public on YouTube regarding her videos. From these five participants who were using social media, P4 and Pb10 were the ones who had more online contacts. P4 was the one who had the highest number of contacts and online friends, and Pb10 was communicating with the public. But this may not indicate that they had better online sociability, as the relationship could be weak with many of these contacts, while others could have fewer but stronger online relations.

In addition, all the male participants had no problem adding the researcher who is a female onto their online accounts, but it is difficult to make broader cultural conclusions about this as it could be because they know that it is for a study. Also, using social networks could be a way for individuals to overcome their cultural restrictions. As mentioned before, people in Arab countries are using online social networks to try to overcome cultural restrictions (Al Omoush et al., 2012).

When it comes to photos and videos, as mentioned earlier, these have always been an issue for people in Saudi Arabia, especially for females, as explained earlier in section 3.2.4.3, the status of personal photos and the different views towards photographs needed to be addressed and explored in this study. The interviewed participants had different views and use of photographs; P2 did not show any of his personal photos online. He liked to search for photos of mosques, historical photos and famous people like kings and members of the Royal family, and his mother said he likes to send some recorded videos of prayers to his family group on WhatsApp. Whereas, P3 used Snapchat to send pictures of himself and even other random pictures to his relatives and friends, which is basically a type of communication. When he created an Instagram account during the interview, he took a '*selfie*' and posted it as a profile photo. He also added two other photos one of himself and another photo of his niece. Participant Pb5 was using WhatsApp; he

was sending pictures mostly of Saudi currency notes, which he gets from searching on Google. In addition, he sent a photo of an old Kuwaiti series actors which he used to like. He was displaying his personal photo on WhatsApp and he had few photos online. Other participants such as P4 and Pb10 were using photos and drawings in a more creative and self-developmental activity as well as communication. P4 liked to post his pictures and drawings on social media. He posted any picture of himself which he regarded as a good picture. On Instagram he had a post, which is a video of himself at a party, and another video of himself drawing his grandfather. He *'liked'* photos and was active and always posting new photos and writing comments. He commented about the photos in English, Arabic and Arabizi. P10 had her own YouTube channel and she posted videos talking about her "awkward life" as she said and her interests; her mother was also relaxed with her daughter being photographed. She recorded the videos in her room showing all the things she owned and what she was doing. She was interested in drawing comics and she had started posting comics on her Tumblr blog. These situations showed the different use of photographs by the participants answering RQ2, and how it is involved in their online activities, such as communication and engaging with family, friends or even the public. Further discussion regarding the impact of photographs and interaction over the photographs will be explored in Chapter 7, from observing the online accounts of the participants.

- **Conservatism**

As discussed earlier, within the culture of some people in Saudi Arabia, there is a stigma attached to the names of females (Al-Jarf, 2005). In addition to conservatism regarding female names, some Arabs are conservative regarding a diagnosis of ASD, due to the possibility (or perception) of stigma attached to it (Dardas & Simmons, 2015). However, with this group of participants there was no problem regarding names and visual representations for most of the participants: participants who had social media accounts used their real names for the username of the account. However, P2 was the only one who was more conservative regarding displaying his photos online, this was also implied regarding providing his full name: his mother was careful not to write her son's

last name and asked him not to write it on the forms, and only wrote his first and middle name. On the newly created Instagram account, his username was part of his first name with his middle name and numbers, but no more information was provided. This appeared to be mostly as a result of being conservative about the family name and reputation. Moreover, P2 did not upload any photos on his Instagram account; neither did he have a personal photo displayed on Instagram or WhatsApp as explained in the previous section.

In addition, when P3 created the Instagram account he wrote his full name and did not have any problems about doing so, also he had his full name as a username on Snapchat. Pb5 did not have his name on WhatsApp before the interview: when he was asked and told that he could write his name, he wrote his full name (first, middle and last), but the teacher told him it was too long and that it would be better to delete the middle name. Although WhatsApp is intended more as a chatting app, not much information about the user is provided. Also the participant Pb5 may not have been aware of the social rules of his family, as he was interviewed with his teacher. It was noticed that his mother had an Instagram account displaying pictures and information about him, so it may not have been a problem for this family anyway. Both P4 and Pb10 shared personal information with the public, while P4 had all his different network accounts on his Instagram page so that people could find him anywhere. Pb10 did not have any problems with revealing her name online and to the public. Her username on YouTube was her first name with a nickname.

All the participants and their caregivers were open regarding their ASD diagnoses, which of course skews the lens of this research towards those who are willing to be more open. Even the caregiver of P2 who was careful to avoid about writing the full name of the participant and displaying his photos online, was talking about ASD and her son's situation without any problems during the interview, but she was concerned about revealing the name and photos of her son with his case to the public online. This shows how conservatism and social rules restricted P2 from displaying his personal photos online, which adds up to answer RQ3, of the factors that affects the use of photographs on social media. However, this may have been particular to the participants in this particular study, and different individuals

could present different degrees of privacy concerns, especially those who are less willing to be open about the diagnostic status of individuals.

- **Independence and Autonomy**

The ability of each participant to be independent enough to use social media differed from one participant to the other. In this respect this group of participants were the ones who were more applicable to use social media. However, they relied on their parents or siblings in some situations and were not fully independent: for example creating an account, setting privacy settings and even sharing their usernames and passwords. This could prevent them from having privacy. In Saudi Arabia, people in general are less independent as stated in Section 3.2.5, as it is not considered for an adult to leave the family home unless there is a specific reason (Aboul-Enein, 2010; Haboush, 2007), also the culture of Arab countries is considered as a low individualism culture according to Hofstede's dimensions (Al Omoush et al., 2012). So gaining independence could be more difficult for individuals with ASD in Saudi Arabia than in other places.

Caregivers were asked questions regarding their attitude to monitoring their children when using social media; some of the caregivers were asked in the online survey and the other caregivers during the interview. The majority believed that individuals with ASD need to be monitored when using social networks. As well as monitoring or keeping track of the person with ASD when using social networks and teaching them to take care, parents may also be concerned about the use of social media by the participants when it comes to the outcomes of any kind of online bullying or unpleasant behaviour. Individuals with intellectual or physical disabilities, including those with ASD, can be more vulnerable to a higher level of face-to-face bullying, which makes them also potentially more vulnerable than others to cyber bullying, as there are similarities between the offline and online demographics (Lough et al., 2014). This also means they could be potentially left defenceless to online bullying compared to others (Kowalski & Fedina, 2011).

During the interview, P2 received a message on WhatsApp while his mother was reading the information sheet; he read the message and his mother did not ask about the message, or who it was from, which showed a certain level of

independence. However, she also said later that she did not allow just any person to speak with her son; she wanted him to speak only to people who might have a good influence on him and could impart some useful knowledge to him. She said she did not want him to waste time with people on WhatsApp or chat with people who might joke about his mistakes, so she monitored who he was talking to. In addition, the participant said he had a Facebook account, although the mother did not know about it; however, he could not access it because he had forgotten the user name and password. His mother also said that she monitored what he was watching on YouTube, and she asked whether it was right or not to do this. When he was signing the consent form, he asked his mother if he should sign and complete the last part, as he was copying exactly what she was doing and how she did it, and she had not yet completed the signature part. On the other hand, the caregiver for P4 said that there is no need for monitoring, which could be because his son is high-functioning, and the caregiver was aware of his son's social network accounts.

In addition, during the interview, Pb5 hid his screen making sure no one saw his screen while he opened WhatsApp. When he was asked if he would like to create an Instagram account, he said he would ask his mother or sister first. He wanted to send a message to ask his sister, but he then remembered she would be at the university. Pb10 was asked how the researcher could contact her afterwards; she said, "I don't know! Call my mum!". She was then asked if this meant there was no direct contact. Then she said, "No, you know like a cell phone, you call my mum and ask to talk with me and that's it".

- **Music**

When the participants were asked about songs and music, P2 showed his interest in the Quran. On the other hand, while interviewing P3, music was played and he said it was nice, he listened to songs but not too much. On the Instagram account for P4, he had a video of himself with loud music playing at a musical party or concert. When Pb5 was asked what he watches on YouTube, and if he listens to music, he said I like to listen to "With God for Al-afasi", which is a type of 'Anasheed', which are songs without musical instruments. With regard to Pb10 she

liked listening to pop music and she said she wants to be famous like 'Beyoncé'. Overall, music may have not appeared to be a major problem that will affect the use of social media for these participants, but two participants out of five showed their religious influence.

For answering RQ1, in regards to this group of participants, it has been noticed that poor Internet connection, digital literacy skills as with difficulties with entering user names as passwords, English language and spelling mistakes were the main factors that had an impact on their use of social media, whereas, music could have the least effect on their use of social media.

6.3.4.2 Participants who could use social media (P1 and Pb13)

In this section the interviews with the participants who were high-functioning and can use social media, but needed extra support are discussed. P1 was not using any social media applications, and Pb13 was using a number of social networks (WhatsApp, Instagram, Facebook) but was not aware of the use of these networks. They both had more problems even with the main understanding of the technologies.

Discussion of the Technological Factors

- **Internet Access**

During the interview, it was noticed that accessing technology was an issue for the two participants (P and Pb13), so this factor was added to FAASCIT. Using social media requires having a device to access the Internet, or to use a device at the centre, school, and university or at work. If accessing a device, such as a desktop, laptop, tablet or a smartphone was not possible either for the inability to afford it, or for other reasons, it will have an impact on the ability to use social media. At the time of the interview, P1 did not own a personal device on his own, he was sharing an iPad with his sister because the family could not provide one solely for his use. He reported that he used to have the Internet on his device, and accessed it on a daily basis, but no longer had it, which resulted in not being familiar with the use of

social media. This could be one of the reasons why P1 was not able to use social media, and he was not given the opportunity to practise using social media. In addition, from all the interviewed participants, P1 was the only participant who did not have access to the Internet at home, nor on the device he shared with his sister.

In regards to Pb13, his caregiver had a wireless portable device that they could connect to at any place and time; however, the participant could access this device only when he was with his caregiver; in addition, he was only allowed to use his phone during weekends. Pb13 started learning to use social networks only when he moved to live with his mother and stepfather at the age of 15, and had a smartphone and Internet access.

Table 6.11. shows the use of social networks and devices by P1 and Pb13.

Participant	Gender	Devices	Used Social Networks	Social Networks Created for the Study
P1	Male	iPad (shared with his sister)	None	Instagram
Pb13	Male	Lenovo Smartphone, Tablet (being repaired)	WhatsApp, Instagram, Facebook	None

However, Pb13 did not have his phone or tablet with him during the interview, as he was only allowed to use the phone at weekends as mentioned earlier.

- **Digital Literacy**

P1 only watched videos on YouTube and he said he also searched on Google for things he was looking for. During the interview his teacher created an Instagram account on his device for P1, which could not be appropriate for the participant to access at any time anyway. The teacher also added that P1 needs more assistance and practice to be able to use Instagram. Pb13 did not know how to reach his social network accounts if it was not from his device, and all account settings were implemented by a person in a mobile shop, so he was not aware of his usernames

and passwords. His mother and stepfather also did not know how to reach his accounts and did not know what were his usernames. This problem of usernames and passwords can make accessing social media more difficult for individuals with ASD, and also it could affect their privacy. Both participants had limited digital literacy and needed assistance for online activities.

Discussion of the Cultural Factors

- **Education and Language**

In regards to the level and quality of education received by P1 and Pb13, at the time the participants were interviewed, P1 was working, he had very limited English abilities. He only knew a few words in English, he had a drawing of a book and wrote the name of the book in English, however, he wrote “Hupe” instead of “Hope”. On the other hand, Pb13 was attending a mainstream school in Makkah, but instead of integrating the students with special needs with typically developing students, they isolated them in one class which had six students with different special needs and who should have been at different school levels. The mother and stepfather of Pb13 were not pleased with the quality of education provided, as their son was not learning from school. Earlier he was living with his father and stepmother and had been treated badly, and did not receive a proper education, which resulted in having poor reading and writing skills, that caused him difficulties at school. For individuals with ASD who are adults and have limited formal support and limited opportunity to be integrated into the community, social networks could be a good opportunity for them to gain support and communicate with other people.

- **Social Rules**

The participants of this group had limited online communication, and no online friendships were known; however, P1 was trying to reach what he desires online, even though he does not use social networks. He used the Internet and was searching on Google for a girl; he said “I want a girl”, he wanted to play with her, but his feelings and intention could be different, as he talked a lot about wishes and

dreams and said, “I want to wish that I love”. This shows that because he finds it hard to find a girl in real life he tried using online technology to fulfil his desires, that shows how photographs can be used by the users with ASD online, adding to RQ2. For Pb13 there was not any information regarding his communication with a female. His school was for males only, and at home his stepbrother was his friend and was always helping him. In the interview, he said he would like to have Skype to call his friend, who was his previous bus driver. So all his contacts and friends were male, and no contact with a female person was mentioned apart from his mother. However, using Skype video calls would not provide the person with the same control of response time over the conversation, as occurs with asynchronous communication.

For there views towards photographs, religious aspects did not seem to be a problem for both P1 and Pb13, P1 for example enjoyed drawing; he drew someone in 10 minutes, while being interviewed. For the study, he was given the idea to post his drawings on Instagram, but he needed to be taught first to learn how to use Instagram; at the time none of his relatives or his teacher were able to teach him. He also used Google to look for photos such as Winnie the Pooh, magic and circus photos. This shows how the participant had interest in visuals, he has also provided a drawing of a book about hope and wishes to show it to the researcher and to explain that he wants his wishes to come true. The value of visuals was also shown with Pb13; he was looking for Instagram by the icon; his stepfather explained that if there was no icon he could not recognise the app. He mainly took pictures from Facebook and sent them on WhatsApp, or from WhatsApp to Facebook and so on. His stepfather said: “He just sends any photo without knowing the context, so if you ever received any inappropriate photos from him, you need to understand that he is not aware of what he can send and what he cannot”. Adding to RQ2, this shows the support of visuals for the individuals with ASD on their online communication.

- **Conservatism**

During the interview, P1 was asked to be filmed on video while he was drawing, he and his caregiver did not have any problems with being recorded. In addition, the

caregiver had pictures of the participant P1 on his own Facebook account, but P1 personally did not use any social media to post any photos. When creating an Instagram account for him, his teacher added three personal photographs of P1. In addition, the caregiver of P1 said that you can search for the name of the participant and find information about him online. Furthermore, as mentioned earlier, neither P13 nor even his caregivers knew his username. His mother asked to search for his full name on Facebook to find his account, but it was not found. Later his Instagram account was found: he had his photo as a profile photo, and his username was his first name and numbers. However, it did not seem that they were conservative about displaying or saying his full name.

- **Independence and Autonomy**

When it comes to being independent, P1 and Pb13 were less independent than the participants in the previous group. P1 did not have his own device, so he could not access the web at any time. He also needed assistance and help remembering the password and accessing the Instagram account which was created during the interview. However, his teacher was busy after the interview and the participant could not receive any support with the use of Instagram. On the other hand, Pb13 could only use his phone and iPad at weekends, and he did not have the opportunity to use these during the week, as his caregiver said he was overusing them and it was hard for them to control his use. This was because his caregivers wanted to make sure he did not spend too much time on the Internet, and so that they were aware when he was online. This could be to protect him from any online abuse, but it could be argued that it was also preventing him from building independence. Without his phone, it was not possible to know about either his Facebook account or his Instagram account. Restricting an individual such as Pb13 in the use of the Internet at certain times could prevent him or her from having the opportunity to take his/her own decisions, and also missing the opportunity of daily online interaction and connecting with friends. As he needed assistance while using social networks, Pb13's caregiver used to write the account names and passwords on a piece of paper. Thus, privacy settings were mainly managed by the caregivers. The parents provided support for him however, although they had contact with him via WhatsApp, they did not know his Facebook or Instagram

accounts, and were not communicating with him using these networks. These findings showed that the role of caregivers is important for the participants in managing and accessing their online accounts, and also to protect them from the consequences of any online vulnerability. However, teaching and explaining how to access their own user account would be helpful for the participants in order to help them in building independence. It will provide them the freedom to join and communicate with people online without feeling they are watched by their parents.

- **Music**

As with P2 and Pb5 in the previous group, P1 and the caregiver of Pb13 showed their religiously view towards music and songs. When P1 was asked what type of music he likes, his caregiver said “Yes”, and asked him, “Who do you like listening to?” and gave him a number of singers who he knew, but he was not interested and he said “No, I like listening to Abdullah Al-khelifi”, who is a Quran reader. In addition, the caregiver of Pb13 said that Pb13 listens to songs and music, but also interested in reading and listening to Quran. Even though some families usually like to show they are less interested in music and more into modesty, it has not been observed in this study that music could form a major problem, at least for the interviewed participants. However, it could cause confusion for the person with ASD if he/she was taught that music is forbidden and then coming across a video with music posted on his/her social media account or in a received link.

However, answering RQ1, the main factors which had an impact on P1 and Pb13 were accessing the Internet and digital devices, language limitations, digital literacy and independence. As with the first group, religious views towards music were exposed.

6.3.4.3 Lower Functioning Participants (Pb6, Pb7, Pb8, Pb9, Pb11, Pb12)

Discussion of the Technological Factors

The other participants were lower functioning; their main understanding was to request what they wanted to watch on YouTube or the application they wished to use. They all had Internet connection at home, but not all had devices of their own for of their limited abilities. However, Pb11 was the one with a slightly higher cognitive ability than the other participants of this group, but also had limited verbal abilities. He owned a Samsung Galaxy smartphone and a Toshiba Laptop. He liked watching Arabic series on YouTube, and he also played computer games with “Sega”, his mother was very attached to him and provided intensive support for him, she said that she had never thought of encouraging her son to use social networks and communication apps. The mother also created an Instagram account for him for the study, but she was the one doing the activities on the account. The other participants who were considered to be lower functioning (Pb6, Pb7, Pb8, Pb9 and Pb12) mainly used the technology for watching YouTube videos, especially cartoon songs. However, family members helped them with their requests and played what they were asking for. Table 6.12, shows information and the devices used by this group of participants.

Table 6.12. shows the use of social networks and devices by the lower-functioning participants.

Participa	Gender	Devices	Used Social Networks	Social Networks Created for the Study
Pb6	Male	iPod	None	None
Pb7	Male	Galaxy smartphone And uses his sister's iPhone 6	None	None
Pb8	Female	iPad 2	None	None
Pb9	Female	Does not have her own device	None	None
Pb11	Male	Samsung Galaxy smartphone, Toshiba Laptop	None	Instagram
Pb12	Male	Does not have his	None	None

		own device		
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Discussion of the Cultural Factors

Three of the lower functioning participants were still going to centres (Pb7, Pb9 and Pb12), whereas Pb6, Pb8 and Pb11 had been obliged to stop attending centres at a certain age and were staying at home. The caregivers of Pb6, Pb11 discussed some of the problems they were facing in regards to the available services, as they could not find an appropriate centre, which could accept their sons at their ages. However, the caregiver of P3 from the first group said that one of the teachers from her son's previous centre was planning to open a centre for individuals with ASD over the age of 16. On the other hand, the caregiver of Pb9 said that there is a problem in the diagnosis system, which needs professional consultants. These reports indicate limited and poor support provided for individuals with ASD, and the need for more advanced and well-organised services. If better care and an adequate level of education is provided from an early age for individuals with ASD, their skills will be developed and less support might be needed when they grow up.

In addition, the caregiver of Pb9 stated that only one of the centres in Jeddah was public and all the others were private, but the expenses of the centres for individuals with ASD had been covered by the government recently. However, this only applied to Saudi citizens who were diagnosed with other cognitive impairments in addition to autism and who had been at a centre for at least three months. In addition, the government started providing an annual grant for other expenses, under certain rules, which could range from '10,000 to 20,000' Saudi Riyals, which is about '£1,800 -£3,700', depending on the case, as reported by the caregiver of Pb9.

Moreover, the mother of Pb9 said that she is teaching her daughter to use the recently released programs for autism, for example, the one that uses PECS, an educational app which does not contain lots of text and mainly uses shapes and drawings. The caregiver of Pb7 was also helping him to use educational apps (animal sounds, and English alphabet) to help her son learn the names of animal;

in addition he used to play video games such as car race games on Sony. Pb8 also played games and puzzles in addition to watching cartoons on YouTube. Pb12 shared a PC and a Samsung tablet but he rarely used them. When he used the PC, he used the paintbrush program only. The caregiver of Pb12 said he did not mind if he could teach him to use an application either in Arabic or English, but he had never looked for programs before. He believed that his son was unable to understand and use technology and would always need monitoring. This could also be due to the lack of Arabic applications and programs for individuals with ASD; however, even the available Arabic apps such as “Tap to Talk” and “Touch to Speak” were not being used by these participants. It appeared from these interviews that most of the parents had not considered the use of technology for their children as an educational or support method for improving communication. They did not see the use of technology as a strategy that could proactively help individuals with ASD in everyday life. The technology was mainly being used to help these individuals with ASD to occupy their time. In order to make technology useful, caregivers need to be involved in finding the right technology for their children (Habash, 2005).

An example of problems with English language was observed when interviewing the caregiver of participant Pb9, who was also an advocate in the field of autism. As mentioned earlier, the mother said that she teaches her daughter programs for autism, such as the educational program, which do not include too much text, but instead more drawings and shapes. The caregiver opened the app on her phone and was trying to make her daughter play the game, explaining that the game is to develop concentration and helps the users to identify colours and shapes, and also explaining how it works. The application was not in English, the name of the app was “ABC Autismo”, and the text was also not in English. When asked whether “Autismo” was a Spanish app, she replied “No, it is English!”. It turned out that the app was available in Portuguese, Spanish and English versions, but she was not using the English one. Producing technologies with Arabic language platforms could make it easier for the Arab users with ASD and also for the caregivers who have limited or no English skills. However, the use of visuals could be an aid to understanding and using the technology, as shown in the situation of Pb9, above,

where instead of not benefiting from the technology at all, the main idea of the app was understood.

Between the participants who were lower functioning, Pb11 used to like taking photographs and recording videos as stated by his mother. He used to have the latest cameras. His mother said “He used to record, and then transfer the videos to the video cassette, even though no one uses it these days, but he has some. So actually Instagram will be easier for him”. However, he had stopped taking photographs after he had been bullied by a group of people thinking he was taking photos of them (this situation will be discussed in the ‘Vulnerability’ section with more details). Regarding the other participants, they had limited use of visuals. Pb7 was using apps for learning the animals by using pictures. Pb9 did not show any interest when her mother tried to show her the app for learning shapes and colours, which could be because it was during the interview, and there is a person who she is not familiar with. Pb6 and Pb8 liked watching cartoons and videos on YouTube. Pb12 did not have any personal device, he did not know how to take photos, and his father tried to help him take a photo, but he said he did not like it. However, with regards to personal photos, the caregivers of Pb7 and Pb8 were relaxed about taking pictures of the participants; even though Pb8 is a female, her mother did not even mind, as she offered if the researcher wants to take a picture of her daughter.

The caregiver of Pb9 had been interviewed on TV about her daughter’s situation; in addition she had a Facebook account which is specifically about autism and her daughter. Pb11 also posted some of his pictures on Instagram, with the help of his mother. Other participants were not conservative with regard to being interviewed or writing their full names. Participants were asked to provide the diagnosis report in order to know the exact diagnosis for each participant; only one caregiver provided two different diagnoses reports for her son, all other participants only gave the type of diagnosis and symptoms. These situations showed that for the interviewed participants, gender did not show a difference for using online social networks and conservatism was more as a personal aspect. However, this was regarding our participants, and other female individuals or their families could have different views.

As these participants had lower abilities than the previous groups, they were fully dependent on their caregivers. P11 was very connected and close to his mother. She taught him how to do things and showed him how to use Instagram and then he could use it. So he was dependent on his mother and did not have the ability to be independent. In addition, the caregivers of Pb6, Pb7, Pb8 and Pb9 explained that the participants requested what they wanted to watch on YouTube, and then someone played it for them. They did not have the ability to search for and type in what they would like to watch, and all of the participants needed support and assistance from their families. In regard to their views towards music, the caregivers for Pb6, Pb7 and Pb8 said that these individuals like to listen to songs from cartoons. However, the concept of music has always been debatable and people in Saudi Arabia have different beliefs and perspectives towards music. Overall, music did not appear to be a problem for all the participants.

As this group of participants were not using social media, the factors were not able to be investigated as proposed in this research. However, limited educational and support services was a factor that could be the focus for improving and developing their skills.

From the first stage of this study, when interviewing experts in the field of autism from different autism centres, it was clear that the use of technologies for individuals with ASD was not a mainstream consideration in Saudi Arabia. Even though the use of technology is now more common, it was not widely used in all autism support centres. Given that the participants were adults, some could have been less familiar with technology from their early childhood, and so it depended on what they used at home. The lack of digital literacy impacts on the use of software programs. Participants did not have the same level of digital literacy; this may have been due not only to the different diagnosis levels and cognitive abilities, but also to their usage of technologies and how familiar they were with them. Understanding certain features of the technology, how things work, how to create, access and setup a social network account differed between individuals.

6.3.4.4 Further Discussion of the Collected Data

When interviewing the participants, additional themes emerged that were not originally included in FAASCIT. Vulnerability, both online and offline, was identified by the caregivers or had been noticed during the study in relation to the different factors. In addition, during the analysis, other themes were identified inductively, such as marriage and hobbies, and these themes are discussed in this section.

- **Vulnerability**

Individuals with intellectual or physical disabilities, including those with ASD, can be more vulnerable to a higher level of face-to-face bullying, which makes them also potentially more vulnerable than others to cyber bullying, as there are similarities between the offline and online demographics (Lough et al., 2014). This also means they could be potentially left defenceless to online bullying compared to others (Kowalski & Fedina, 2011). As well as monitoring or keeping track of the person with ASD when using social networks and teaching them to take care, parents may also be concerned about the use of social media by the participants when it comes to the outcomes of any kind of online bullying or unpleasant behaviour. Caregivers were asked questions regarding their attitude to monitoring their children when using social media; some of the caregivers were asked in the online survey and the other caregivers during the interview. The majority believed that individuals with ASD need to be monitored when using social networks. For example, the mother of P2 stated that she usually checks what her son watches on YouTube, and as mentioned earlier, she was not allowing her son to chat to everyone, even if they were his relatives, as some people might make jokes about his mistakes. Besides conservatism, lacking independence could also be a factor that restricted P2 from displaying his photos online, which adds to answer RQ3.

In addition, the caregiver for P4 said that there is no need for monitoring, which could be because his son is high-functioning, and the caregiver was aware of his son's social network accounts. In this research, in addition to the contribution of the caregiver or parent in the study for increasing the motivation for communication, parents were asked to become involved and to understand the use

of social media, so that they were aware of anything happening during the study. For example, P3 created an Instagram account for the study. In just a few days, he was following “*Fifty Shades of Grey*”, which has photos and videos of strong sexual scenes from the movie. As adults, the participants may believe they should make their own decisions about following any accounts they like; the caregivers may have a different view. However, the participants differed, and these aspects of understanding may not always be harmful for the participant: for example, if the content was not something very bad but rather simply not acceptable to everyone. Other aspects could be more harmful, such as being bullied online by other users, Internet frauds or watching and viewing inappropriate videos or pictures. In addition, social networks and dating sites could violate the privacy of users, if they are not controlled or managed correctly. For example, P4 had a high number of followers and online friends on social networks, and Pb10 was presenting her personal videos open to the public on YouTube, which could be seen by anyone. This could be seen as an advantage of sociability and having contact with other users, but it also could result in exposing and putting themselves in a potential vulnerability implication, as interacting with people online could also have negative (antagonistic) interactions besides the positive and friendly interactions (Leskovec, Huttenlocher, & Kleinberg, 2010). Even though Pb10 was high-functioning, she was also facing problems with her communication with people. She said, “You know, when people stare at me when I’m noisy, it makes me quite nervous”. She also said she did not like programs which require typing text, as her writing was not good and she did not want people joking about her writing.

In addition, as discussed, participants had problems and difficulties with setting up their accounts and saving their usernames and passwords; this would also prevent them from having their own online privacy and independence. Moreover, the caregiver of Pb13 said that he had situations where relatives complain about what Pb13 was sending to them, he said that any person who would like to communicate with this individual would need to understand his situation; as he might send some pictures which could contain offensive text or something which may not be acceptable to everyone, so the recipient needed to either like it or ignore it. Pb13 was not aware of the meanings of the pictures, and did not understand what was

written, which shows that limited reading and writing skills, caused problems with the use of photographs online with relatives, answering to RQ3.

On the other hand, the caregivers of the individuals with lower cognitive levels were facing more problems. For example, the caregiver of Pb7 said that her son needed to be closely monitored all the time for his behaviour and also to see what he was watching, because he was aggressive and could imitate what he watched and enact it afterwards, so it would be necessary to monitor him for his online usage as well. In addition, when the caregiver of Pb6 was asked about his nephew, he said, he needs to be monitored just like any other teenager at his age. Other caregivers provided examples of what issues their children could face when interacting with other people. For example, as mentioned earlier, Pb11 had been beaten by a group of people when he was taking random photographs. His mother said that he used to like taking photographs and his father used to buy the latest cameras for him. The mother added, "The last one was a Sony, the very small one; he used this camera until one day he was filming a video from the car, and a group of men came and dragged him from the car and beat him and broke his camera, thinking he was recording them. Since this incident he does not touch the video camera any more". She also reported other incidents with people: for example, at a supermarket, her son understood that if he ate something while they were buying groceries he should leave the wrapping in the trolley, so they would pay for it when they were finished. One day she was surprised by the worker shouting at her son and claiming that he had stolen a chocolate. She had to explain that the wrapping was in the trolley and that she was going to pay for it; she also explained his situation but it was not easy until someone actually understood. She also told another story which happened with a person in a shopping centre she said, "I heard the lady saying 'Why does she even take him out if he is disabled?', and she was saying words which really burned my heart". She added "Yes, I really was disconnected from the world for a long time. But I, I was brave and I accepted and thank God about all this".

These vulnerable situations and the problems of facing communities that do not accept or understand individuals with different abilities mean the parents experience the stigma of ASD, which results in the these parents living lives that

are isolated from other people and living a life of their own with their children (Woodgate et al., 2008).

- **Marriage**

When interviewing the participants, it emerged that the possibility of marriage was an issue that many of the families think about. Three of the caregivers had been asking and thinking about whether their son could get married. One of the sons, P3 was high-functioning, employed and used social media, whereas perhaps the more unexpected marriage thoughts were regarding the other participants (Pb6, Pb7) who were not only diagnosed with ASD, but also suffered cognitive disabilities, and had not shown any language or communication abilities. Another caregiver said that she did not think that her son, Pb11, could get married. She asked a doctor whether her son could have children, and the doctor said it would be advisable to only allow him to have two children, but the mother said she thought he would not be eligible to be married anyway. She then said that just a day ago, her friend suggested finding a girl for him, advising her to be honest with the people and they might accept his diagnosis of ASD. She was suggesting finding a young girl from another country and paying her 600 Saudi riyals a month, which is around £112 to take care of her and her son. However, the mother did not accept this idea and thought it would be unfair to the girl and even her son. Then she said “I understand the idea of people like my friend who called me yesterday, she told me you will not live for him for ever, he will have children and then his children will take care of him. I told her I am asking God to take me with him on the same day. I cannot live without him, and he cannot live without me”. The situation of each participant differed, and some could be more willing to get married than others. Having proper education, better support opportunities, and independence can result in having better outcomes (Eaves & Ho, 2008), which could help a person with ASD experience improved social relationships.

- **Hobbies and Interests**

While interviewing the participants, some of their hobbies, activities and interests were noted. Participants P1, P4, Pb10 all enjoyed drawing. The caregiver of P1 asked him to draw a person during the interview, he finished the drawing in about

10 minutes. He was mainly interested in magic, and he mentioned many times that he wanted his wishes and dreams to come true. Pb10 said she liked to draw cartoons and comic strips. Her favourite apps were the ones, which she uses to create characters. She even said that she had started using Tumblr to post her comics, as mentioned earlier, but she only posted three subsequent to the interview. P4 also had some of his drawings on his Instagram account, and was also interested in reading comic books. In addition, participants were also interested in playing video games. Pb10 said she was a game developer; she was using an app to develop games, and she also liked life simulator and adventure games. P1 liked to play the one which he referred to as “The big boy who is chased by the police”. Pb5 liked to play a game on his iPad called “Temple Run”. In addition to using social media, using computers in drawing, developing characters and in playing video games shows technology can be a tool that encourages adults with ASD to increase their communication with other people. It can also be used as an means of entertainment and for practising their hobbies.

Additionally, some participants were interested in sports, P2 liked football. Pb5 was practicing sports regularly; as he was an assistant coach at the centre he used to attend, he was planning to join a sports tournament. While interviewing P3, he asked his mother to tell me about him winning the tournament in cycling, in which he took part. P4, was also going to the gym and exercising regularly. On the other hand, other participants had been dealing with difficult situations in regard to going to the gym. Practising sports had not always been easy for them. The caregiver for Pb13 said he faced problems finding a gym that accepts the participant, as he required assistance. However, P13 was accepted at one of the gyms after many attempts. His stepfather said “There are 3 or 4 gyms in our area, but none of them accepted him in the gym. Only one has hardly accepted him after I pressured them to do so and I threatened them with the ministry and the minister. They did not even accept to register him officially. I take him once or twice and pay for one hour. The hour is 30 riyals; only one hour and he needs to leave”.

Access to gyms, like other support services and education, as pointed out earlier, represents a major problem for people who are low- functioning, more so than for

higher-functioning individuals. The mother of Pb11 faced difficulties finding a gym to accept her son. Pb8's mother was also struggling to find a gym, which could accept her daughter. In addition, the mother of Pb7 said that they bought a training machine for their son to exercise at home, but he got bored quickly and he did not use it regularly. From these different situations it was shown that the public are still not accepting or understanding of individuals with ASD, as was also shown from the situations which Pb11 faced when interacting with the public, which were mentioned in the previous section. It is important that people understand that individuals with ASD need to be integrated into society and be given their rights, regardless of their abilities. Individuals with ASD also need to be given the right support so that they can be understood when meeting people face to face in different situations and to be accepted by the online community, in order to make communication and interaction in virtual situations easier.

6.4 Summary

In order to explore the use of social media by the individuals with ASD in Saudi Arabia and how different cultural or technological factors can affect their use of social networks and their communication, the analysis of themes was structured according to the already identified FAASCIT factors. The factors related to the use of social networks were mainly discussed in relation to the participants who were considered at the higher functioning end of the autistic spectrum and were able to use social media (P2, P3, P4, Pb5, Pb10 and Pb13). However, all the participants' data was included and discussed in this Chapter. It has been shown that despite the differences in cognitive levels, participants differed in their lifestyle, received different education standard levels, and were subjected to different conditions. All these aspects were reflected in their use of social media and their online communication. It was also noted that the identified factors did not affect them all in the same way. It is important to understand the needs of individuals with ASD in order to know what obstacles they face while using the technologies, which is why these personal insights and individual differences are so valuable in this research context.

Chapter 7

Participants' Online Activities (Further Observation)

As has been discussed in Chapter 6, the participants were using different social media technologies, and for different uses. In order to explore more about their interaction and use of social media, how they carry on online activities, the role of photographs on their online communication, and how the factors identified in FAASCIT could impact their online actions, the participants' activities on their social media accounts was observed for a period of six months. Besides interviewing the participants, this observation also adds to the investigation of the activities (Observe users and Describe user journeys) in the inclusive design tool kit presented in Section 4.3.5 to include Arabs with ASD.

After the completion of the interviews, participants P2, P3, P4, Pb5 and Pb10, in addition to P1, Pb13 and Pb11 were in contact with the researcher via a social network connection. However, from the group of participants who were using social media, only P3, P4 and Pb5 were actively communicating on social networks or with the researcher. The caregiver of P2 provided the Instagram account created for him, but no activities appeared to be undertaken, which seems to indicate he was not using the account. Pb10 was actively online on YouTube and Tumblr; however, no personal communication took place. With regard to P1 and Pb11, as the Instagram account was created for the study, they were not using it on their own, so their activities were not implemented independently. This chapter will describe and discuss the activities implemented by the participants mentioned when using social networks throughout the period of the study. In addition to exploring the cultural and technological factors involved when the participants were using social networks, another goal was to focus on the role of photographs and videos in their communication to explore what impact it had on the social communication of the participants. The material covered in this chapter addresses

the following research questions and objectives:

RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?

- Determining the extent to which individuals with ASD interact concerning photos or videos on social networks via comments and conversations.
- How photos or videos displayed on personal social media accounts can ease interaction and communication for Arab adults with ASD.

RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult Arabs with ASD?

- Evaluating the relevance of the factors of FAASCIT for Arab adults when using social media technologies and exploring how these factors can affect their usability and the users' sociability. The GQM for identifying the data to be collected is presented in Table 7.1.
- Determining which factors have an influence on the usability of social media technologies when evaluating the use of photographs.

Table 7.1 **GQM approach for collecting the data regarding the factors of FAASCIT**
(Online observation)

Goal (Factors from FAASCIT)		Questions (To achieve the goals)	Metric (Identifying what data to collect)
Digital literacy	abbreviations, acronyms and web terminology	Are Arabs with ASD familiar with, and do they understand the use of Internet language, abbreviations and social network terminology?	- The use of abbreviations - The use of acronyms
	Arabizi	Are Arabs with ASD familiar with Arabizi? Do Arab adults with ASD use Arabizi when using online social media?	- The use of Arabizi
Culture-related content in technology		Do social media technologies developed in Western countries and according to the Western culture present a problem for Arab adults with ASD?	-Misunderstanding cultural content in technologies

Goal (Factors from FAASCIT)		Questions (To achieve the goals)	Metric (Identifying what data to collect)
Caregivers' Support		Do caregivers in Saudi Arabia provide sufficient support for the person with ASD in using technologies?	- Caregivers' online communication with the participant
Language		Does the language cause any barrier in communicating via social media for adults with ASD in Saudi Arabia? Does the lack of English language cause any barrier to adults with ASD in Saudi Arabia for understanding the technology?	- The language used on the social media networks - Problems with the language
Social rules	friendship, relationships and communicating with the opposite gender	Do adults with ASD in Saudi Arabia face restrictions when communicating with people online?	- Friends they have (online) - The users with whom the participants communicate
	the concept of representation and photography	Are individuals with ASD free to display their photographs online? Do photographs present a problem for the participants? Are Arabs with ASD conservative about their photos appearing online, especially females?	- Type of photographs they like - Type of photographs they post online - Photo displayed on their profile
	conservatism and displaying personal names	Are adults with ASD in Saudi Arabia able to add their personal information and real names online on social networks? Are individuals with ASD in Saudi Arabia open about their diagnosis online?	- Name and details displayed on their profile - Content of the photos, videos or text they present online - Talking about ASD
Independence and autonomy		Are adults with ASD in Saudi Arabia able to use social media on their own?	- The participants' decisions in giving online responses and carrying out activities

Goal (Factors from FAASCIT)	Questions (To achieve the goals)	Metric (Identifying what data to collect)
Gender differences	Are males and females with ASD in Saudi Arabia using technology the same way?	<ul style="list-style-type: none"> - Privacy settings - Name and details displayed on their profile - Photo displayed on their profile - Displaying personal photos online - The main purpose of using social media
Music	Do videos or audios containing music posted on social networks cause a problem for Arab users with ASD?	<ul style="list-style-type: none"> - Music videos posted on their accounts

7.1 An Overview of Participants' Online Accounts

The profile status and actions carried out by the participants on their social online networks during the research period are presented in the following tables. The number of likes in the 'activities' column represents the number of the researcher's photos that were liked by each participant. The comment is the number of comments the participant wrote about their own posted photos. The first table (Table 7.2) represents details regarding the Instagram accounts for the higher functioning participants (P2, P3 and P4), and the lower functioning participants (P1 and Pb13) and Pb11 who had lower verbal abilities. Followed by Table 7.3, which represents the updates of their accounts after three months, and Table 7.4 and Table 7.5 represents details of all other used social media accounts, as most of the participants created an Instagram account for the purposes of the study.

Table 7.2 Participants' Instagram profiles

Participant	Social Network	Date created	Number of followers	Number of users they follow	Number of posts	Profile picture	Personal information	Activities
P2	Instagram	Created for the study	12	15	0	None	The username is part of his first name and his middle name	None
P3	Instagram	Created for the study	9	10	2	His picture	His full name	2 comments on his photos 1 mention (tagging another user) 2 likes
P4	Instagram	Already had an account	1231	2039	126	His picture	Full name, interests and other user accounts	Very active
P1	Instagram	Created for the study	3	5	3	Random picture	His full name	1 comment on his photo
Pb13	Instagram	Already had an account	1	2	0	His ID photo	None	None
Pb11	Instagram	Created for the study	18	14	33	His picture	None	6 likes 1 comment on his photo Likes for all his photos

It is clear from Table 7.2, that P4's had a large number of online followers and was following a large number of people on Instagram. He also had a large number posts, comments and likes and that he also wrote comments on other people's photos. Table 7.3 shows the changes in the participants' Instagram accounts after three months. The parts that changed are highlighted in grey. The aim of presenting these tables is to show the amount of social media activity and online communication undertaken by the participants during the three months. However, the Instagram account of Pb13 disappeared after a certain time, so no information regarding this individual's updates has been listed in Table 7.3; the Facebook account provided was also not found, so there was no further contact with Pb13 available.

Table 7.3 Participants' Instagram profiles (after three months)

Participant	Social Network	Date created	Number of followers	Following	Number of posts	Profile Picture	Personal Information	Posts
P2	Instagram	Created for the study	7	15	0	None	The username is part of his first name and his middle name	None
P3	Instagram	Created for the study	46	85	6	His picture	His full name	6 comments, one for each photo posted
P4	Instagram	Already had an account	1263	2114	137	His picture	Full name, interests and other user accounts	Very active
P1	Instagram	Created for the study	2	5	3	Random picture	His full name	1 comment on his photo
Pb13	Could not be found							
Pb11	Instagram	Created for the study	20	14	33	His picture	None	2 comments on his photo

In the following tables regarding the other social media accounts, it was according to the provided accounts given by the participants or their caregivers, so for P2 even though he was using WhatsApp, he only provided the Instagram account that was created for the study. In addition, P5 did not have an Instagram account and did not create one, as mentioned in Chapter 6. He was only using WhatsApp, and Pb10 also was not using Instagram, but preferred using other social media as shown in Table 7.4. An update of their activities after three months is presented in Table 7.5.

Table 7.4 **Participants' profiles on other social networks**

Participant	Social Network	Number of friends	Profile Picture	Personal Information	Posts
P3	Snapchat	NA	No photo	Full name	- 61 previous posts on his 'Snapchat Story' - No new posts - No direct posts
P4	Facebook	161	His picture	Full name, School, Home town, Family members	63 photos
Pb5	WhatsApp	NA	His picture	Full name	19 photos sent
Pb10	Tumblr	NA	A cartoon picture	Nickname	3 posts
	YouTube	NA	Her picture	First name + a nickname	16 videos Subscribes to a large number of channels

Table 7.5 **Participants' other social network activities (after three months)**

Participant	Social Network	Number of friends	Profile Picture	Personal Information	Activities
P3	Snapchat	NA	No photo	Full name	- 61 previous posts on his 'Snapchat Story' - No new posts visible - No direct posts

P4	Facebook	160	His picture	Full name, School, Home town, Family members	63 photos
	Snapchat	NA	His picture	Full Name	47,162 stories posted.
Pb5	WhatsApp	NA	His picture	His full name	19 photos sent
Pb10	Tumblr	NA	A cartoon picture	Nickname	10 posts
	YouTube	NA	Her photo	First name + a nickname	16 videos Subscribes to a large number of channels

Although the previous tables show that not all the participants were using social media a great deal for posting information, they may have been using social media for viewing and browsing other users accounts. In addition, they could have been using social media with their families and close friends, through private messaging or instant messaging systems like WhatsApp. From Table 7.3, it has been shown that the participants P1 and P2 did not make any online activity on Instagram. This could be for the reason that they only created it for the study, but were not interested afterwards. P3 also created the account for the study, but he had continued using it, even though his activities were limited. Moreover, WhatsApp could only be observed by direct communication between the researcher and the participants, so P5 could be actively using the application with other users. P3 was using Snapchat, but no videos or photos could be viewed by the researcher on his Snapchat 'Story', which could be that P3 managed and customised the settings, to not be viewed by the researcher. However, even the social media accounts that were used by the participants prior to the interviews, there was not much changes within the three months, as shown in Table 7.5. In regards to cultural aspects, the only female was not conservative regarding displaying her photographs or name online, so there did not really appear to be any difference between the participants in regard to the use of technology by different genders, or the conservatism of female online appearance. In addition, on the Instagram of P2 that was created for the study, there was no personal information or any personal photos presented on

his account. The account name was part of his first name and middle name, but the family name was not displayed. This could be the case for any online user, but as his mother was asking not to write his family name on the form during the interview, this was more perceived as a conservatism case. However, as mentioned previously, the challenge in this research was to find participants, so individuals with conservative tendencies could be unwilling to be interviewed at the first place anyway.

7.2 Participants' Online Activities

Using photos could be motivating for individuals with ASD in encouraging them to communicate with their family and friends, and to help them build relationships with other people. In addition, it has been found by Al-Wakeel et al. (2015) that people with autism recognise familiar places and their family member's faces, which could indicate that the use of photographs of familiar people or places online, or photographs about traditional events would motivate the individuals with ASD to communicate over a photograph. Photographs can be a reason to open up a conversation and have been observed to be the most engaging posts on social media, particularly on Facebook, according to (Cooper, 2013). As this research was focused on the use of photos and also videos on social media, investigating the use of photos and videos by the participants on their social accounts was an area of interest.

7.2.1 Posting Photos to the Participants

In this section, the activities of the participants in response to a number of actions carried on by the researcher are shown. Each table represents a type of photograph sent to the participants, and the reaction that resulted. This could only be done with the social networks that allowed photographs to be distributed. The focus was on P2, P3, P4, Pb5 and P10, as they were the higher functioning participants who were practising the use of social networks. However, Pb10 was only using YouTube and Tumblr, so it was not possible to share any photos with this individual, as Tumblr does not allow private photo sharing, and YouTube is for video sharing.

Table 7.6 Sending a photo of interest to the participant

Participant	Social Network	Sent Date	Response date	Type of response
P2	Instagram	16/06/2015	No response	
P3	Instagram	16/06/2015	No response	
P4	Instagram	16/06/2015	16/06/2015	- Replied "Hi"
Pb5	WhatsApp	16/06/2015	No response	

Table 7.7 Sending a "Ramadan Greeting" photo to the participants

Participant	Social Network	Sent Date	Response date	Type of response
P2	Instagram	17/06/2015	No response	
P3	Instagram	17/06/2015	No response	
P4	Instagram	17/06/2015	17/06/2015	-Replied with greeting about Ramadan
Pb5	WhatsApp	17/06/2015	17/06/2015	-Replied greeting about Ramadan -Asked a question and opened up a conversation

Table 7.8 Sending an "Eid Greeting" photo to the participants

Participant	Social Network	Sent Date	Response date	Type of response
P2	Instagram	21/07/2015	No response	
P3	Instagram	21/07/2015	No response	
P4	Instagram	21/07/2015	Text	-Replied for the greeting
Pb5	WhatsApp	21/07/2015	Delivered and seen after 3 days. No response	

With regard to Pb5, he did not respond to the "Eid Greeting" photo; however, after 24 days he sent a message via WhatsApp, and was very excited saying that he had obtained first place in a tournament, so he was away when the photo was sent. An original plan was to ask the caregivers to post a photo of a family member or a picture of a familiar moment for the participant, on the participant's online

account, but as mentioned earlier, caregivers were not interested in carrying out extra tasks.

7.2.2 Online activities by the participants

This section summarises the activities and communications made by the participants with the researcher within a period of six months, and the type of photographs or visuals used. Only three of the participants (P3, P4, Pb5) continued communicating with the researcher, as shown in the following tables.

Table 7.9 Activities carried out by P3, P4 and Pb5

Activities carried out by P3		
Social Network	Date	Type of interaction
Snapchat	24 July 2015	Post: a snap on his story (a photo of him with red coloured scribbles on part of his face)
Activities carried out by P4		
Social Network	Date	Type of interaction
Instagram	20 July 2015	Text: A small chat about how Eid was going Post: photo as an Eid Greeting sent via direct messaging
Instagram	May –Sep 2015	Likes: liking different photos Text: comments and replying to comments
Snapchat	September 2015	Text: Hi, when first added Post: pictures and videos of himself on his Snapchat story. He posted a video about his paintings. And also he also liked to point out different words from signs, which could have other meanings. He spoke in Arabic in his short videos. He made some grammar mistakes, but he spoke clearly.
Activities carried out by Pb5		
Social Network	Date	Type of interaction
WhatsApp	21 April 2015	Text: Initiating a conversation (calling the recipient by name and chatting)
	22 April 2015	Text: Initiating a conversation (calling the recipient by name and starting with a story) Post: sent a photo of a Kuwaiti series
	23 April 2015	Text: Initiating a conversation (calling the recipient by name and then telling a story) Post: sent 10 photos of money

	29 April 2015	Text: Initiating a conversation (calling the recipient by name and saying Hi)
	30 April 2015	Text: Initiating a conversation (calling the recipient by name and then telling a story)
	19 May 2015	Post: Initiating a conversation (sent a photo of money)
	25 May 2015	Post: Initiating a conversation (sent two photos of money)
	26 May 2015	Text: replying to the conversation of the day before
	27 May 2015	Text: Initiating a conversation (informing the researcher that the holidays had started)
	1 June 2015	Text: chatting Post: sent four photos of money
	13 June 2015	Text: Initiating a conversation (calling the researcher by name and then telling a story) Post: sent a photo of a Kuwaiti series
	17 July 2015	Text: chatting after he received a greeting photo, then initiating a conversation
	14 August 2015	Text: Initiating a conversation (informing the researcher about his return from the States).
	31 August 2015	Text: Initiating a conversation (greeting)
	1 September 2015	Text: Replying to a post and telling a story
	25 September 2015	Text: Initiating a conversation (greeting for the second Eid)

The table above represent the main activities undertaken by the three participants; these were the activities which could be accessed or viewed from the identified social media being used, with the existing settings.

7.3 Summary of the Use of Social Media Accounts of the Participants

In the previous chapter, the main use of social media by the participants was discussed, based on the results of the interviews. This section will discuss the main purpose of the use of social media by participants and with whom they were interacting, in addition to investigating how they were using the media, by observing their accounts.

Table 7.10 A summary of the main use of social media by the participants

Participant	Use of Social Media	People they interact with
P2	WhatsApp: <ul style="list-style-type: none"> • Sending videos of “Friday prayer talks” and photos to his mother or close family members. • Being in contact with three friends from college. • Learning grammar skills with the help of his mother. 	<ul style="list-style-type: none"> - Close family (siblings, parents) - Relatives (uncles) - Three friends from college
P3	Snapchat: <ul style="list-style-type: none"> • Posting photos of himself Instagram: <ul style="list-style-type: none"> • Posting photos and writing a comment underneath the photo, such as photos of his cousin, niece, his drawing, a fake tattoo, and a funny video. 	<ul style="list-style-type: none"> - Close family (siblings, parents) - Relatives (aunts, uncles, cousins) - Friends
P4	Snapchat: <ul style="list-style-type: none"> • Posting photos of himself • Snapping about a drawing he made • Snapping himself representing comedian funny videos • Speaking or posting photos about words from signs that have a different meaning, or could be used differently • Texting Instagram: <ul style="list-style-type: none"> • Posting photos and videos • Writing comments • Texting direct messages • Liking other’s people photos 	<ul style="list-style-type: none"> - Close family (siblings, parents) - Relatives (aunts, uncles, cousins) - Friends - People from the public
Pb5	WhatsApp: <ul style="list-style-type: none"> • Chatting and telling old stories • Providing information, such as, returning back to the country, winning the first place, starting the holiday, getting his salary, and sending greetings • Sending photos, mainly of currency notes 	<ul style="list-style-type: none"> - Close family (siblings, parents) - Relatives (cousins)
Pb10	YouTube: <ul style="list-style-type: none"> • Uploading videos of her, showing her possessions, such as, books, stuffed animals and toys. • Videos of her playing a video game- a 	<ul style="list-style-type: none"> - Relatives (aunts) - People from the public

Participant	Use of Social Media	People they interact with
	role-play video game called "Fallout" ³⁶ , and "surgeon simulator" game. • A video of a cartoon she created, changing her voice for different characters. • Subscribing to other channels • Replying to the comments Tumblr: • Posting photos of cartoon comics she had created	
P1	Not using social networks	NA
Pb13	Was not able to continue the observation	- Close family (siblings) - Relatives
Pb11	Not using social networks personally	NA

Table 7.10, shows that the two most active participants were P4 and Pb10. They liked using photographs and videos. It has been shown that for both participants the use of visuals helped them to present something they wanted to show, which implies as self-representation, referring back to answering RQ2. P4 added videos on his Snapchat *story* every day. He made humorous, comical videos as his blogging theme and joked about signs and words which can be read or used with a different meaning in a humorous way, or explaining an English word which is pronounced similarly to an Arabic word. In addition, he stated in one of his Snapchat videos, that his friends were asking about him, and that they wanted him to post more of his funny posts. He also posted videos of himself explaining different theories for example 'multiply and division', 'single and married' in his own amusing way. He used *emojis* and *emoticons*³⁷ in both Instagram and Snapchat. In Snapchat there are many icons of images that can be used, and he used these to explain his ideas.

Pb10 was using YouTube and Tumblr. The number of videos posted by Pb10 on

³⁶ Fallout <http://gamestudies.org/0902/articles/schulzke>

³⁷<https://www.theguardian.com/technology/2015/feb/06/difference-between-emoji-and-emoticons-explained>

her YouTube channel reached 27, in six of the videos she was talking about herself for around 15 minutes, and was recorded by someone else. Pb10 talked openly about herself, showing her room, and different things she owns, and also her full name was shown in all of her videos written on a desk nameplate. This appears to be the opposite of what people generally think a Saudi female of her age would be allowed to do. One video was a humorous cartoon, which she created, and she used her own voice and changed it for the different characters. Other videos were about video games, 'Role-play games' that she liked to play, and included her explaining the concept of the game. All videos were presented in English, as she preferred speaking in English, as mentioned in Section 6.3.4.1. However, comments on YouTube are open to the public, any person can write a comment, which may be sarcastic or aggressive, and cyber bullying is quite prevalent on YouTube comments (Dadvar, Trieschnigg, Ordelman, & de Jong, 2013). For example, Pb10 received a comment saying "Are you a guy or a girl?", she replied, "Of course, I'm a girl", and another comment asking, "How do you have subscribers!", which looks like an offensive question. However, she took the question seriously and replied saying that "It's easy, if you put your weird stuff about yourself, people will either like you or hate you, but at least you will be famous". Her intention was to be famous; at the end of the videos she asked people to leave 'comments' and 'likes', and said that if anyone had a question about her, she would do a Q&A session. She has also mentioned in the interview that she wished to be famous, like 'Beyoncé'. Moreover, the 'like' and 'dislike' buttons could cause concern if the concept in the message or image is not fully understood or the concept of collecting likes or dislikes could become a fixation. Pb10 used to check the number of viewers and the likes regularly, and appeared to be obsessed with this aspect. Receiving too many 'dislikes' for a video, or being exposed to unpleasant comments could have a negative effect on subsequent online actions, and may result in preventing the individuals with ASD from posting videos or photos online, answering RQ3. The other participants who were lower functioning as mentioned before were not observed as they were not using social networks, or their accounts were not found.

7.4 Online Survey (addressed to adults with ASD)

In Section 6.2, the online survey which was distributed in order to recruit participants was discussed; however, that survey was addressed to the caregivers of adults with ASD, so there could be a possibility that adults with ASD who had received the survey themselves may have been excluded from the survey. Therefore, to ensure as wide participation as possible, another survey was created which was directly addressed to adults with ASD, (see Appendix F). The online survey was sent to Arabic Twitter accounts, mainly related to Saudi Arabia. Three forms were completed; however, only one participant was able to use social media, and this participant was given the link by his brother. He was 33 years old, and he said he lived by himself. He declared that he had Internet connection at work, home and mobile data using a personal computer. He was using Google+, WhatsApp and YouTube, and for searching for information, sharing photos and for joining groups for the exchange ideas. He displayed his full name on the social media accounts and writes in both Arabic and English, but he did not know the meaning of the provided Arabizi sentence. The participant was not interviewed, but he gave permission for the researcher to observe his online account. On Google+, and he had 22 followers. Most of his posts were photographs and videos of links describing different things with Arabic text, for example, news regarding a new mobile application, finding a job, a photograph describing success and how to be successful, and photographs of prayers. He only had one photo of himself, which was the photo from his ID card. He did not show any sign of online interactions and paid no attention to posts or other ways of interacting with other online individuals. The possibility of investigating the use of social media with this participant was limited, so the relevance of the FAASCIT factors could not be judged just from these observations.

7.5 Summary

In this chapter the role of visuals and the activities of the participants, including their profile settings, throughout the period of the study have been described. It has been shown that there is a limited use of social networks by the participants,

which could be a result of them not being interested in communication online, or being unwilling to communicate more generally. Participants P4 and Pb10 were the most active participants on social networks, P3 was less active and Pb5 was only using WhatsApp. However, he replied and communicated when contacted. P1, P2, Pb11 and Pb13 did not have any further contact with the researcher, or visible online activities. However, P2 was observed via his use of an Instagram account, which had been created for the study. This may have been different if the contact with the researcher had been via WhatsApp instead of via his new Instagram account. P1, Pb13 and Pb11 were not able to use social networks on their own, and although access to Pb13's Facebook and Instagram accounts was given, they could no longer be found. An additional participant was reached via the online survey addressed to the adults with ASD; however, further investigation was needed in order to collect more information regarding that participant. Overall, more investigation of the use of social media by adult Arabs with ASD is still needed.

Chapter 8

Discussion of the Research Findings

This chapter presents the main findings of this PhD research. As explained in Chapter 4, the metric which is the focus in this research was the in-use metric (the use of social networks by adult Arabs with ASD within their cultural context). So after evaluating and discussing the factors in FAASCIT, it is important to examine how these factors potentially affect the accessibility and usability components with regard to the use of social media by adults with ASD in Saudi Arabia, and how these finding answered the research questions.

8.1 Reporting the Findings

In the remainder of this chapter, the overall findings from this research are presented, answering each of the main research questions.

RQ1 What technological or cultural factors are important for the usability and accessibility of social media technologies for adult Arabs with ASD and their families?

The factors that caused issues with the participants during the interviews were presented in the content analysis in sections 5.2, and 6.3.3.2. From this, the main findings from interviewing experts showed that restrictions of accessing the Internet and English language abilities were the main factors that could have an impact on individuals with ASD. In addition, in regard to the first group of participates (P2, P3, P4, Pb5, Pb10) who were already using social media, some factors were affecting their use of the online technologies and different participants faced different issue, however the main factors were poor Internet connection, limited digital literacy such as entering usernames and passwords, limited English language abilities and spelling difficulties. The other group (P1, Pb13) had difficulties to be familiar with the use of social media technologies and had difficulties with the main issues. The main factors affecting this group were restrictions to access the Internet, restrictions of accessing digital devices,

language abilities, reading and writing skills, digital literacy and independence. Whereas, the lower functioning group (Pb6, Pb7, Pb8, Pb8, Pb11, Pb12) had very limited abilities and where not able even to start using social media and could barley use the technology to view online material with great help. In the following sections, the findings from this research and the impact of each of the factors on each group is presented.

1- Participants who were using social media

Technological Factors

- **Internet Access**

From interviewing the participants who were using social networks, it has been found that accessing the Internet was an issue with the participants, which was a result of poor Internet signals or from the difficulties of accessing a wireless network that they have not been connected to before. However, all participants of this group had Internet at home and a device for using social media. They mentioned that they were using the Internet on a daily basis, and participants P4, Pb5 and Pb10 were using the Internet at any time during the day, but there is a need to take care that this is not obsessional behaviour (Howlin, 1998). However, from the observational study (Chapter 7), the participants did not show much online activities, which could be a result of privacy settings or they might be interested to use the Internet for other activities, such as one-to-one chatting or using Google, or playing online games.

In addition, Pb10 said during the interview that she feels lonely, so the use of the Internet could be a way of keeping her engaged with other people, supporting the claim that computer technology can be a supportive tool for a person with ASD (Bolte et al., 2010). However, it was shown that the lack of availability of Internet in the places of work or study or in support centres, or the unavailability of mobile Internet data could cause a delay in communicating or texting, or even prevent the person from contacting other people. As illustrated when one of the participants (Pb5) who wanted to text his friend, who was also one of the participants in this study, via WhatsApp, but said his friend does not have Internet at work and was

not able to reply. This type of situation shows that not only is the availability of Internet connection important for the person with ASD, but also for the family and relatives with whom he/she communicates. Another reason for not receiving an immediate response might be that the receiver is busy and not online, which may not be understood by someone with ASD. Having a wider online social network could be important were there is a dependency on few carers (Hong et al., 2013). The same participant (Pb5) wanted to send a message to his sister via WhatsApp during the interview, but changed his mind when he remembered that his sister was at the university. Even though the receiver could view the message later, when she was free and had an Internet connection, he did not send the message, because he wanted a prompt response from her regarding the creation of an Instagram account for him during the interview. However, he was not able to receive a response, and he did not want to create the account without asking his sister first. Prompt reply systems for individuals with ASD have been designed to help them receive a response on demand when they need it, which could be from more than one person: these include the Portable Affect Recognition Learning Environment (PARLE), developed by Bishop (2003), and the SocialMirror, developed by Hong et al. (2012), which were described in Section 2.3.2. These applications also suggest responses during real-time conversations, and the absence of Internet connection will prevent the person from benefiting from these type of services, as the individual with ASD may need a response from the other users, and not receiving a respond at the required time could create problems.

In regards to the poor Internet signal, the centre where the participant in the previous example was interviewed had a wireless network connection but the connection was poor and the participant was using his mobile data. In addition, the network connection was weak in areas where some of the participants were living. As mentioned in Chapter 6, two of the participants had a problem downloading applications during the interview because the broadband connection was slow and poor. One of the participants was not able to download Facebook on his phone and he had to go to a higher floor to obtain a better signal, but he was not successful and so Facebook was not downloaded. An intermittent connection could cause an upset and even result in anti social behaviour in some individuals with ASD, and

may make them reluctant to try to register on another occasion. In this case, participant P3 was asked to download Facebook after the interview, create an account and add the researcher, but no request from him or any information regarding his Facebook account was provided, this could have been because once again he was unable to connect to the Internet. However, it could also be that he downloaded Facebook but did not create an account, or that he created an account but did not send a friendship request. This illustrates the complexity of supporting individuals with ASD in Saudi Arabia where neither the network connection nor the technological support is guaranteed from carers or special centres.

Difficulties accessing the Internet was also demonstrated when one of the participants (P2) had a problem trying to connect to the wireless network at the hotel lobby. Choosing the network and entering the password required many attempts and explanation from the researcher, which highlights the issue of digital literacy. The issue of Internet access and the use of passwords maybe a hidden problem where devices connect automatically, as the researcher was not able to see all the participants logging in to a new network. Those interviewed at their home or centre had devices that were already connected to the wireless connection.

- **Access to Technology Devices**

Not all participants had the same opportunity of owning technology devices from an early age. Even though at the time of the interview, all of the participants of this group had devices, but some were more advanced in the use of different technologies. For example, participant Pb10 had had the opportunity to own devices since she was young, and she had many types of devices, and so was familiar with the use of technology, as mentioned in Section 6.3.4.1. However, it has also been shown that participants, who owned and were practicing the use of the technology, had improved digital literacy.

- **Digital Literacy**

Participants had different levels of digital literacy and different abilities in using social media. Accessing social media accounts was also a problem for the higher functioning participants, especially from another device, so they were mainly saving their account information on their own devices, to have easier access to it. It

has been shown that the lack of technical ability prevented the participant P2 from connecting to a wireless network as mentioned earlier, and from accessing his Facebook account during the interview. Most participants had problems entering the username and the password, which was also a problem reported by Burke et al. (2010), and they lacked the knowledge of how to retrieve the account details by using the email address. Difficulties in remembering their usernames and passwords lead them to save their details on the device or writing it down on a piece of paper, and sharing it with a member of the family, which causes security issues as reported by Gehringer (2002). These issues prevent them having complete privacy and independence, and could allow any member of the family or a stranger to have access to their accounts. In addition, limited digital literacy could also result in an inability to manage the privacy settings. But on the other hand, it is important to remember the safety of vulnerable individuals such as those with ASD, when allowing carers to check their online activities to prevent inappropriate behaviour.

It was apparent that digital literacy was important for accessing the online accounts: it was observed that not only problems with the English language but also misspelling basic Internet words such as 'Hotmail', misunderstanding online functionalities and the inability to recognise their own accounts, all caused accessibility issues. However, although several cases regarding understanding the terminology and abbreviations used in the technology were noted, this did not appear to be a main issue that could prevent the users from using social media. It could cause misunderstanding when communicating online, but further investigation needs to be addressed regarding this case. In addition, participants (Pb5 and Pb10) showed their interest in playing video games, which is a skill that maybe considered is part of digital literacy according to Eshet (2012).

Individuals with ASD have the potential to become enthusiastic about the idea of social networks once they are introduced to them in a supportive way, as in the situation with P3, when he was given the idea of using Instagram, which allows for the upload of pictures and videos. He joined and then asked if he could go on and use Facebook. Askool (2013) and Hynan et al. (2014) have reported that the use of digital technology can improve social inclusion by increasing the social

opportunities for people in general. It has also been shown that, being able to use technologies in general can increase employment prospects, in particular, computer science has been cited as a job well suited to those who have HFA (Grandin, 1999). It was clear from this study that the participants who were HFA all enjoyed the use of digital technologies, and P4 and Pb10 understood the way social media could increase their interaction with people online.

Cultural Factors

- **Education**

When it comes to literacy skills in general, participants P2, P3, P4, Pb5 and Pb10, who had experienced better educational opportunities had better reading, writing and communication skills than the other participants, and the research showed they also had better abilities to use social media networks. In addition, the participant with better English abilities had better use of the technologies; however, this was a result of having a private English teacher at home, and attending a private mainstream school, which was not the case for all the other participants. This indicates that public support provided for ASD in Saudi Arabia may not be sufficient, especially for learning the English language, and that caregivers may be facing costs beyond their means.

- **Language and Technology**

English language abilities were also reflected in the use of social media by the participants. It is shown that when using social media limited English language ability can prevent the individuals from accessing social media accounts or introduce a barrier when registering for a new account. In addition, it has been shown that as passwords and email addresses must be in English, participants had difficulties in entering the usernames and passwords, as spelling errors would not allow the registration process to be completed. This was the case with P2: typing the email address and password with spelling mistakes was preventing him from being able to access the Facebook account. He was not aware of how to spell 'Hotmail' which is a basic word for those who are Hotmail email owners.

In addition, as mentioned earlier, the participant with better English abilities was more familiar with the use of social media, and was using more technologies than other participants, but she was not familiar with Arabizi, as she used to type in English online when she needed to. As mentioned in Chapter 3, Arabizi was devised for making technologies developed in English accessible and useful for Arabic speaking people which in her case she did not need. Participant Pb5, who did not know English, was also unable to read Arabizi, as reading English letters was hard for him anyway. Whereas, participants P2 and P4, who had some English abilities but who were more familiar with Arabic, could read Arabizi, as they were Arabic speakers, but they could type in either Arabic or Arabizi. Moreover, participants Pb5 who was not familiar with English, and P2 and P3, who were more familiar with Arabic but also knew English, were all using the Arabic version of their social media platforms, which shows that Arabic was their preferred language if it was available. This indicates that if such technologies were provided in Arabic, it would be useful for individuals with ASD who are from Arabic speaking countries. However, Google translator was used by the high-functioning participants to translate any unknown English words, and they reported that they found it useful.

Moreover, difficulties in spelling either in Arabic or English could make a person with ASD avoid texting and chatting on social media, and visuals could be used as an alternative. Pb10 did not like using Facebook, even though her English was good, because of her spelling mistakes, but she liked uploading videos of herself talking and also uploading her comic cartoon designs on social media. Hynan et al. (2014) also found individuals with communication problems may have difficulties with text-based online systems, as was found in this study.

- **Social Rules**

Participants reported having only a small number of friends offline: for example, P2 had three friends, P3 had two friends, and Pb10 had 1 friend. This could be a result of their difficulty in building friendships, and could also be accounted from the cultural perspective, as in low individualism communities, people have been found to have fewer friends for a longer time (Al Omoush et al., 2012). However, P4 and Pb10 had many online friends and followers from the public on social

networks, which could be also a concern with regard to facing negative interaction with people. The participants had different preferences for modes of interacting with their friends; P3 said he preferred to interact with his friends in person rather than via online communication, while Pb10 said she spoke with her friend via a phone call. These examples show that it is not necessarily the case that individuals with ASD prefer online communication, as claimed by Burke et al. (2010), however, it might be that in these cases it was because they were communicating with close friends who they were used to. This simply highlights the individuality of preferences of people with ASD such that assumptions about similarities or generalities should be avoided.

Moreover, in this study as shown in Table 7.10, in Chapter 7, participants who were using social media were communicating with their close families or relatives, even though all participants were living with their close families. As has been indicated the culture in Saudi Arabia is collectivist according to Hofstede dimensions³⁸, and that the family relations are strong offline, which has also been found to be the case in online relations at least among the percipients in this study. This was a different finding when compared to the study carried out by Mazurek (2013), which took place in the United States where individuals with ASD were less likely to maintain social media contact with family members, compared to other more frequently reported reasons for their use of social media.

In addition, the finding of the study also shows that online representation for girls differs depending on the family views and beliefs towards this issue and how conservative they are in conforming to the cultural social rules. However, it was shown that although parents were more aware and open about ASD, the Saudi Arabian public still needs to become more educated and understanding. Several incidents reported by the participants showed that the public was still not accepting and understanding individuals with ASD or individuals with cognitive disabilities. However, it has been shown, from the interviews, that participants and their caregivers were not very conservative in the Saudi sense of holding back about their diagnoses and were open to talking about this issue, sharing their

³⁸ <http://geert-hofstede.com/saudi-arabia.html>

experiences and joining public conferences. This allowed these individuals with ASD to represent themselves online, for example, Pb10, who was enjoying posting videos on YouTube about her life; her mother was also proud of her daughter and sent one of the videos via WhatsApp before the interview. This showed that even though it has been found that some parents in Arab countries hide their children for having a 'stigma', as reported by Nasr (2008), this does not apply to everyone, which could be a result of different personal attitudes, or could be because people's perceptions of ASD have changed and they have become more educated about the subject. However, it is unlikely that the families who might be hiding their diagnosed son or daughter would be reached to be interviewed anyway. Moreover, this factor could account for the challenges and difficulty in finding participants initially, as five of the interviewed representatives of centres said that families were more likely to deny their children's diagnosis. Thus, it can only be said that being open regarding ASD was the case for the people who were interviewed in this study. There could still be conservatism regarding the reputation of the family name, as, for example, in the case of participant P2, but for the other participants there was not a problem.

One of the main reasons for using social media by the participants revealed from the observational study was to represent themselves by showing photos and videos, as this reflects who they are and what they feel, and also to share their lifestyle. In addition, P4 who was using social media to share jokes and to present some of his ideas, said he was doing this at the request of his friends. Pb10 was checking the number of subscribers and viewers for her YouTube videos and she became excited when the numbers increased. This illustrates that their use of social media could enable them to gain social recognition with family and friends, as 'likes', positive feedback and other positive features of social media provide an individual with the satisfaction obtained from the feeling of social acceptance (Seiter, 2015). It appeared from this group of participants that their views toward photographs did not seem to be a problem in terms of religious views, even for the interviewed female. Their main purposes of using social media were not very different from those of other (non-ASD) users, but it could be that this group of

individuals found it particularly useful, as they had difficulty in presenting themselves and sharing their thoughts offline.

- **Conservatism**

Conservatism regarding ASD was not an issue for the participants or their caregivers, as mentioned in Chapter 6, and only one caregiver was conservative with writing the full name of her son (P2). It has also been known from the interview and the observational study that this participant did not provide any personal photos on any online account. Other participants did not have any problem, and for the female participant it was clear that displaying her personal photographs online did not form a problem for her caregivers, as they were assisting her with recording her videos. Her full name was also displayed on her videos for the public, which can be viewed by any user. In addition, photos and videos was an interaction method for P4 for example, as he was interacting over the photos he posts on Instagram. Pb10 was also communicating by responding to comments on her YouTube videos.

- **Independence and Autonomy**

As mentioned earlier, Saudi Arabia was rated as having low individualism according to Hofstede's dimensions. This was reflected in the results of the interviews with the participants, who were dependent on their parents in many respects, including accessing the technology. The caregivers were involved in a variety of ways: in downloading the applications, accessing the accounts, deciding what to display or who the participants could communicate with, or even setting restrictions and giving permission to use the Internet. Moreover, in Western countries one of the main aims of technologies provided for individuals with ASD is to help them to gain independence; a number of technologies have been designed with this aim in mind, as discussed in Section 2.3. However, when interviewing the participants in this study, it was found that they were all living with their parents, despite their cognitive abilities. Even though the caregivers' goal was to make sure these individuals with ASD would have a safe and happy life, their thoughts were constrained by thinking of marriage and finding someone who would take care of them, rather than helping them to increase their ability to live independently.

In addition, parents were involved in monitoring and sometimes in controlling the participants in certain situations, such as deciding who they are allowed to talk to or what they are going to watch online, or what activities they were going to carry out online. This could be for the participant's own benefit, but it could also make them lose confidence in their ability to make their own decisions. Because individuals with ASD in Saudi Arabia are controlled and monitored, using technologies or applying strategies that are used in projects involving Western ASD users may not necessarily be applicable in the Saudi culture. For example, the case of traveling to meet new people, in the ACEbook project (see Section 2.3.1).

However, if there was support for the caregivers to become more involved with both online and offline social meetings with their sons or daughters who have ASD, these caregivers may learn to feel more confident about allowing for increased independence of their children, depending on their abilities. Adding to that, in Saudi Arabia, the difference between the amount of independence given to a male and a female is a major issue for all Saudi individuals both online and offline. However, for this group of individuals with ASD, their cognitive ability had an impact on their literacy level and also all the other factors which gave them the opportunity to be independent to a certain level despite their gender.

- **Music**

The presence of music, on the other hand, did not present a major problem for the interviewed adults with ASD; however, the participants' and the caregivers' views towards music was affected by the religious aspects of Islam and their beliefs. P2 and Pb5 said they preferred listening to *Anasheed* ('Religious songs with a particular type of instruments'). In the first interviews one participant (Pb5) said that music is forbidden. There are aspects of religious beliefs that are praised in Saudi Arabia, such as knowing the Quran and being able to take part in the daily prayers. It was found in the study that the music linked to these religious activities, had become an important aspect of belonging to the community in the eyes of the parents, for example, P2, had a recording of the entire Quran with his voice, which was given to the researcher, and the caregivers showed their encouragement and appreciation of these activities.

Overall, it has been noticed that there is a connection between the factors, and some factors are affected by others. Also some factors, such as the language, digital literacy, the quality of education and accessing the Internet can have an effect to the use of social media technologies more than other factors which did not form a huge problem, such as music. Figure 8.1, shows the relation between the factors, and how these factors were affected as a result of other factors for the group of participants who were using social media. It has been noticed that the type and quality of education had an effect on the level of English language ability the participants had, and both the quality of education and the English language ability had an effect on the participants' understanding of the use of technology and their overall digital literacy. In addition, their independence was affected by their understanding of the use of technology, as they were depending on their caregivers to help them in using the technologies. Also even though parental control was not a main factor, it had appeared to be a reason that affected their independence, and controlled their use of social media. Moreover, opportunities of having technological devices increased the change of being familiar with the technologies. These were the main effects of one factor to the others, according to this group of interviewed participants.

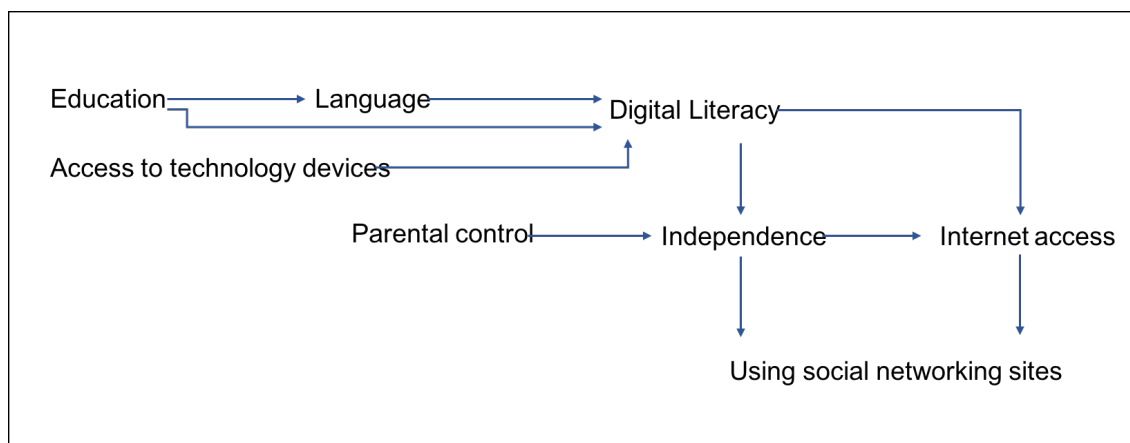


Figure 8.1 The relation between some of the factors according to the group of participants who were using social media

2- Participants who could use social media

The participants of this group were affected by the limited access of the Internet and the availability of the devices to access the Internet, so this could be one of the main issues that affected their abilities to use social media. However, the impact of this factor was a cause from the caregivers, as P1 was not provided with a device, and Pb13 was controlled and restricted for the use of the Internet and devices. Pb13 said that he always wanted to be on the Internet, but was prevented by his family as his amount of Internet use had to be controlled. Having limited or no access to devices at home or at centres means that the person will not be familiar with the technology's functionalities and features, as it has been shown that the individuals with no or limited digital literacy were those who had no or less experience with technologies. So these participants had limited knowledge of using social media in addition to limited academic skills, especially for Pb13, as a result of family problems. Lack of proper support and care from childhood could have a negative impact on an individual with ASD, even when he/she becomes an adult. In addition, the lack of knowledge in both Arabic and English languages could cause misunderstanding when using technologies, and also misunderstanding written text could cause frustration and problems for the receivers. It raises the risk of the individual being criticised for a lack of understanding both online and offline, as in the case of Pb13.

The lack of support in regard to technological applications by the caregiver or by educational organisations could be a reason of not using technologies, or could cause limited digital abilities. It has been noted that the level of digital skills of the parents has an impact on the way those with physical disabilities may use the Internet (Raghavendra, Wood, Newman, Lawry, 2012), which may also be true for those with ASD. So it is important for the individuals with ASD to have support from parents and siblings (Raghavendra et al., 2012) as well as training and practice in order to become digitally literate. Two of the interviewed experts mentioned that some parents might have problems with music, depending on their religious views, but they did not mention the participants' views, even though they had an opinion. For example, when participants (P1, Pb13) were asked about their attitude towards music, their caregivers answered instead.

In addition, social media is a connecting application as it is a human-human

interaction (Spolsky, 2004), which could help the participant to communicate and interact with other people. Providing reliable Internet networks at universities, workplaces and support centres would be useful for both the individuals with ASD and their caregivers and friends, as long as support is available when required. If proper support was provided, the participants could be taught how to use technologies, which could make the caregivers more relaxing with using the Internet, or with trying to provide a solo device for the individual. However, the participants who had received a better quality of education were in private schools or private centres, which not all caregivers were able to afford.

Moreover, if the person has his/her device, this will help in building independence. There is a dilemma for all carers; controlling an adult with ASD could have an effect on his/her independence, but maybe essential for safety reasons. So it is important for caregivers to have the knowledge to explain and provide assessment, in order to help users with ASD to benefit from the use of social networks. Also, it is important for the developers and designers to help in creating technologies, which suit all users, their skills and abilities, and in Saudi Arabia, Arabic as well as the English language.

So the main factor that affected the use of social media by this group was accessing technology devices as they had restrictions. This affected their ability to access the Internet when needed, and had an effect also on their digital literacy and understanding of the technologies, as they did not have a chance to be familiar with technologies. Charing or being restricted to use a device had a main effect on their independence, as they were not able to make decisions on their own. In addition, their English language ability and their overall literacy had been affected by the quality of education they received, which all formed issues to use social media, see Figure 8.2.

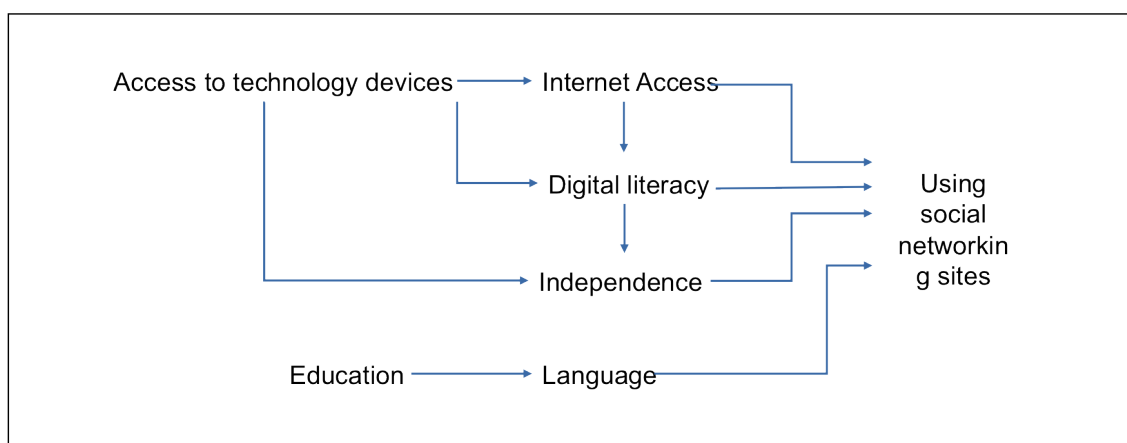


Figure 8.2 **The relation between some of the factors according to the group of participants who could be able to use social media**

3- Lower Functioning Participants

In this current study some caregivers of these participants were not considering the use of the technologies. However, that main use of the Internet was observed that the lower-functioning participants enjoyed cartoon songs on YouTube. This required support and monitoring from the caregivers. Some parents however were not aware of any educational or social applications for helping the participants with social skills; thus, not only were they finding it difficult to select the most appropriate technology (Habash, 2005), but were not even considering the technology as a useful tool. However, having access to technologies means that care needs to be taken when supporting its use, for example, Pb11 liked to take photos with his digital camera, and when he was beaten for not understanding the social use of this technology in Saudi Arabia. He stopped taking photos and did not use his camera again. Later he was given a smart phone, but he never practiced his hobby of photography in the way he had previously with the digital camera. This is an example of the support needs to be given to a vulnerable person with ASD. These situations where the use of technology has been inappropriate shows how confidence and enjoyment of hobbies can be affected.

However, for this group of participants, the factors in this study might not have an effect on the use of social media in the same way as other participants, as this group of participants were not eligible to use social media as a result of their level of cognitive ability. So the factors are not considered as a main reason for

preventing their use of social networks. In addition, a main issue regarding this group was the fact was that even parents of lower functioning participants were also thinking of and discussing marriage possibilities for their sons or daughters. This could be for the reason that caregivers are tired and need to find someone to take care of their child, or to make sure their child is taken care of after they die.

RQ2 In what ways can photographs and videos disseminated using social media technologies support adult Arabs with ASD with social skills and family relations?

The overall finding about the choice of social media was that there was not one social media technology which was preferred by all participants. Facebook was not the first choice for any of the participants; instead, WhatsApp seemed to be the most used communication app for these participants. Most social media technologies use photo sharing; however, Snapchat appeared to be the most effective social media application for connecting with the higher functioning participants, as the participant who was using Snapchat (P4) was the one who maintained daily communication with the researcher through his daily Snap videos and photos, which shows the ease of visuals for communication. In addition, YouTube was widely used by the participants to watch different types of videos, such as movies and drama or comedy series, both in Arabic and English. However, only one participant (Pb10) was using YouTube to upload videos and was interacting with other people via the comments feature, which helped her to interact with people online. She avoided using social medias that require chatting and lots of typing, and her main use of social media was posting photos and videos. Thus, photographs and videos were the media which helped these participants overcome their language difficulties and spelling errors and allowed them to communicate online. In addition, Pb10 was using YouTube videos to present herself, and was asking people to write comments or questions regarding the videos she posted. Similarly, P4 was using Snapchat and Instagram for self-presentation. They were both sharing their thoughts, stories and interests with the public. Hynan et al. (2014) also reported that people with communication

problems in their study were using the Internet for self-representation. In addition, observations in this current study show that the most active online participants were the ones who had a purpose to deliver when using a social network, which motivated them to use it, such as Pb10 filming herself and talking about her life with the desire to be famous, and P4 making videos of himself delivering comedy acts and jokes. This could lend support to the statement by Bahiss et al. (2010) that individuals with ASD prefer to interact and communicate online, when they are involved in an activity. P2 was also sharing his interests, but he was mainly using WhatsApp with his family, so he used to send photos and videos of what he found interesting to share it with his mother.

In addition, as discussed earlier, one of the advantages of photographs in supporting online communication was illustrated in the case of Pb13, who had poor language abilities and was not able to understand even text which was written in Arabic, so he was interested in sending photos instead. He used to take a photo from Facebook and send it to people via WhatsApp, and vice versa; this helped him to maintain contact with other people despite his limited language abilities. Photographs were the medium which could allow him to communicate with other online users. It was also shown that posting a photograph or a video could open a conversation, even if it was a small conversation, which helped in making individuals with ASD more connected with their family and friends, or even with the public. As in the case of Pb5, who used to send photos via WhatsApp without any prior notice or text. He sent images of Saudi currency notes, to explain that he had received his salary for that month.

In addition, the icons and logos of social media accounts helped the participants to recognise the different applications: even though they might not know the application or its use, they could recognise the logo. In addition, online photos and videos could be viewed as a method for helping individuals with ASD in achieving their wishes. The believed culture and religious views of some people in Saudi Arabia may restrict individuals from practising the realisation of their desires in public, as in the case of P1. P1 was looking for a picture of a girl online by searching in Google, because he “wanted a girl”. He was not knowledgeable about using social media, but he knew that he could find online what he desired, even if he could not

reach it offline. This supports what Al Omoush et al. (2012) claimed, that users in Arab counties in general use social media to fulfil their needs and wants and be liberated and free from the cultural restrictions. In addition, Pb10 was uploading videos of herself, as she wanted to be famous, and yet she was avoiding talking in public because she said people could start staring at her and it would make her nervous. This is another example of how technology can help some individuals when offline situations could be difficult in some situations. In particular, in Saudi Arabia where communication between different genders is not always accepted, and those of different ranks in society often expect a title to be used. However, in online communication, social rules maybe more relaxed online, as mentioned by Al Omoush et al. (2012), and Pb10 had more freedom to express herself.

RQ3 In what ways does culture affect the usability of photographs and videos disseminated using social media technologies for adult Arabs with ASD?

From the interviewed participants, it was clear that the cultural rules differ from one family to another, as is the case for all people in Saudi Arabia. As we have seen, the only female high-functioning participant posted videos online of herself talking about her life. The cultural rules regarding conservatism for girls and the hijab were not an issue for her. Being open and providing information about her personal life could be a positive aspect that helps her to communicate with people and use online social media. However, it could also have potential implications in terms of vulnerability: such users with ASD could be putting themselves in a position where they could be harmed. Vulnerability issues and facing unpleasant situations online could be one of the factors that could impact the use of photographs or videos by the participant.

In addition, participant P2 was the most conservative participant in regard to publicising his family name, and he did not display any of his personal photos on any social network or online applications. If he had himself chosen a well recognised photo, it would have been helpful for him to spot the account more easily when he was trying to find it, as his registered name was not unique.

Conservatism, social rules and restricted independence were all factors that could be a reason that prevented P2 from posting his photos online.

Moreover, the lack of language skills could cause the individual to misunderstand the concept of a photo with text included, and send inappropriate photographs that could cause problems with family relations. Such was the case with Pb13, as some of the photos he sent contained text, and the inability to read the text prevented him from understanding the meaning of the photo. Because he only looked at the image and ignored the text, this could cause problems, should the images be received by outsiders who did not know him. In this case, his caregiver told the researcher he only sent images to family and friends. There is also the issue of the sensitivity of receivers and the people with whom the person ASD is interacting, as not understanding the individual's condition and making jokes about his or her typing or spelling could lead individuals with ASD to avoid using social media, and this could make them even more isolated.

Following the observational study, it was noticed that P3 continued using the Instagram account, which was created during the interview. Also, Pb10 started using Instagram and Snapchat, even though when she was asked during the interview she said "I am not a cliché of the generation". This is not a normal statement, but it shows a certain amount of independence even though it may have come from a YouTube video. This could show that if the individuals with ASD were introduced to something which was not yet known to them, they would consider using it. This was also the case for P2, when he was asked in an informal meeting if he had a Facebook account, but he did not have a Facebook account. At that time he did not have an account, but later joined Facebook, although his mother said that she did not know about this activity. It is thought he might joined Facebook after being asked about it the previous time.

After conducting the study, it was clear that religion had an impact on the participants with ASD in Saudi Arabia, and when reviewing the type of photos or videos they prefer, many were related to religious and cultural aspects. An updated diagram of the research is shown in Figure 8.3. In addition, the interviewed experts did not question the cultural or religious aspects of the images or music, which had

an important role in the lives of these individuals. Further questioning by the researcher revealed when using social media, the religious and cultural images provided the participants with the feeling of belonging and encouraged their use of the technology. Experts in the field of ASD should acknowledge these preferences in order to help these individuals in Saudi Arabia to communicate and to be integrated in to the society.

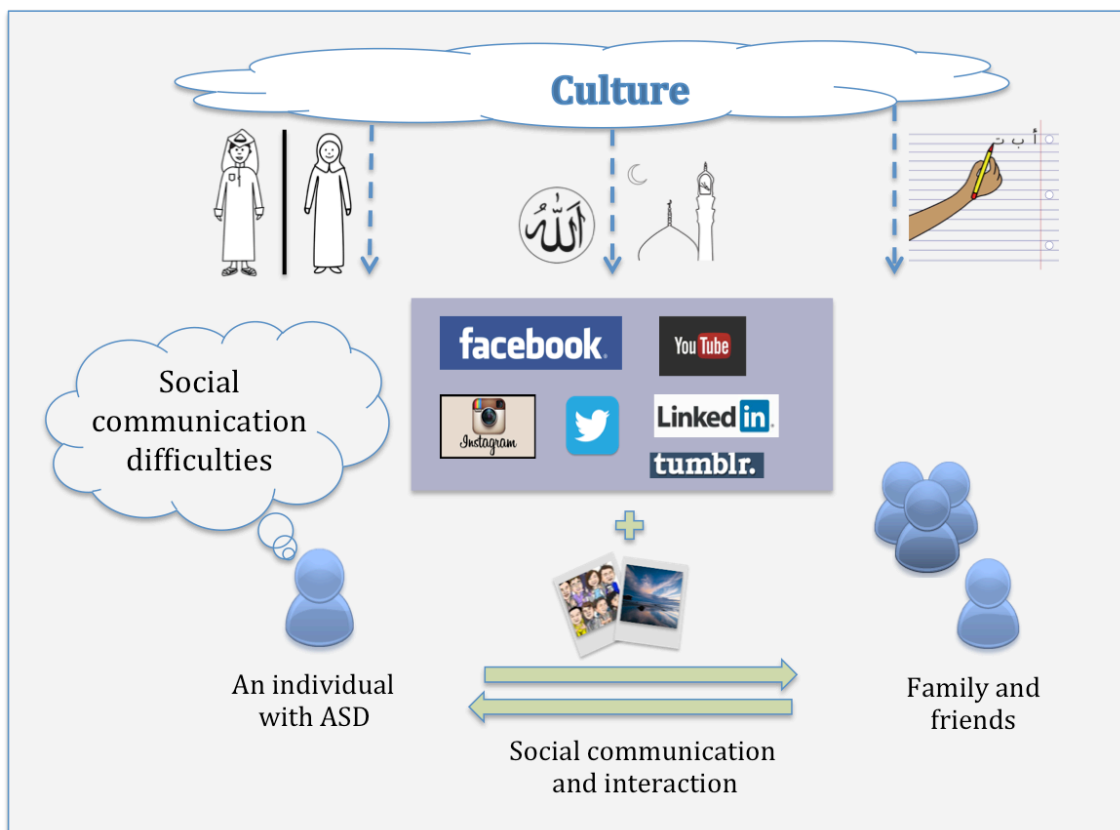


Figure 8.3 **Main components of the research and the impact of culture (gender, religion, literacy) factors**

In addition, from the findings, the needs of the participants were exposed that contributes in the 'Capturing the needs' activity in the 'Explore' phase of the inclusive design mentioned in Chapter 1, Figure 1.2. For individuals with ASD, in order to help them and ease the use of technologies, parents, specialists, organisations, technology developers, and the public need to understand ASD, and their desires. It has been shown that the participants need better Internet connections, support in technical abilities, English language, independence, ability to make decisions, the ability to present themselves and their desires and better

educational opportunities. Developers can provide translation tools that are attached to technologies that do not have an Arabic platform, describable visuals for simplifying and presenting information to ease their understanding of the technologies, password protection features, autism friendly tutorials for technologies, in addition, the creation of Arabic cultural related technologies can be useful for the individuals with ASD. Moreover, parents should provide care and attention, which also requires providing the best possible educational opportunities, giving their sons or daughters a chance to present and practise their hobbies and interests, and to help them in building independence. Educational or supportive organisations should provide qualified support that can help in improving the individuals with ASD, and for higher functioning participants providing simple technical support, English language, in addition to behavioural and social skills.

8.2 Summary

This chapter has presented the findings from this study. The impact of the factors of FAASCIT have been shown with regards to the participants, and how these factors affect the use of social media technologies. The culture and religion of Saudi Arabia has shown to have an impact on the use of social media, and that for individuals with ASD, it is not easy for them to manage these issues without the help of a caregiver, which could lead to impact their privacy and independence. However, it has been found that poor Internet connections and reduced digital literacy impacted on the ownership or the ability to access social media accounts.

The issues around the use of music were also discussed, but did not appear to affect the participants, although their choices were based around the religion and culture rather than popular music, even though this was acceptable by some of the caregivers. The factors above have an effect on every individual in Saudi Arabia, but the usefulness of photographs and images for those with ASD as a method of communication and initiating a conversation is of particular interest. The use of visuals allows the individuals with ASD to avoid typing text, to connect with people and provide a media for self-presentation. However, using photographs was affected by certain factors that were explored, such as the level of literacy which

limited the understanding of the concept of the photos, conservatism regarding personal photos presented online, difficulties of making decisions about what to post and cases of vulnerability that prevented the capturing of photos.

Chapter 9

Conclusion and Future Work

9.1 Conclusion

This research study has provided rich insights into the roles of technology and the use of social media in the lives of adults with autism spectrum disorder (ASD) in Saudi Arabia. It has been shown that in Western countries, technology that is connected to the internet has a significant impact on the lives of individuals with ASD. Indeed, various studies have been undertaken regarding the use of social networking websites for improving the social and communication skills of individuals with ASD, with the goal of helping such individuals to both enjoy independent living and better integrate into society. However, the literature review found there was a lack of research in the field of ASD in Arab countries, especially regarding the use of technology to support this population. Moreover, adults on the autism spectrum receive less research attention, although the difficulties that they face in terms of communication often place them in problematic situations that can adversely affect their social lives. In addition, it has been shown that individuals with ASD in Saudi Arabia receive only limited social support, especially once they reach adulthood, and that specialist public support is not currently available to everyone. Thus, the use of social media could be particularly valuable for adults with ASD to help them develop social and communication skills, as well as helping them become better integrated into society. When it comes to the use of social media and technologies that are designed in Western countries and influenced by Western culture, there are noticeable differences in the way they are accepted by individuals with differing religious beliefs and social norms. In the case of the Arabic culture, there are particular beliefs related to Islam, along with moral and political rules, which cause restrictions for Saudi individuals both offline and online.

This study is the first to explore and identify relevant factors for technology use by adults with ASD in Saudi Arabia. The findings from the study provided an

interpretation of the use of social networks by users with ASD and some insights into their online behaviour, in addition to the impact of various cultural and technological factors related to the use of technology and social media as well as the impact of using visuals. The findings showed that the use of visuals within online social applications was an important aspect for the participants. The participants who were considered to be higher functioning were the ones who used social media and who undertook online activities, some who had restrictions had limited or no use of social media, whereas the lower functioning participants mainly used YouTube for watching videos. With some lower functioning participants, there were concerns that the technology was keeping them occupied rather than adding to their skills and once again training for both teachers and parents was considered necessary to make sure they understood the positive aspects of using social media. However, the lack of appropriate Arabic supporting technologies prevented the introduction of the type of specially developed social media applications for ASD that are available in English. However, this study found that although it is generally thought that the strong cultural and traditional rules apply across all Saudi Arabia, not all areas of the country apply such rules in the same way. Therefore, having set out to research the impact of these cultural and traditional rules, the study found that the impact on those with ASD was not necessary the same for all the interviewed individuals. The participants had different levels of language ability, academic literacy, digital literacy, independence and social life opportunities, which were all found to affect their use of technology in different ways. Individuals with ASD have their own preferences and ways of using social media despite the regulations; however, there were certain factors that had an impact on all, such as technical issues regarding connecting to the Internet. It has also been shown that for the higher functioning participants, the quality of education and support received was a main factor that showed its influence on the participants, and for the participants who were not using social media during the period of the study their ability to access technology devices was a main factor that prevented or limited them from using social media.

Furthermore, one reason mentioned for not using text-based social media was to avoid making spelling mistakes that could result in embarrassment and discomfort

for the participants. This highlights the value of using visuals for social communication practices online and for simplifying the expression of participants' feelings. Those participants who did use social media most commonly followed a special theme or style, and they typically used photos and videos to present themselves online. The use of photographs and videos was a major means of communication, since it helped them to overcome language difficulties and provided an opportunity to become connected with others. In addition, the use of visuals helped the participants to initiate conversations, offer an idea or explain what they wanted to discuss, and achieve self-representation and social acceptance.

In addition, it has been shown that a misunderstanding of social and cultural rules has created vulnerability incidents involving the participants in Saudi Arabia, which might not have been the case in other countries. In particular, cultural issues regarding photographs or videos, including posting personal videos online, taking photographs of people in public, as well as using culturally unacceptable photographs and posting them online, have caused problems for the participants in Saudi Arabia, because these unwritten rules may not have been properly understood by individuals with ASD. Such situations of vulnerability have caused the participants to stop engaging in a favourite hobby, damaged their confidence and self-esteem, and led to the isolation of individuals with ASD and their caregivers. Caregivers should be involved in providing guidance for individuals with ASD regarding cultural rules in order to prevent these situations from arising. It has also been noted that some of the participants also enjoyed drawing, which shows their creativity and imagination to be factors that should be developed with ongoing support, rather than allowing problems to arise as they gain skills and a freedom of expression that could land them in unpleasant situations.

It has also been shown that cultural rules and religious beliefs were reflected in the choices and views of some of the participants regarding photographs, videos and the type of music they enjoy. However, their stated preferences regarding a particular type of music could be affected by the preferences of their caregivers or by what is considered acceptable in the surrounding community, which could of course affect their decisions and freedom of choice. Building independence is

important for adults with ASD, but because the culture of Saudi Arabia is a collectivist culture and because family relations are strong, independence is hard to achieve for individuals in general, while for individuals with ASD it may be even more difficult. Yet, achieving a certain level of independence for adults with ASD should be facilitated in order to provide them with the opportunity to make their own decisions, rather than having to completely rely on others. On the other hand, vulnerability issues and an over-obsession with technology can be problematic for individuals with ASD; hence, reasonable control over the use of online technology should be instigated.

These findings added information of the issues individuals with ASD are facing in Saudi Arabia when using online social technologies. In particular, their main use of technologies, the online applications they were using, why they were using them and what difficulties they faced in terms of usability and accessibility. Information from the centres, in addition to the collected information from the individuals themselves added knowledge that has not been published before. This information is valuable because this study is the first study to examine ASD individuals in this specific context, and this initial research strategy could be a guide for future research in the field. It also helps experts and caregivers to understand different aspects that are important to ASD individuals when using social media, that would help them being connected and integrated into the society. In addition, the significance findings from investigating the factors of the FAASCIT framework is a contribution to the field of ASD research, and also contributes to the field of cultural related studies in social sciences, as there is a dearth of research in Saudi Arabia on these specific cultural factors. Future cultural studies can be guided by applying the designed framework on different groups, and in different countries or regions. These further investigations could be useful to provide information on the differences in the impact of cultural factors on ASD users, and non-ASD users, in addition to the differences of other cultures, which could help in creating inclusive designs that are suitable for most users.

Overall, this research study has contributed to the literature in this field by providing information regarding adults with ASD in Saudi Arabia, individuals who are all too often invisible. A study of the use of technology by adults and

adolescents with ASD in Saudi Arabia has not previously been undertaken, nor has there been a prior study focusing on issues relating to the usability and accessibility of social media for Saudi adults with ASD. Better understanding of the needs of adults with ASD could help in integrating them into society and preventing them from being neglected. Improving the quality and availability of technology for individuals with ASD could help such individuals to improve their social communication and interactions with other people, which could in turn lead to them having better opportunities in life, including better jobs, friendships and relationships.

Being able to meet and talk to adult individuals with ASD in Saudi Arabia was a unique opportunity. It was a difficult task to visit people in their homes or even in public places, to deal with various unpleasant situations, and to travel around the country, particularly as a female researcher. However, it was all worth the effort to add to the knowledge and experience regarding adults with ASD, who are not the subject of much attention in Saudi Arabia, especially in terms of their social lives, and who may have missed out on opportunities to receive adequate support services during their childhood. Information of this kind is important when it comes to providing better facilities and support services for this population of individuals with ASD. It is also beneficial to gain knowledge regarding the use of technology by adults with ASD in Saudi Arabia in case such technology is to be considered and utilised in the support centres.

Moreover, as shown in Section 1.6, this study contributed in covering the first step (exploring) of the process of developing an inclusive design, and future research could be developed based on this study to complete the other steps of creating technology designs which would help to include Arabs with ASD. This could help the developers of web applications to better consider the specific needs of this population in their designs, so that their applications would be more useful and accessible for Arab users with ASD. The introduction of alternatives to password logins and increased use of images would be helpful along with better privacy settings to ensure those with ASD can be protected from difficult situations by accidentally making their interactions public. The lack of Arabic-based technologies and the existence of cultural differences should be taken into account

when considering the support needs of Arabs with ASD. Individuals with ASD are valuable members of the community and they should not be isolated or ignored. Their needs should therefore be taken into account during the design and development of mainstream and other technologies. This would enable Arab adults with ASD to use technology more easily in such a way that accommodates their particular cultural context and helps them to effectively use social networks to improve both their communication and socialising (Brosnan, Parsons, Good, & Yuill, 2016).

9.2 Limitations and Future Work

In this research, the study was carried out with 12 experts in the field of autism, 13 participants and their caregivers, and therefore the findings may not be applicable to all adult Arabs with ASD, especially females, as only one female participant who was high functioning was able to use social media. Even though the focus was on adults in Saudi Arabia, it is also the case that the picture presented here may not be generalised for all individuals with ASD in Saudi Arabia. The findings are a reminder about the individuality of people with ASD; each participant had a different situation, and received different types and amount of support during their lives, in addition to the effects of differing levels of traditions and cultural or religious beliefs. Nevertheless, the findings of the study provide an overview of some of the main different issues that individuals with ASD face in Saudi Arabia with regard to technology use, where cultural factors are an important consideration in the use of social media networks by a person with ASD.

In addition, when interviewing the experts and specialists the picture obtained was from their point of view, and based on the different situations they faced in their centres, and each centre provided a somewhat different service to the others. More situations could be found if more participants and experts had been interviewed, but as has been stated this was hard to achieve in the time and with the resources available at the time of the study. Future research could include more investigating in order to have a deeper understanding from the perspective of more individuals with ASD, and the particular difficulties they face when using social media, especially female social media users. Moreover, in qualitative research it is

possible that the implementation of the study could be biased by the researcher's opinions and views; however, personal experiences helped in informing the research in important ways.

In addition, future work following this research, could include studies of adults with ASD from different Arab countries which would bring a wider overview of understanding as to how they use social media, and to see if the different Arabic cultures have a different impact on the use of social media networks. It would also be interesting to study the effect of the factors identified in this research on the use of social media by adults with ASD from different non-Western cultures, and also from Western cultures, to understand the different issues that all adults with ASD face when using social networks, regardless of their different cultures. Moreover, the factors from 'FAASCIT' could be investigated regarding the use of social media by Arabs in general, or with other types of disabilities.

It is important for researchers to pay attention to individuals and groups who need support and to try to find solutions or tools to help people with ASD to have a better quality of life and to enable them to address their own needs more easily. It would be interesting to carry out further research regarding individuals with ASD and their use of technology.

List of References

- 68 Percent of Saudi Girls Drop Last Name on Facebook. (2010, January 19). *Asharq Al-Awsat*. Retrieved from <http://english.aawsat.com/2010/01/article55252114/68-percent-of-saudi-girls-drop-last-name-on-facebook> [Last access 16 September 2016].
- 7aki Fadi. (2009). The Difference Between Men and Women in the Middle Eastern (Arab) Blogosphere. *7aki Fadi*. Retrieved from <http://7akifadi.com/2009/08/06/the-difference-between-men-and-women-in-the-middle-eastern-arab-blogosphere/> [Last access 16 September 2016].
- A, L. (2013). Qatar Culture Club: Displays of Gender-Specific Behavior in a Family Gathering. *Display of Gender-Specific Behaviour in a Family Gathering*. Retrieved from <http://qatarcultureclub.blogspot.co.uk/2013/04/displays-of-gender-specific-behavior-in.html> [Last access 16 September 2016].
- Aboul-Enein, B. H. (2010). The cultural gap delivering health care services to Arab American populations in the United States. *Journal of cultural diversity*, 17(1), 20.
- Abran, A., Khelifi, A., Suryn, W., & Seffah, A. (2003). Usability meanings and interpretations in ISO standards. *Software Quality Journal*, 11(4), 325-338.
- ACEbook project helps adults with Autism across Europe to make friends: Improving quality of life for people with autism. (2011, September 27). *Autism Europe*. Retrieved from <http://www.autismeurope.org/publications/press-releases/document-497.html> [Last access 16 September 2016].
- Agarwal, R., Sampath, H. A., & Indurkha, B. (2013). A usability study on natural interaction devices with ASD children *Universal Access in Human-Computer Interaction. User and Context Diversity* (pp. 447-453): Springer.
- Ahy, M. H. (2016). Networked communication and the Arab Spring: Linking broadcast and social media. *new media & society*, 18(1), 99-116.
- Al Omoush, K. S., Yaseen, S. G., & Alma'Aitah, M. A. (2012). The impact of Arab cultural values on online social networking: The case of Facebook. *Computers in Human Behavior*, 28(6), 2387-2399.
- Alberto, P. A., Cihak, D. F., & Gama, R. I. (2005). Use of static picture prompts versus video modeling during simulation instruction. *Research in developmental disabilities*, 26(4), 327-339.
- Al-Arifi, B., Al-Rubaian, A., Al-Ofisan, G., Al-Romi, N., & Al-Wabil, A. (2013). Towards an arabic language augmentative and alternative communication application for autism *Design, User Experience, and Usability. Health, Learning, Playing, Cultural, and Cross-Cultural User Experience* (pp. 333-341): Springer.
- Al-Faries, A., Al-Khalifa, H. S., Al-Razgan, M. S., & Al-Duwais, M. (2013). *Evaluating the accessibility and usability of top Saudi e-government services*. Paper presented at the Proceedings of the 7th International Conference on Theory and Practice of Electronic Governance.

References

- Al-Farsi, Y. M., Al-Sharbati, M. M., Al-Farsi, O. A., Al-Shafae, M. S., Brooks, D. R., & Waly, M. I. (2011). Brief Report: Prevalence of Autistic Spectrum Disorders in the Sultanate of Oman. *Journal of Autism and Developmental Disorders*, 41(6). doi:10.1007/s10803-010-1094-8.
- Al-Gain, S. I., & Al-Abdulwahab, S. S. (2002). Issues and obstacles in disability research in Saudi Arabia. *Asia Pacific Disability Rehabilitation Journal*, 13(1), 45-49.
- *Al-Ghamdi, F. (2014). Two Students Design the First Rehabilitation Application for Autistic Children. *Al-Watan Online*. Retrieved from http://www.alwatan.com.sa/nation/News_Detail.aspx?ArticleID=174185&CategoryID=3 [Last access 23 September 2016].
- Al-Jarf, R. S. (2005). *Connecting students across universities in Saudi Arabia*. Paper presented at the *Paper Presented at the 4th Asia CALL Conferece.*, Sorabol College, Geongju, South Korea.
- Al-Mukhtar, R. (2013). How differently do women and men use social media? *Arab News*, [online]. Retrieved from <http://www.arabnews.com/node/457407> [Last access 23 September 2016].
- Al-Saggaf, Y. (2004). The effect of online community on offline community in Saudi Arabia. *The Electronic Journal of Information Systems in Developing Countries*, 16.
- Al-Saggaf, Y. (2011). Saudi females on Facebook: An ethnographic study. *International Journal of Emerging Technologies and Society*, 9(1), 1.
- Al-Saggaf, Y., & Williamson, K. (2004). *Online communities in Saudi Arabia: Evaluating the impact on culture through online semi-structured interviews*. Paper presented at the Forum Qualitative Sozialforschung/Forum: Qualitative Social Research.
- Al-Salehi, S. M., Al-Hifthy, E. H., & Ghaziuddin, M. (2009). Autism in Saudi Arabia: Presentation, Clinical Correlates and Comorbidity. *Transcultural Psychiatry*, 46(2). doi:10.1177/1363461509105823.
- Al-Wabil, A., Al-Shabanat, H., Al-Sarrani, R., & Al-Khonin, M. (2010). Developing a multimedia environment to aid in vocalization for people on the autism spectrum: a user-centered design approach *Computers Helping People with Special Needs* (pp. 33-36): Springer.
- Al-Wakeel, L., Al-Ghanim, A., Al-Zeer, S., & Al-Nafjan, K. (2015). A Usability Evaluation of Arabic Mobile Applications Designed for Children with Special Needs—Autism. *Lecture Notes on Software Engineering*, 3(3), 203.
- Alam, T., & Ali, M. (2010). The Challenge of Usability Evaluation of Online Social Networks with a Focus on Facebook.
- Alamer, S. M. (2015). Cultural Perspectives of Associating Music With the Giftedness in Saudi Arabia. *Canadian Social Science*, 11(2), 8.

* Arabic references

- *Aldifyan, H. (2013). The Demands of a Government Autistic Education Center at a City's Human Rights Meeting. *AlMadina*. Retrieved from <http://www.al-madina.com/node/456848> [Last access 23 September 2016].
- Alhamdan, S. (2016). Saudi students, expats affected by disruption of free call services. *Saudi Gazette*. Retrieved from <http://saudigazette.com.sa/saudi-arabia/saudi-students-expats-affected-disruption-free-call-services/> [Accessed 14 September 2016]
- *Aljuhani, A. (2013). Transportation, Lack of Teachers and the Lack of Workers Worries an Autism Center in Jeddah. *AlMadina*. Retrieved from <http://www.al-madina.com/node/476073> [Last access 23 September 2016].
- Allen, R., Hill, E., & Heaton, P. (2009). Hath charms to soothe...'An exploratory study of how high-functioning adults with ASD experience music. *Autism*, 13(1), 21-41.
- AlMadina. (2014). The Desired Hope Centre Refuses Over 12-year-old Special Needs. *AlMadina*. Retrieved from <http://www.al-madina.com/node/508724> [Last access 16 September 2016].
- Almasoud, H. (2010). Services and Support for Individuals with Autism: a comparative study between the UK and Saudi Arabia.
- Almasoud, H. (2013). Educating students with autism spectrum conditions in Saudi Arabia: Policy, Practice and Provision for Inclusive and Special Education. *HubPages*. Retrieved from <http://hubpages.com/health/Educating-students-with-autism-spectrum-conditions-in-Saudi-Arabia> [Accessed 15 July 2016]
- AlMunajjed, M. (2009). Women's education in Saudi Arabia: The way forward. *Booz & Company*, 1-23.
- Alnuaim, M. (2013). The Composition of the Saudi Middle Class: A Preliminary Study. *Gulf Research Center*.
- Alolyan, A. A. (2015). The perceived impact of the internet on family and social relations in the Kingdom of Saudi Arabia. *Doctoral thesis (PhD), Manchester Metropolitan University*.
- Alqahtani, M. M. (2012). Understanding autism in Saudi Arabia: A qualitative analysis of the community and cultural context. *Journal of Pediatric Neurology*, 10(1), 15.
- Alquraini, T. (2011). Special Education in Saudi Arabia: Challenges, Perspectives, Future Possibilities. *International Journal of Special Education*, 26(2), 149-159.
- Alrawabdeh, W. (2009). Internet and the Arab World: Understanding the Key Issues and Overcoming the Barriers. *International Arab Journal of Information Technology*, 6(1), 27-32.
- Alsheikh, T., Lindley, S. E., & Rode, J. A. (2010). *Understanding Online Communication through Arab Eyes*. Paper presented at the CHI 2010, April 10-15, 2010, Atlanta, Georgia, USA.

* Arabic references

References

- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR®* (4th ed.): American Psychiatric Pub.
- American Psychiatric Association. (2013). *The Diagnostic and Statistical Manual of Mental Disorders: DSM 5*: bookpointUS.
- Amr, M., Bu Ali, W., Hablas, H., Raddad, D., El-Mehesh, F., El-Gilany, A.-H., & Al-Shamy, H. (2012). Sociodemographic factors in Arab children with Autism Spectrum Disorders. *The Pan African medical journal*, 13, 65-65.
- Amr, M., Raddad, D., El-Mehesh, F., Mahmoud, E.-H., & El-Gilany, A.-H. (2011). Sex differences in Arab children with Autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5(4). doi:10.1016/j.rasd.2011.01.015.
- Amr, M., Raddad, D., El-Mehesh, F., Bakr, A., Sallam, K., & Amine, T. (2012). Comorbid psychiatric disorders in Arab children with Autism spectrum disorders. *Research in Autism Spectrum Disorders*, 6(1). doi:10.1016/j.rasd.2011.05.005.
- Arab Social Media Report. (2015). Arab Social Media Influencers Summit. Retrieved from: <http://dmc.ae/img/pdf/white-papers/ArabSocialMediaReport-2015.pdf> [Last access 23 September 2016].
- Arab users of social networking sites surge in 2012. (2012). *Al Arabiya News*. Retrieved from <http://english.alarabiya.net/articles/2012/05/08/212904.html> [Last access September 2016].
- Askool, S. S. (2013). The Use of Social Media in Arab Countries: A Case of Saudi Arabia *Web Information Systems and Technologies* (pp. 201-219): Springer.
- Attwood, T. (2003). Is There a Difference Between Asperger's Syndrome and High Functioning Autism?. *Sacramentoasis.com*.
- Autism Lacks Awareness and is Hidden in Hadhramaut. (2012, December 7). *Out Of Hadhramaut*. Retrieved from <http://hadrhamouts.blogspot.co.uk/2012/12/autism-lacks-awareness-and-is-hidden-in.html> [Last access 16 September 2016].
- Bahiss, K., Cunningham, S. J., & Smith, T. (2010). *Investigating the usability of social networking sites for teenagers with autism*. Paper presented at the Proceedings of the 11th International Conference of the NZ Chapter of the ACM Special Interest Group on Human-Computer Interaction.
- Baird, G., Simonoff, E., Pickles, A., Chandler, S., Loucas, T., Meldrum, D., & Charman, T. (2006). Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: the Special Needs and Autism Project (SNAP). *The lancet*, 368(9531), 210-215.
- Barakat, H. (1993). *The Arab world: Society, culture, and state*: Univ of California Press.
- Bashraheel, L. (2010). Students Campaign Against KAU Norms. *Arab News*. Retrieved from <http://www.arabnews.com/node/338622> [Last access 23 September 2016].
- Basili, V. R. (1992). Software modeling and measurement: the Goal/Question/Metric paradigm. *Technical Report CS-TR-2956, Department of Computer Science, University of Maryland, College Park, MD, USA*.

- Basili, V. R. (1993). Applying the Goal/Question/Metric paradigm in the experience factory. *Software Quality Assurance and Measurement: A Worldwide Perspective*, 21-44.
- Benford, P. (2008). *The use of internet-based communication by people with autism*. University of Nottingham.
- Bickman, L., & Rog, D. J. (Eds.). (2008). *The Sage handbook of applied social research methods*. Sage Publications.
- Birrell, L. (2013). 10 Things you Need to Know About Living in Jeddah Saudi Arabia. Retrieved from <http://www.expatsblog.com/contests/857/10-things-you-need-to-know-about-living-in-jeddah-saudia-arabia> [Last access 6 January 2016].
- Bishop, J. (2003). The Internet for educating individuals with social impairments. *Journal of Computer Assisted Learning*, 19(4), 546-556. doi:10.1046/j.0266-4909.2003.00057.x.
- Blandford, A. (2013). Semi-structured qualitative studies. In: Soegaard M, Dam RF (eds) *The encyclopedia of human-computer interaction*, 2nd edn. Retrieved from <http://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/semi-structured-qualitative-studies> [Last access 23 September 2016].
- Blume, H. (1997). Autistics, freed from face-to-face encounters, are communicating in cyberspace. *The New York Times*. Retrieved from <http://www.nytimes.com/1997/06/30/business/autistics-freed-from-face-to-face-encounters-are-communicating-in-cyberspace.html> [Last access 23 September 2016].
- Bolte, S., Golan, O., Goodwin, M. S., & Zwaigenbaum, L. (2010). What can innovative technologies do for Autism Spectrum Disorders? *Autism*, 14(3), 155-159. doi:10.1177/1362361310365028.
- Brantlinger, E., Jimenez, R., Klingner, J., Pugach, M., & Richardson, V. (2005). Qualitative studies in special education. *Exceptional children*, 71(2), 195-207.
- Bricki, N., & Green, J. (2007). A guide to using qualitative research methodology.
- Brosnan, M., & Gavin, J. (2015). Why Those with an Autism Spectrum Disorder (ASD) Thrive in Online Cultures but Suffer in Offline Cultures. *The Wiley Handbook of Psychology, Technology and Society*, 250.
- Brosnan, M., Parsons, S., Good, J., & Yuill, N. (2016). How can participatory design inform the design and development of innovative technologies for autistic communities?. *Journal of Assistive Technologies*, 10(2).
- Browne, K. (2005). Snowball sampling: using social networks to research non-heterosexual women. *International Journal of Social Research Methodology*, 8(1), 47-60.
- Brownlow, C., & O'Dell, L. (2002). Ethical issues for qualitative research in on-line communities. *Disability & Society*, 17(6), 685-694.

References

- Brugha, T. S., McManus, S., Bankart, J., Scott, F., Purdon, S., Smith, J., . . . Meltzer, H. (2011). Epidemiology of Autism Spectrum Disorders in Adults in the Community in England. *Archives of General Psychiatry*, 68(5), 459-466.
- Buescher, A. V., Cidav, Z., Knapp, M., & Mandell, D. S. (2014). Costs of autism spectrum disorders in the United Kingdom and the United States. *JAMA pediatrics*, 168(8), 721-728.
- Burke, M., Kraut, R., Williams, D., & Acm. (2010). Social Use of Computer-Mediated Communication by Adults on the Autism Spectrum. *2010 Acm Conference on Computer Supported Cooperative Work*.
- Charlop-Christy, M. H., Carpenter, M., Le, L., LeBlanc, L. A., & Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of applied behavior analysis*, 35(3), 213-231.
- Chen, M., Tsai, Y., & Wu, T. (2005). *Comparing three different text representations for students with autism*. Paper presented at the Electronic Proceedings of the 11th International Conference on Human-Computer Interaction (HCI'2005).
- Children with autism could miss out on non-verbal cues to social interaction. (2013, September 9). *Durham University News*. Retrieved from <http://www.dur.ac.uk/news/newsitem/?itemno=18572> [Last access 16 September 2016]
- Clark, L. (2012). Muslim Pupils Taken Out of Music Lessons 'because Islam Forbids Playing an Instrument'. *Daily Mail Online News*. Retrieved from <http://www.dailymail.co.uk/news/article-1291218/Muslim-pupils-taken-music-lessons-Islam-forbids-playing-instrument.html> [Last access 23 September 2016].
- Cooper, B. B. (2013). 7 Powerful Facebook Statistics You Should Know for a More Engaging Facebook Page. *The Buffer Blog*. Retrieved from <http://blog.bufferapp.com/7-facebook-stats-you-should-know-for-a-more-engaging-page> [Last access 23 September 2016].
- Cooper, M., Sloan, D., Kelly, B., & Lewthwaite, S. (2012). *A challenge to web accessibility metrics and guidelines: putting people and processes first*. Paper presented at the Proceedings of the international cross-disciplinary conference on Web accessibility.
- Copeland, S. R., & Hughes, C. (2000). Acquisition of a picture prompt strategy to increase independent performance. *Education and Training in Mental Retardation and Developmental Disabilities*, 294-305.
- Correa, T., Hinsley, A. W., & De Zuniga, H. G. (2010). Who interacts on the Web?: The intersection of users' personality and social media use. *Computers in Human Behavior*, 26(2), 247-253.
- Couch, D., & Liamputtong, P. (2008). Online dating and mating: The use of the Internet to meet sexual partners. *Qualitative Health Research*, 18(2), 268-279. doi:10.1177/1049732307312832.
- Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*: SAGE Publications.

- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*: Sage publications.
- Creswell, J. W., Hanson, W. E., Plano, V. L. C., & Morales, A. (2007). Qualitative research designs selection and implementation. *The counseling psychologist*, 35(2), 236-264.
- Cullen, J. M., & Alber-Morgan, S. R. (2015). Technology Mediated Self-Prompting of Daily Living Skills for Adolescents and Adults with Disabilities: A Review of the Literature. *Education and training in autism and developmental disabilities*, 50(1), 43-55.
- Dadvar, M., Trieschnigg, D., Ordelman, R., & de Jong, F. (2013). *Improving cyberbullying detection with user context*. Paper presented at the European Conference on Information Retrieval.
- Daniel, J. (2005). Education for all in the Arab world. *UNESCO*, 25, 4.
- Dannélls, D. (2006). *Automatic acronym recognition*. Paper presented at the Proceedings of the Eleventh Conference of the European Chapter of the Association for Computational Linguistics: Posters & Demonstrations.
- Dardas, L., & Simmons, L. A. (2015). The stigma of mental illness in Arab families: a concept analysis. *Journal of psychiatric and mental health nursing*, 22(9), 668-679.
- Darwish, K. (2013). Arabizi detection and conversion to Arabic. *arXiv preprint arXiv:1306.6755*.
- Deif, F. (2008). *Perpetual Minors: Human Rights Abuses Stemming from Male Guardianship and Sex Segregation in Saudi Arabia*: Human Rights Watch London.
- Department for Education. (2011). *Support and aspiration: a new approach to special educational needs and disability, a consultation* (Vol. 8027): TSO Shop.
- Digital Literacy: Different Age Groups Have Different Skills. (n.d.). *Technology*. Retrieved from <http://www-e.openu.ac.il/geninform/openletter/ol20/26-27.pdf> [Last access 16 September 2016].
- Do you understand the hidden language of Internet slang?. Adolescent Autism Forum. (posted: 2011). *Wrong Planet.net, Aspergers and Autism Community*. Retrieved from <http://www.wrongplanet.net/postt166750.html> [Last access 16 September 2016].
- Dodd, S. (2005). *Understanding autism*. Elsevier Australia.
- Driscoll, D. L., Appiah-Yeboah, A., Salib, P., & Rupert, D. J. (2007). Merging qualitative and quantitative data in mixed methods research: How to and why not. *Ecological and Environmental Anthropology (University of Georgia)*, 18.
- Duggan, M., & Smith, A. (2013). Social Media Update 2013. *Pew Research Center*. Retrieved from <http://www.pewinternet.org/2013/12/30/social-media-update-2013/> [Last access 23 September 2016].
- Eapen, V., Mabrouk, A. A., Zoubeidi, T., & Yunis, F. (2007). Prevalence of pervasive developmental disorders in preschool children in the UAE. *Journal of Tropical Pediatrics*, 53(3). doi:10.1093/tropej/fml091.

References

- Eaves, L. C., & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. *Journal of autism and developmental disorders*, 38(4), 739-747.
- Edwards, T. L., Watkins, E. E., Lotfizadeh, A. D., & Poling, A. (2012). Intervention research to benefit people with autism: How old are the participants? *Research in Autism Spectrum Disorders*, 6(3), 996-999. doi:10.1016/j.rasd.2011.11.002.
- Eftekhari, A., Fullwood, C., & Morris, N. (2014). Capturing personality from Facebook photos and photo-related activities: How much exposure do you need? *Computers in Human Behavior*, 37, 162-170.
- Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication*, 12(4), 1143-1168.
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of advanced nursing*, 62(1), 107-115.
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis. *Sage Open*, 4(1), 2158244014522633.
- Escandell-Vidal, V. (2009). Social cognition and second language learning. *Pragmatics Applied to Language Teaching and Learning*. Newcastle Upon Tyne: Cambridge Scholars Publishing, 1-42
- Eshet, Y. (2012). Thinking in the digital era: A revised model for digital literacy. *Issues in informing science and information technology*, 9, 267-276.
- Essa, M. M., Guillemin, G. J., Waly, M. I., Al-Sharbaty, M. M., Al-Farsi, Y. M., Hakkim, F. L., . . . Al-Shafae, M. S. (2012). Increased Markers of Oxidative Stress in Autistic Children of the Sultanate of Oman. *Biological Trace Element Research*, 147(1-3). doi:10.1007/s12011-011-9280-x.
- Evers, V. (1997). *Human-computer interfaces: Designing for culture*. University of New South Wales Sydney, Australia.
- Evers, V., & Day, D. (1997). *The role of culture in interface acceptance*. Paper presented at the Human-Computer Interaction INTERACT'97.
- FaceTime not working; how to troubleshoot FaceTime to fix your problems, iPhone, iPad, iPod, Mac. (2016, March 15). *Apple Toolbox*. Retrieved from <http://appletoolbox.com/2012/02/facetime-not-working-how-to-troubleshoot-facetime-to-fix-your-problems/> [Last access 16 September 2016].
- Fairbrother, N. (2002). The treatment of social phobia-100 years ago. *Behaviour Research and Therapy*, 40(11), 1291-1304.
- Filipek, P. A., Accardo, P. J., Baranek, G. T., Cook, E. H., Dawson, G., Gordon, B., . . . Volkmar, F. R. (1999). The screening and diagnosis of autistic spectrum disorders. *Journal of Autism and Developmental Disorders*, 29(6), 439-484. doi:10.1023/a:1021943802493.
- Fombonne, E. (2003). Epidemiological surveys of autism and other pervasive developmental disorders: An update. *Journal of Autism and Developmental Disorders*, 33(4), 365-382. doi:10.1023/a:1025054610557.

- Fox, K. (2005). *Watching the English: The Hidden Rules of English Behavior*: Hodder & Stoughton.
- Francis, S., & Begley, J. (2014). *Connect: Creative Social Networking for the UK Autism Community*. Paper presented at the *The 2nd international conference on Innovative Technologies (IT) for Autism (ASD)*, Paris. http://www.dailymotion.com/video/x289yi3_connect-creative-social-networking-for-the-uk-autism-community_school [Last access 23 September 2016].
- Frith, U., Morton, J., & Leslie, A. M. (1991). The cognitive basis of a biological disorder: Autism. *Trends in neurosciences*, 14(10), 433-438
- Gabr, A. (2013). Will free VoIP apps disappear from the Middle East? A look at Saudi Arabia's Viber ban. Retrieved from <http://www.wamda.com/2013/06/will-free-voip-apps-disappear-from-the-middle-east-saudi-arabia-viber-ban> [Accessed 4 January 2016]
- Ganz, M. L. (2007). The lifetime distribution of the incremental societal costs of autism. *Archives of Pediatrics & Adolescent Medicine*, 161(4), 343-E345. doi:10.1001/archpedi.161.4.343.
- Gehring, E. F. (2002). *Choosing passwords: security and human factors*. Paper presented at the Technology and Society, 2002.(ISTAS'02). 2002 International Symposium on.
- Gentleman, A. (2011). Where's the support for autistic young people? *Society, The Guardian*. Retrieved from <http://www.theguardian.com/society/2011/oct/11/where-support-autistic-young-people> [Last access 16 September 2016].
- Georgescu, A. L., Kuzmanovic, B., Roth, D., Bente, G., & Vogeley, K. (2014). The use of virtual characters to assess and train non-verbal communication in high-functioning autism. *Frontiers in human neuroscience*, 8.
- Ghanem, R. (2011). 'Arabizi is destroying the Arabic language'. *Arab News*. Retrieved from <http://www.arabnews.com/node/374897> [Last access 16 September 2016].
- Gillott, A., Furniss, F., & Walter, A. (2001). Anxiety in high-functioning children with autism. *Autism*, 5(3), 277-286.
- Golan, O., & Baron-Cohen, S. (2006). Systemizing empathy: Teaching adults with Asperger syndrome or high-functioning autism to recognize complex emotions using interactive multimedia. *Development and Psychopathology*, 18(2), 591-617. doi:10.1017/s0954579406060305.
- Gold, C., Wigram, T., & Elephant, C. (2006). Music therapy for autistic spectrum disorder. *The Cochrane Library*.
- Goodwin, M. S. (2008). Enhancing and Accelerating the Pace of Autism Research and Treatment The Promise of Developing Innovative Technology. *Focus on Autism and Other Developmental Disabilities*, 23(2), 125-128. doi:10.1177/1088357608316678.

References

- Graham, G. (2012). *Using Facebook to Improve Social Communication Skills of Students with Autism Spectrum Disorders*.
- Grandin, T. (1999). Choosing the Right Job for People with Autism or Asperger's Syndrome. *Indiana University Bloomington, Indiana Resource Centre for Autism*. Retrieved from <https://http://www.iidc.indiana.edu/pages/Choosing-the-Right-Job-for-People-with-Autism-or-Aspergers-Syndrome> [Last access 27 September 2016]
- Grandin, T., & Attwood, T. (2012). *Different . . . Not Less: Inspiring Stories of Achievement and Successful Employment from Adults With Autism, Asperger's, and ADHD*: Future Horizons Incorporated.
- Gray, C. (1995). Teaching children with autism to "read" social situations. *Teaching children with autism: Strategies to enhance communication and socialization*, 219-242.
- Groden, J., Cautela, J., Prince, S., & Berryman, J. (1994). The impact of stress and anxiety on individuals with autism and developmental disabilities. In *Behavioral issues in autism* (pp. 177-194). Springer US.
- Grynszpan, O., Martin, J.-C., & Nadel, J. (2008). Multimedia interfaces for users with high functioning autism: An empirical investigation. *International Journal of Human-Computer Studies*, 66(8), 628-639.
- Gurgenidze, M. (2012). About Some Important Aspects of Using Abbreviations and SMS Language in the Modern English. *Bilingual Scholarly Peer-Reviewed Journal Spekali*.
- Habash, M. A. (2005). *Assistive Technology Utilization for Autism An Outline of Technology Awareness in Special Needs Therapy*. Paper presented at the Second International Conference on Innovations in Information Technology, Dubai.
- Haboush, K. L. (2007). Working with Arab American families: Culturally competent practice for school psychologists. *Psychology in the Schools*, 44(2), 183.
- Hamdan, A. (2005). Women and education in Saudi Arabia: Challenges and achievements. *International Education Journal*, 6(1), 42-64.
- Hammoud, H. R. (2006). Illiteracy in the Arab world. *Adult Education and Development*, 66, 83.
- Harper, C. B., Symon, J. B., & Frea, W. D. (2008). Recess is time-in: Using peers to improve social skills of children with autism. *Journal of autism and developmental disorders*, 38(5), 815-826.
- Harrison, S., Sengers, P., & Tatar, D. (2011). Making epistemological trouble: Third-paradigm HCI as successor science. *Interacting with Computers*, 23(5), 385-392.
- Hart, J., Ridley, C., Taher, F., Sas, C., & Dix, A. (2008). *Exploring the facebook experience: a new approach to usability*. Paper presented at the Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges.
- Heble, A. (2007). Teaching Literature Online to Arab Students Using technology to overcome cultural restrictions. *Arts and Humanities in Higher Education*, 6(2), 219-226.

- Hendricks, D. (2010). Employment and adults with autism spectrum disorders: Challenges and strategies for success. *Journal of Vocational Rehabilitation*, 32(2), 125.
- Hersh, M. (2014). Evaluation framework for ICT-based learning technologies for disabled people. *Computers & Education*, 78, 30-47.
- Hill, C. E., Loch, K. D., Straub, D. W., & El-Sheshai, K. (1998). A qualitative assessment of Arab culture and information technology transfer. *Journal of global information management*, 6, 29-38.
- Hock, K. B., & Lafi, S. M. (2011). Assistive Communication Technologies For Augmentative Communication In Arab Countries: Research Issues.
- Hofstede, G. (1980). *Culture's consequences*. Beverly Hills: Ca: Sage.
- Hofstede, G. (2010). Geert hofstede. *National cultural dimensions*.
- Hofstede, G., & Bond, M. H. (1988). The Confucius connection: From cultural roots to economic growth. *Organizational dynamics*, 16(4), 5-21.
- Hofstede, G., Hofstede, G. J., Minkov, M., & Vinken, H. (2008). Values survey module 2008. URL: <http://www.geerthofstede.nl/media/253/VSM08English.doc> (Stand 30.06.2010).
- Holloway, I. (1997). *Basic concepts for qualitative research*: Wiley-Blackwell.
- Hong, H., Kim, J. G., Abowd, G. D., & Arriaga, R. I. (2012). *Designing a social network to support the independence of young adults with autism*. Paper presented at the Proceedings of the ACM 2012 conference on Computer Supported Cooperative Work.
- Hong, H., Yarosh, S., Kim, J. G., Abowd, G. D., & Arriaga, R. I. (2013). *Investigating the use of circles in social networks to support independence of individuals with autism*. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.
- Howlin, P., Gordon, R. K., Pasco, G., Wade, A., & Charman, T. (2007). The effectiveness of Picture Exchange Communication System (PECS) training for teachers of children with autism: a pragmatic, group randomised controlled trial. *Journal of Child Psychology and Psychiatry*, 48(5), 473-481.
- Howlin, P., Goode, S., Hutton, J., & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*, 45(2), 212-229. doi:10.1111/j.1469-7610.2004.00215.x.
- Howlin, P. (1998). Psychological and educational treatments for autism. *Journal of Child Psychology and Psychiatry*, 39(03), 307-322
- Hume, K., Loftin, R., & Lantz, J. (2009). Increasing independence in autism spectrum disorders: A review of three focused interventions. *Journal of autism and developmental disorders*, 39(9), 1329-1338.
- Hussein, H., Taha, G. R., & Almanasef, A. (2011). Characteristics of autism spectrum disorders in a sample of egyptian and saudi patients: transcultural cross sectional

References

- study. *Child and adolescent psychiatry and mental health*, 5. doi:10.1186/1753-2000-5-34.
- Hynan, A., Murray, J., & Goldbart, J. (2014). 'Happy and excited': Perceptions of using digital technology and social media by young people who use augmentative and alternative communication. *Child Language Teaching and Therapy*, 30(2), 175-186.
- In the name of their mothers Saudis break with tradition on Twitter. (2011, October 11). *Asia News*. Retrieved from <http://www.asianews.it/news-en/In-the-name-of-their-mothers-Saudis-break-with-tradition-on-Twitter-23136.html> [Last access 16 September 2016].
- *Internet.sa. (c2016). The Internet in Saudi Arabia. *Internet.sa*. Retrieved from <http://www.internet.sa/ar/internet-in-saudi-arabia/> [Last access 16 September 2016].
- Jaalouk, D., Okasha, A., Salamoun, M. M., & Karam, E. G. (2012). Mental health research in the Arab world. *Social psychiatry and psychiatric epidemiology*, 47(11), 1727-1731.
- Jasilek. (2013). The Effect of Social Media on Language. *London School of Public Relations Blog [online]*. Retrieved from <http://blog.lspr-education.com/socialmedia/the-effect-of-social-media-on-language/> [Last access 16 September 2016].
- Johnston, S., Nelson, C., Evans, J., & Palazolo, K. (2003). The use of visual supports in teaching young children with autism spectrum disorder to initiate interactions. *Augmentative and Alternative Communication*, 19(2), 86-103.
- Kalban, H. M. B. (2007). *Comparing Usability Standards for Arabic and English*. British University in Dubai.
- Kamp-Becker, I., Smidt, J., Ghahreman, M., Heinzl-Gutenbrunner, M., Becker, K., & Remschmidt, H. (2010). Categorical and Dimensional Structure of Autism Spectrum Disorders: The Nosologic Validity of Asperger Syndrome. *Journal of Autism and Developmental Disorders*, 40(8). doi:10.1007/s10803-010-0939-5.
- Kana, R. K., Keller, T. A., Cherkassky, V. L., Minshew, N. J., & Just, M. A. (2006). Sentence comprehension in autism: thinking in pictures with decreased functional connectivity. *Brain*, 129, 2484-2493. doi:10.1093/brain/awl164.
- Kandalaf, M. R., Didehbani, N., Krawczyk, D. C., Allen, T. T., & Chapman, S. B. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of autism and developmental disorders*, 43(1), 34-44.
- Karreman, J., Van Der Geest, T., & Buursink, E. (2007). Accessible website content guidelines for users with intellectual disabilities. *Journal of Applied Research in Intellectual Disabilities*, 20(6), 510-518.
- Kemp, S. (2015). Digital, Social & Mobile Worldwide in 2015. *We Are Social*. Retrieved from <http://wearesocial.com/uk/special-reports/digital-social-mobile-worldwide-2015> [Last access 23 September 2016].

* Arabic references

- Khalifa, R. M. (2015). Pragmatic Functions of Social Networks'acronyms. *Vol.3*(No.4), pp.37-49.
- Khan, I. A. (2011). Learning difficulties in English: Diagnosis and pedagogy in Saudi Arabia. *Educational Research*, 2(7), 1248-1257.
- Kowalski, R. M., & Fedina, C. (2011). Cyber bullying in ADHD and Asperger Syndrome populations. *Research in Autism Spectrum Disorders*, 5(3), 1201-1208.
- Kowalski, R. M., Morgan, C. A., Drake-Lavelle, K., & Allison, B. (2016). Cyberbullying among college students with disabilities. *Computers in Human Behavior*, 57, 416-427.
- Kremer-Sadlik, T. (2005). *To be or not to be bilingual: Autistic children from multilingual families*. Paper presented at the Proceedings of the 4th International Symposium on Bilingualism.
- Lancioni, G. E., & O'Reilly, M. F. (2002). Teaching food preparation skills to people with intellectual disabilities: a literature overview. *Journal of Applied Research in Intellectual Disabilities*, 15(3), 236-253.
- Larsson, G. (2011). *Muslims and the new media: Historical and contemporary debates*: Ashgate Publishing, Ltd.
- Le Renard, A. (2014). *A society of young women: opportunities of place, power, and reform in Saudi Arabia*: Stanford University Press.
- Leekam, S. R., Nieto, C., Libby, S. J., Wing, L., & Gould, J. (2007). Describing the sensory abnormalities of children and adults with autism. *Journal of autism and developmental disorders*, 37(5), 894-910.
- Leidner, D. E., & Kayworth, T. (2006). Review: a review of culture in information systems research: toward a theory of information technology culture conflict. *MIS quarterly*, 30(2), 357-399.
- Leskovec, J., Huttenlocher, D., & Kleinberg, J. (2010). *Signed networks in social media*. Paper presented at the Proceedings of the SIGCHI conference on human factors in computing systems.
- Levy, A., & Perry, A. (2011). Outcomes in adolescents and adults with autism: A review of the literature. *Research in Autism Spectrum Disorders*, 5(4), 1271-1282.
- Living in Saudi Arabia. (2013, March 25). *GOV.UK*. Retrieved from <http://www.gov.uk/guidance/living-in-saudi-arabia> [Last access 16 September 2016].
- Lloyd, V., Gatherer, A., & Kalsy, S. (2006). Conducting qualitative interview research with people with expressive language difficulties. *Qualitative health research*, 16(10), 1386-1404.
- Loch, K. D., Straub, D. W., & Kamel, S. (2003). Diffusing the internet in the Arab world: the role of social norms and technological culturation. *Engineering Management, IEEE Transactions on*, 50(1), 45-63.
- Lord, C., & McGee, J. P. (2001). *Educating children with autism*. Washington DC: National Academic Press.

References

- Lough, E., Flynn, E., & Riby, D. M. (2014). Mapping Real-World to Online Vulnerability in Young People with Developmental Disorders: Illustrations from Autism and Williams Syndrome. *Review Journal of Autism and Developmental Disorders*, 2(1), 1-7.
- Macintosh, K., & Dissanayake, C. (2006). Social skills and problem behaviours in school aged children with high-functioning autism and Asperger's Disorder. *Journal of Autism and Developmental Disorders*, 36(8). doi:10.1007/s10803-006-0139-5
- Malin, C. (2010). 15 Million MENA Facebook Users - Report. *Spot on*. Retrieved from <http://www.spotonpr.com/mena-facebook-demographics/> [Last access 16 September 2016].
- Mansell, J., & Beadle-Brown, J. (2004). Person-centred planning or person-centred action? Policy and practice in intellectual disability services. *Journal of Applied Research in Intellectual Disabilities*, 17(1), 1-9.
- Marcus, A., & Hamoodi, S. (2009). The impact of culture on the design of Arabic websites *Internationalization, Design and Global Development* (pp. 386-394): Springer.
- Mazurek, M. O. (2013). Social media use among adults with autism spectrum disorders. *Computers in Human Behavior*, 29(4), 1709-1714.
- McElroy, D. (2008). Saudi Woman Killed for Chatting on Facebook. *The Telegraph*. Retrieved from <http://www.telegraph.co.uk/news/worldnews/1583420/Saudi-woman-killed-for-chatting-on-Facebook.html> [Last access 16 September 2016].
- McNally, K. (2009). EUGENE BLEULER'S FOUR As. *History of Psychology*, 12(2), 43-59. doi:10.1037/a0015934.
- Meadan, H., Ostrosky, M. M., Triplett, B., Michna, A., & Fettig, A. (2011). Using visual supports with young children with autism spectrum disorder. *TEACHING Exceptional Children*, 43(6), 28-35.
- Mehzabin, P., & Stokes, M. A. (2011). Self-assessed sexuality in young adults with High-Functioning Autism. *Research in Autism Spectrum Disorders*, 5(1), 614-621. doi:10.1016/j.rasd.2010.07.006.
- Mei, C., Mason, L., & Quarles, J. (2014). *Usability issues with 3D user interfaces for adolescents with high functioning autism*. Paper presented at the Proceedings of the 16th international ACM SIGACCESS conference on Computers & accessibility.
- Mendelson, A. L., & Papacharissi, Z. (2010). Look at us: Collective narcissism in college student Facebook photo galleries. *The networked self: Identity, community and culture on social network sites*, 1974, 1-37.
- Miller, B. (2012). Boys, Girls and Computers: Gender Differences in Technology Usage. *NVATE*. Retrieved from <http://nvate.com/6195/gender-tech/> [Last access 23 September 2016].
- Mishkhas, A. (2004). Saudi Arabia to Overturn Ban on Camera Phones. *Arab News*. Retrieved from <http://www.arabnews.com/node/259698> [Accessed 11 March 2016].

- Mitchell, P., Parsons, S., & Leonard, A. (2007). Using virtual environments for teaching social understanding to 6 adolescents with autistic spectrum disorders. *Journal of Autism and Developmental Disorders*, 37(3). doi:10.1007/s10803-006-0189-8.
- Mohammed, H. S., Wahass, S. H., & Mahmoud, A. A. (2016). Incidence of autism in high risk neonatal follow up. *Neurosciences*, 21(1), 43-46.
- Molin, A. (2012). IKEA Regrets Cutting Women From Saudi Ad. Retrieved from <http://www.wsj.com/articles/SB10000872396390444592404578030274200387136> [Last access 3 June 2016].
- Moore, M., & Calvert, S. (2000). Brief report: Vocabulary acquisition for children with autism: Teacher or computer instruction. *Journal of Autism and Developmental Disorders*, 30(4). doi:10.1023/a:1005535602064.
- Mumy, A. P. (2013). Why Should Parents Talk to Their Children in Their Native Language? *Multilingual Living* Retrieved from <http://www.multilingualliving.com/2013/04/15/why-should-parents-talk-to-their-children-in-their-native-language/> [Last access 16 September 2016].
- Myers, M. D. (1997). Qualitative research in information systems. *Management Information Systems Quarterly*, 21, 241-242.
- Nasr, O. (2008). Autism... in the Middle East. *Anderson Cooper 360°, CNN*. Retrieved from <http://ac360.blogs.cnn.com/2008/04/02/autism-in-the-middle-east/> [Last access 23 September 2016].
- Newschaffer, C. J., Croen, L. A., Daniels, J., Giarelli, E., Grether, J. K., Levy, S. E., . . . Reaven, J. (2007). The epidemiology of autism spectrum disorders*. *Annu. Rev. Public Health*, 28, 235-258.
- Nielsen, J. (2012). Usability 101: Introduction to Usability. Retrieved from <http://www.nngroup.com/articles/usability-101-introduction-to-usability/> [Last access 16 September 2016].
- Noterdaeme, M., Wriedt, E., & Hoehne, C. (2010). Asperger's syndrome and high-functioning autism: language, motor and cognitive profiles. *European Child & Adolescent Psychiatry*, 19(6). doi:10.1007/s00787-009-0057-0
- O'Keeffe, G. S., & Clarke-Pearson, K. (2011). The impact of social media on children, adolescents, and families. *Pediatrics*, 127(4), 800-804.
- Orsmond, G. I., Krauss, M. W., & Seltzer, M. M. (2004). Peer relationships and social and recreational activities among adolescents and adults with autism. *Journal of autism and developmental disorders*, 34(3), 245-256.
- Orsmond, G. I., Shattuck, P. T., Cooper, B. P., Sterzing, P. R., & Anderson, K. A. (2013). Social participation among young adults with an autism spectrum disorder. *Journal of autism and developmental disorders*, 1-10.
- Otterbeck, J., & Ackfeldt, A. (2012). Music and Islam. *Contemporary Islam*, 1-7.
- Ousley, O. Y., & Mesibov, G. B. (1991). Sexual Attitudes And Knowledge Of High-Functioning Adolescents And Adults With Autism. *Journal of Autism and Developmental Disorders*, 21(4). doi:10.1007/bf02206871

References

- Palfreyman, D., & Khalil, M. a. (2003). "A Funky Language for Teenzz to Use:" Representing Gulf Arabic in Instant Messaging. *Journal of Computer-Mediated Communication*, 9(1), 0-0.
- Park, S., Cho, S.-C., Cho, I. H., Kim, B.-N., Kim, J.-W., Shin, M.-S., . . . Yoo, H. J. (2012). Sex differences in children with autism spectrum disorders compared with their unaffected siblings and typically developing children. *Research in Autism Spectrum Disorders*, 6(2). doi:10.1016/j.rasd.2011.11.006
- Parsons, S., Beardon, L., Neale, H. R., Reynard, G., Eastgate, R., Wilson, J. R., . . . Hopkins, E. (2000). Development of social skills amongst adults with Asperger's Syndrome using virtual environments: the 'AS Interactive' project. *3rd ICDVRAT, Sardinia Italy*, 163-170.
- Parsons, S., Guldberg, K., MacLeod, A., Jones, G., Prunty, A., & Balfe, T. (2009). International review of the literature of evidence of best practice provision in the education of persons with autistic spectrum disorders. *Research Reports No, 2*.
- Parsons, S., Leonard, A., & Mitchell, P. (2006). Virtual environments for social skills training: comments from two adolescents with autistic spectrum disorder. *Computers & Education*, 47(2). doi:10.1016/j.compedu.2004.10.003
- Parsons, S. (2016). Authenticity in Virtual Reality for assessment and intervention in autism: A conceptual review. *Educational Research Review*, 19, 138-157.
- Parsons, S., & Cobb, S. (2011). State-of-the-art of virtual reality technologies for children on the autism spectrum. *European Journal of Special Needs Education*, 26(3), 355-366.
- Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. *Journal of Intellectual Disability Research*, 46, 430-443. doi:10.1046/j.1365-2788.2002.00425.x
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*: SAGE Publications, inc.
- Peña, E. D. (2013). Bilingualism and Autism. *2 Languages 2 Worlds* Retrieved from <http://2languages2worlds.wordpress.com/2013/04/29/bilingualism-and-autism/> [Last access 16 September 2016].
- Pfeil, U., Arjan, R., & Zaphiris, P. (2009). Age differences in online social networking—A study of user profiles and the social capital divide among teenagers and older users in MySpace. *Computers in Human Behavior*, 25(3), 643-654.
- Pierce, K. L., & Schreibman, L. (1994). Teaching daily living skills to children with autism in unsupervised settings through pictorial self-management. *Journal of applied behavior analysis*, 27(3), 471-481.
- Porayska-Pomsta, K., Frauenberger, C., Pain, H., Rajendran, G., Smith, T., Menzies, R., . . . Lemon, O. (2012). Developing technology for autism: an interdisciplinary approach. *Personal and Ubiquitous Computing*, 16(2). doi:10.1007/s00779-011-0384-2.
- Preece, J. (2001). Sociability and usability in online communities: Determining and measuring success. *Behaviour & Information Technology*, 20(5), 347-356.

- Preece, J., & Maloney-Krichmar, D. (2003). Online communities: focusing on sociability and usability. *Handbook of human-computer interaction*, 596-620.
- Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the horizon*, 9(5), 1-6.
- Putnam, C., & Chong, L. (2008). *Software and Technologies Designed for People with Autism: What do users want?* Paper presented at the Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility.
- Qabbani, B. (2011). Dubai urged to step up for autism awareness. *The National*. Retrieved from <http://www.thenational.ae/news/uae-news/dubai-urged-to-step-up-for-autism-awareness> [Last access 16 September 2016].
- Raghavendra, P., Wood, D., Newman, L., & Lawry, J. (2012). Why aren't you on Facebook?: patterns and experiences of using the Internet among young people with physical disabilities. *Technology and Disability*, 24(2), 149-162.
- Raising autism awareness in the Arab region. (2008, May 7). *Ashoka Arab World*. Retrieved from <http://ashokaarabworld.wordpress.com/2008/05/07/raising-autism-awareness-in-the-arab-region/> [Last access 15 September 2016].
- Rajasekar, S., Philominathan, P., & Chinnathambi, V. (2006). Research methodology. *arXiv preprint physics/0601009*.
- Reinecke, K., & Bernstein, A. (2011). Improving performance, perceived usability, and aesthetics with culturally adaptive user interfaces. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 18(2), 8.
- Robertson, C. (2003). Autonomy and identity: the need for new dialogues in education and welfare. *Support for Learning*, 16(3), 122-127.
- Robson, C. (2002). *Real world research: A resource for social scientists and practitioner-researchers* (Vol. 2): Blackwell Oxford.
- Rochman, B. (2011). MyAutismTeam: A New Site for Families With Autism. *TIME.com*. Retrieved from <http://healthland.time.com/2011/12/08/myautismteam-for-parents-of-kids-with-autism-new-site-offers-advice-and-emotional-support/> [Last access 23 September 2016].
- Rugh, W. A. (2002). Education in Saudi Arabia: choices and constraints. *Middle East Policy*, 9(2), 40.
- Sadler, G. R., Lee, H. C., Lim, R. S. H., & Fullerton, J. (2010). Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nursing & health sciences*, 12(3), 369-374.
- Sailers, E. (2010). iPhone and iPod touch Apps for (Special) Education. *App list: app icon, title with link, and description provided*.
- Salem, F., & Mourtada, R. (2012). Social Media in the Arab World: Influencing Societal and Cultural Change? (Vol. Vol. 2#1, pp. 29): *Arab Social Media Report*, Dubai School of Government.

References

- Salem, F., Mourtada, R., & Alshaer, S. (2013). Transforming Education in the Arab World: Breaking Barriers in the Age of Social Learning. *Arab Social Media Report, Dubai School of Government–DSG*.
- Salhani, J. (2013). Arabizi – does the Levant youth speak Arabic these days? *Your Middle East [online]*. Retrieved from <http://www.yourmiddleeast.com/features/arabizi-does-the-levant-youth-speak-arabic-these-days-11803> [Last access 23 September 2016].
- Samadi, S. A., & McConkey, R. (2011). Autism in developing countries: lessons from iran. *Autism research and treatment, 2011*.
- Saqer, G. (2010). Google: MENA Online Ad Spending is Between 110-130 Million USD in 2010, 100 Million Arab Users will be Online in 2015. *Arab Crunch [online]*. Retrieved from <http://arabcrunch.com/2010/12/google-mena-ad-spending-is-between-110-130-million-usd-in-2010-100-million-arab-users-will-be-online-in-2015.html> [Last access 23 September 2016].
- Saudi Gazette. (2014). Parents complain from short support for autistic children in Saudi Arabia. Retrieved from <http://english.alarabiya.net/en/News/middle-east/2014/03/03/Parents-upset-with-the-way-institutions-handling-autistic-children.html> [Last access 23 September 2016].
- Saudi Gazette. (2015). The downside of street photography in Saudi Arabia. *Al Arabiya*. Retrieved from <http://english.alarabiya.net/en/media/digital/2015/02/07/The-downside-of-street-photography-in-Saudi-Arabia.html> [Last access 23 September 2016].
- Sawyer, R. (2011). The Impact of New Social Media on Intercultural Adaptation. *Senior Honors Projects. Paper, 242*.
- Scassellati, B., Admoni, H., & Mataric, M. (2012). Robots for use in autism research. *Annual review of biomedical engineering, 14*, 275-294.
- Scealy, M., Phillips, J. G., & Stevenson, R. (2002). Shyness and anxiety as predictors of patterns of Internet usage. *CyberPsychology & Behavior, 5*(6), 507-515.
- Seffah, A., Donyaee, M., Kline, R. B., & Padda, H. K. (2006). Usability measurement and metrics: A consolidated model. *Software Quality Journal, 14*(2), 159-178.
- Seiter, C. (2015). The Secret Psychology of Facebook: Why We Like, Share, Comment and Keep Coming Back. *Buffer Social*. Retrieved from <https://blog.bufferapp.com/psychology-of-facebook> [Last access 31 August 2016]
- Seltzer, M. M., Shattuck, P., Abbeduto, L., & Greenberg, J. S. (2004). Trajectory of development in adolescents and adults with autism. *Mental Retardation and Developmental Disabilities Research Reviews, 10*(4), 234-247. doi:10.1002/mrdd.20038
- Sevilla, J., Herrera, G., Martínez, B., & Alcantud, F. (2007). Web accessibility for individuals with cognitive deficits: A comparative study between an existing commercial web and its cognitively accessible equivalent. *ACM Transactions on Computer-Human Interaction (TOCHI), 14*(3), 12.

- Shane, H. C., Laubscher, E. H., Schlosser, R. W., Flynn, S., Sorce, J. F., & Abramson, J. (2012). Applying Technology to Visually Support Language and Communication in Individuals with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 42(6), 1228-1235. doi:10.1007/s10803-011-1304-z.
- Shankar, R. (2011). Factors influencing online social interactions *Online Communities and Social Computing* (pp. 355-362): Springer.
- Sharf, B. F. (1999). Beyond netiquette: the ethics of doing naturalistic disclosure research on the Internet, in: S.JONES (Ed.). *Doing Internet research: Critical issues and methods for examining the Net*, 243-275.
- Shattuck, P. T., Seltzer, M. M., Greenberg, J. S., Orsmond, G. I., Bolt, D., Kring, S., . . . Lord, C. (2007). Change in autism symptoms and maladaptive behaviors in adolescents and adults with an autism spectrum disorder. *Journal of autism and developmental disorders*, 37(9), 1735-1747.
- Shattuck, T. P., Roux, A. M., Hudson, L. E., Taylor, J. L., Maenner, M. J., & Trani, J.-F. (2012). Services for adults with an autism spectrum disorder. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, 57(5), 284.
- Shay, R., Bhargav-Spantzel, A., & Bertino, E. (2007). *Password policy simulation and analysis*. Paper presented at the Proceedings of the 2007 ACM workshop on Digital identity management.
- Sherman, L. (2015). How to be a Woman in Saudi Arabia: Abayas, Hijabs, and Segregation. Retrieved from <http://www.pinkpangea.com/2015/06/how-to-be-a-woman-in-saudi-arabia-abayas-hijabs-and-segregation/> [Last access 23 September 2016].
- Sherry, J. L., Lucas, K., Greenberg, B. S., & Lachlan, K. (2006). Video game uses and gratifications as predictors of use and game preference. *Playing video games: Motives, responses, and consequences*, 213-224.
- Shpigelman, C.-N., & Gill, C. J. (2014). How to Make Online Social Networks Accessible for Users with Intellectual Disability? *Computers Helping People with Special Needs* (pp. 471-477): Springer.
- Sigafoos, J., O'Reilly, M., Cannella, H., Upadhyaya, M., Edrisinha, C., Lancioni, G. E., . . . Young, D. (2005). Computer-presented video prompting for teaching microwave oven use to three adults with developmental disabilities. *Journal of Behavioral Education*, 14(3), 189-201.
- Silver, M., & Oakes, P. (2001). Evaluation of a new computer intervention to teach people with autism or Asperger syndrome to recognize and predict emotions in others. *Autism*, 5(3), 299-316.
- Silverman, D. (2006). *Interpreting qualitative data: Methods for analyzing talk, text and interaction*: Sage.
- Simm, W., Ferrario, M. A., Gradinar, A., & Whittle, J. (2014). *Prototyping 'clasp': implications for designing digital technology for and with adults with autism*. Paper presented at the Proceedings of the 2014 conference on Designing interactive systems.
- Simsim, M. T. (2011). Internet usage and user preferences in Saudi Arabia. *Journal of King Saud University-Engineering Sciences*, 23(2), 101-107.

References

- Sjoberg, D. I., Dyba, T., & Jorgensen, M. (2007). *The future of empirical methods in software engineering research*. Paper presented at the 2007 Future of Software Engineering.
- Speicher, M. (2015). What is Usability? *arXiv preprint arXiv:1502.06792*.
- Spolsky, J. (2004). It's Not Just Usability. *Joel on Software*. Retrieved from <http://www.joelonsoftware.com/articles/NotJustUsability.html> [Last access 23 September 2016].
- Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS quarterly*, 679-704.
- Stewart, M. E., Barnard, L., Pearson, J., Hasan, R., & O'Brien, G. (2006). Presentation of depression in autism and Asperger syndrome A review. *Autism*, 10(1), 103-116.
- Straub, D. W., Loch, K. D., & Hill, C. E. (2002). Transfer of information technology to the Arab world: a test of cultural influence modeling. *Information Technology Management in Developing Countries*, 92-151.
- Straub, Loch, K. D., & Hill, C. E. (2003). Transfer of information technology to the Arab world: a test of cultural influence modeling. *Advanced topics in global information management*, 2, 141-172.
- Sun, H. (2001). *Building a culturally-competent corporate web site: an exploratory study of cultural markers in multilingual web design*. Paper presented at the Proceedings of the 19th annual international conference on Computer documentation.
- Taha, G. R., & Hussein, H. (2014). Autism Spectrum Disorders in Developing Countries: Lessons from the Arab World *Comprehensive Guide to Autism* (pp. 2509-2531): Springer.
- Tedre, M., Sutinen, E., Kähkönen, E., & Kommers, P. (2006). Ethnocomputing: ICT in cultural and social context. *Communications of the ACM*, 49(1), 126-130.
- The State of Social Media in Saudi Arabia 2013. (2014, January 6). Retrieved from The Social Clinic website: <http://www.thesocialclinic.com/the-state-of-social-media-in-saudi-arabia-2013/> [Last access 16 September 2016].
- Thiemann, K. S., & Goldstein, H. (2001). Social stories, written text cues, and video feedback: Effects on social communication of children with autism. *Journal of applied behavior analysis*, 34(4), 425-446.
- Tighe, C. (2014). Saudi Arabia Offers Cultural Challenge. *Business Education*. Retrieved from <http://www.ft.com/cms/s/2/99772e46-4b21-11e4-b1be-00144feab7de.html> - axzz3giYGyUml [Last access 23 September 2016].
- Tincani, M., Travers, J., & Boutot, A. (2009). Race, culture, and autism spectrum disorder: Understanding the role of diversity in successful educational interventions. *Research and Practice for Persons with Severe Disabilities*, 34(3-4), 81-90.
- Trepagnier, C. Y., Olsen, D. E., Boteler, L., & Bell, C. A. (2011). Virtual Conversation Partner for Adults with Autism. *Cyberpsychology Behavior and Social Networking*, 14(1-2). doi:10.1089/cyber.2009.0255.

- Usher, S. (2013). Saudi Arabia blocks Viber messaging service. *BBC News*. Retrieved from <http://www.bbc.co.uk/news/world-middle-east-22806848> [Last access 23 September 2016].
- Van Laarhoven, T., Kraus, E., Karpman, K., Nizzi, R., & Valentino, J. (2010). A comparison of picture and video prompts to teach daily living skills to individuals with autism. *Focus on Autism and Other Developmental Disabilities*, 25(4), 195-208.
- Van Laarhoven, T., & Van Laarhoven-Myers, T. (2006). Comparison of three video-based instructional procedures for teaching daily living skills to persons with developmental disabilities. *Education and Training in Developmental Disabilities*, 365-381.
- Varnagy-Toth, Z. (2015). Usability Testing with People on the Autism Spectrum: What to Expect. *UX matters*. Retrieved from <http://www.uxmatters.com/mt/archives/2015/10/usability-testing-with-people-on-the-autism-spectrum-what-to-expect.php> [Last access 23 September 2016].
- Veltri, N. F., & Elgarah, W. (2009). *The Role of National Cultural Differences in User Adoption of Social Networking*. Paper presented at the southern association for information systems conference, Charleston, SC.
- Venkatesh, S., Greenhill, S., Phung, D., Adams, B., & Duong, T. (2012). Pervasive multimedia for autism intervention. *Pervasive and Mobile Computing*, 8(6), 863-882. doi:10.1016/j.pmcj.2012.06.010
- Vidyasagar, G., & Rea, D. M. (2004). *Saudi women doctors: gender and careers within Wahhabic Islam and a 'westernised' work culture*. Paper presented at the Women's studies international forum.
- Wainer, A. L., & Ingersoll, B. R. (2011). The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 5(1), 96-107. doi:10.1016/j.rasd.2010.08.002
- Wallace, S., Parsons, S., & Bailey, A. (in press). Self-reported sense of presence and responses to social stimuli by adolescents with ASD in a collaborative virtual reality environment. *Journal of Intellectual and Developmental Disability*.
- Wallace, S., Parsons, S., Westbury, A., White, K., White, K., & Bailey, A. (2010). Sense of presence and atypical social judgments in immersive virtual environments Responses of adolescents with Autism Spectrum Disorders. *Autism*, 14(3). doi:10.1177/1362361310363283
- Waller, S., Bradley, M., Hosking, I., & Clarkson, P. J. (2015). Making the case for inclusive design. *Applied ergonomics*, 46, 297-303.
- Walsh, L., & Barry, M. (2009). A Classroom Investigation of Software Design Requirements for Special Needs Learners.
- White, S. W., Oswald, D., Ollendick, T., & Scahill, L. (2009). Anxiety in children and adolescents with autism spectrum disorders. *Clinical psychology review*, 29(3), 216-229.

References

- Williams, P. (2013). Web site usability testing involving people with learning disabilities using only images and audio to access information. *Journal of Research in Special Educational Needs*, 13(2), 142-151.
- Williams, P., Jamali, H. R., & Nicholas, D. (2006). *Using ICT with people with special education needs: what the literature tells us*. Paper presented at the Aslib Proceedings.
- Williams, P., & Nicholas, D. (2006). Testing the usability of information technology applications with learners with special educational needs (SEN). *Journal of Research in Special Educational Needs*, 6(1), 31-41.
- Wing, L., & Potter, D. (2002). The epidemiology of autistic spectrum disorders: Is the prevalence rising? *Mental Retardation and Developmental Disabilities Research Reviews*, 8(3), 151-161. doi:10.1002/mrdd.10029
- Wingate, M., Kirby, R. S., Pettygrove, S., Cunniff, C., Schulz, E., Ghosh, T., . . . Constantino, J. (2014). Prevalence of autism spectrum disorder among children aged 8 years-autism and developmental disabilities monitoring network, 11 sites, United States, 2010. *MMWR Surveillance Summaries*, 63(2).
- Winter, S. (2012a). Autism Light, Honoring 338 Autism Heroes. *Autism Light*. Retrieved from <http://autism-light.blogspot.co.uk/2012/04/sara-winter.html> [Last access 16 September 2016]
- Winter, S. (2012b). The story of Squag. *MaRS*. Retrieved from <http://www.marsdd.com/2012/08/02/the-story-of-squag/> [Last access 16 September 2016]
- Wohlin, C., Runeson, P., Höst, M., Ohlsson, M. C., Regnell, B., & Wesslén, A. (2012). *Experimentation in software engineering*: Springer Science & Business Media.
- Woodgate, R. L., Ateah, C., & Secco, L. (2008). Living in a world of our own: The experience of parents who have a child with autism. *Qualitative health research*, 18(8), 1075-1083.
- World Health Organization. (2011). *World health statistics 2011*: World Health Organization.
- World Wide Web Consortium W3C. (2005). Introduction to Web Accessibility. *Web Accessibility Invitation*. Retrieved from <http://www.w3.org/WAI/intro/accessibility.php> [Accessed 16 August 2016]
- Wright, C., Diener, M. L., Dunn, L., Wright, S. D., Linnell, L., Newbold, K., . . . Rafferty, D. (2011). SketchUp™: A technology tool to facilitate intergenerational family relationships for children with autism spectrum disorders (ASD). *Family and Consumer Sciences Research Journal*, 40(2), 135-149.
- Wu, M. (2006). Hofstede's cultural dimensions 30 years later: A study of Taiwan and the United States. *Intercultural Communication Studies*, 15(1), 33.
- Yazbak, F. E. (2004). Autism seems to be increasing worldwide, if not in London. *British Medical Journal*, 328(7433), 226-227. doi:10.1136/bmj.328.7433.226-c

- Zywica, J., & Danowski, J. (2008). The faces of Facebookers: Investigating social enhancement and social compensation hypotheses; predicting Facebook™ and offline popularity from sociability and self-esteem, and mapping the meanings of popularity with semantic networks. *Journal of Computer-Mediated Communication*, 14(1), 1-34.
- Özdemir, Y. (2014). Cyber victimization and adolescent self-esteem: The role of communication with parents. *Asian Journal of Social Psychology*, 17(4), 255-263.

Appendices

Appendix A Participant Information Sheet

Participant Information Sheet (caregivers)

Participant Information

Ethics reference number: ERGO/FPSE/11614	Version: 5	Date: 2014-09-23
Study Title: Improving Social and Communication Skills of Adult Arabs with ASD through the Use of Social Media Technologies		
Investigator: Alaa Mashat		

Please read this information carefully before deciding to take part in this research. If you are happy for you son or daughter to participate you will be asked to sign a consent form. Participation is completely voluntary.

What is the research about? I am a PhD student in the school of Physical Sciences & Engineering at the University of Southampton; my field is Computer Science and my research is focusing on the usability and accessibility of social media by adult Arabs with Autism Spectrum Disorder (ASD), in order to improve their social and communication skills. The study also aims to find if cultural factors might affect the usability of social media technology by users with ASD in Arab countries. Survey questions will be regarding general information about the individuals with ASD and about the usage of social networks. Interview questions for the individuals with ASD, will be regarding the use of social networks (Facebook), focusing on the interaction and communication of the users with family and friends by the use of photos.

Why have I been chosen? As a caregiver of an adult with ASD (High-Functioning or Aspergers) living in an Arabic country, you are selected to be aware of the participation of your carrier, and you are offered the to agree or disagree. The main goal of participating in the study is to provide the participants the opportunity to improve their communication and social skills by the use of some tasks on Facebook. The participation would be helpful for implementing this research.

What will happen to me if I take part? When agreeing to take part of the research after the survey, you will be asked to sign a consent form, and then you will be asked to help your carrier to set a Facebook account or arrange some of the settings. You will then be asked to accompany the participant when implementing the study in case any necessity.

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Are there any benefits in my taking part? By agreeing of the participation, you will help in establishing and completing the research. The benefits of the research will be to the individuals with ASD, that are the focus of this research by finding how to improve their communication and social skills aiming to give them a better life. Despite the results and the findings of the research, the study would be a contribution adding to the current knowledge.

Are there any risks involved? Regarding the participant, the general questions of the interview, risks are likely not involved. In case the individual experienced anxiety or depression, the interview will be stopped. The confidentiality of the audio-recorded information will be considered following the ethical standards of the University of Southampton.

Will my data be confidential? Data collected from or about the participants will be stored and held confidential in a password protected computer. All files containing any personal data will be made anonymous by separating identifying data, and used only in accordance with the Data Protection Act (1998). Any paper documents will be stored in a locked cabinet. Your data will be linked to your consent form by a specific id number. After the completion of the research the data will be destroyed. Managing the data will be compliance with the University of Southampton data management policy: <http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html>

What happens if I change my mind? If you are the participant felt any discomfort or decided to not complete, you have the right to withdraw at any time without providing any excuse reasons, and the data will be deleted.

What happens if something goes wrong? In the unlikely case of concern or complaint, please do not hesitate to contact:

Researcher: Ms. Alaa Mashat: aam1f11@ecs.soton.ac.uk, Tel: +xxxxxxxxxxxxx

Supervisor: Dr. Mike Wald: xxxxxxxxxxxx, Tel: + xxxxxxxxxxxx

Supervisor: Dr. Sarah Parsons: xxxxxxxxxxxx Tel: + xxxxxxxxxxxx

Or contact Dr Martina Prude, Head of Research Governance: xxxxxxxxxxxx,
Tel: xxxxxxxxxxxx

Thank you very much for your interest to participate in this research project. If you wish to continue, may I ask you to please sign the consent form provided.

Kind Regards,

Alaa Mashat

Participant Information Sheet (adults with ASD)

Participant Information

Ethics reference number: ERGO/FPSE/11614	Version: 5	Date: 2014-09-23
Study Title: Improving Social and Communication Skills of Adult Arabs with ASD through the Use of Social Media Technologies		
Investigator: Alaa Mashat		

Please read this information carefully before deciding to take part in this research. If you are happy to participate you and your caregiver will be asked to sign a consent form. Your participation is completely voluntary.

What is the research about? I am a PhD student in the school of Physical Sciences & Engineering at the University of Southampton; my field is Computer Science and my research is focusing on the usability and accessibility of social media by adult Arabs with Autism Spectrum Disorder (ASD), in order to improve their social and communication skills. The study also aims to find if cultural factors might affect the usability of social media technology by users with ASD in Arab countries. Interview questions will be regarding the use of social networks (Facebook), focusing on the interaction and communication of the users with family and friends by the use of photos.

Why have I been chosen? As an adult with ASD (High-Functioning or Aspergers) living in an Arabic country, you are selected as a participant in the study for offering useful information regarding the technologies you use for improving your social and communication skills that would be helpful for the research.

What will happen to me if I take part? When agreeing to take part of the research, you will be asked to sign a consent form, and then you will be asked to set a Facebook account if you do not have an account, or set some of the settings by the help of the caregiver if needed. You will be interviewed by the researcher in a face-to-face meeting and you are required to do some tasks. The interview will be audio recorded. It will be held in the centre, school or maybe another convenient place if you are not a student in a school or a centre. The date will be arranged regarding to your convenient time. You will then be asked to answer a questionnaire at the end of the study.

Appendices

Are there any benefits in my taking part? By participating, you will help in establishing and completing the research. The benefits of the research will be addressed to you, by finding how to improve your communication and social skills in order to improve your quality of life. Despite the results and the findings of the research, the study would be a contribution adding to the current knowledge.

Are there any risks involved? Regarding the general questions of the interview, risks are likely not involved. In case the individual experienced anxiety or depression, the interview will be stopped. The confidentiality of the audio-recorded information will be considered following the ethical standards of the University of Southampton.

Will my data be confidential? Data will be stored and held confidential in a password protected computer. All files containing any personal data will be made anonymous by separating identifying data, and used only in accordance with the Data Protection Act (1998). Any paper documents will be stored in a locked cabinet. Your data will be linked to your consent form by a specific id number. After the completion of the research the data will be destroyed. Managing the data will be compliance with the University of Southampton data management policy: <http://www.calendar.soton.ac.uk/sectionIV/research-data-management.html>

What happens if I change my mind? If you feel any discomfort or decide to not complete, you have the right to withdraw at any time without providing any excuse reasons, and your data will be deleted.

What happens if something goes wrong? In the unlikely case of concern or complaint, please do not hesitate to contact:

Researcher: Ms. Alaa Mashat: aam1f11@ecs.soton.ac.uk, Tel: +xxxxxxxxxxxxxx

Supervisor: Dr. Mike Wald: xxxxxxxxxxxxx, Tel: + xxxxxxxxxxxxx

Supervisor: Dr. Sarah Parsons: xxxxxxxxxxxxx Tel: + xxxxxxxxxxxxx

Or contact Dr Martina Prude, Head of Research Governance: xxxxxxxxxxxxx,
Tel: xxxxxxxxxxxxx

Thank you very much for your interest to participate in this research project. If you wish to continue, may I ask you to please sign the consent form provided.

Kind Regards,

Alaa Mashat

Appendix B Consent Form

Ethics reference number: ERGO/FPSE/11614	Version: 5	Date: 2014-09-23
Study Title: Improving Social and Communication Skills of Adult Arabs with ASD through the Use of Social Media Technologies		
Investigator: Alaa Mashat		

Please initial the box(es) if you agree with the statement(s):

I have read and understood the Participant Information (version 4 dated 2014-08-19) and have had the opportunity to ask questions about the study.

☐

I agree to take part in this study.

☐

I understand my participation is voluntary and I may withdraw at any time and for any reason.

☐

I agree to record my voice during my participation in this study

☐

Data Protection

I understand that information collected during my participation in this study will be stored on a password protected computer/secure University server and that this information will only be used in accordance with the Data Protection Act (1998).

Name of participant (print name).....

Signature of participant.....

Name of parent / guardian (print name).....

Signature of parent / guardian.....

Date.....

Appendix C Survey Questions for Recruiting Participants



Accessibility toolbar

UNIVERSITY OF
Southampton

A Survey Regarding Participating in the Research About Improving Social and Communication Skills for Adult Arabs with ASD

يخدم هذا الاستبيان رسالة الدكتوراه للطالبة آلاء مشاط في كلية الإلكترونيات وعلوم الحاسبات بجامعة ساوثهامبتون. يهتم البحث بدراسة استخدام شبكات التواصل الاجتماعي من قبل العرب البالغين (١٦ سنة وما فوق) المصابين بالتوحد، وذلك من أجل تحسين قدرات التواصل لديهم وتطوير مهاراتهم الاجتماعية. وتهدف هذه الدراسة إلى معرفة مدى تأثير العوامل الثقافية عند استخدام تقنيات وسائل التواصل الاجتماعي - وخصوصاً الفيس بوك - في الدول العربية من قبل المستخدمين المصابين بالتوحد. الهدف من تعبئة هذا الاستبيان هو التعرف على أهلية الأشخاص الراغبين في استكمال المشاركة في البحث.

تعبئة الاستبيان يستغرق من ١٠-١٥ دقيقة

إذا كان لديك أي استفسار الرجاء التواصل مع آلاء مشاط على الإيميل التالي

aam1f11@ecs.soton.ac.uk

شكراً لكم على المشاركة

My name is Alaa Mashat, I am a PhD student at the University of Southampton; my field is Computer Science and my research is focusing on the use of social media by adult Arabs with Autism Spectrum Disorder (ASD) in order to improve their social and communication skills. The study also aims to find if cultural factors might affect the usability of social media technology (in particular Facebook) by users with ASD in Arab countries. The intention of the survey is to get an overview of the people who are willing to participate.

It will take from 10 to 15 minutes.

If you have any questions please contact Alaa Mashat at: aam1f11@ecs.soton.ac.uk

Thank you for your time..

☐ Please tick (check) this box to indicate that you consent to taking part in this survey

[Click here to start this survey](#) ➡

1. Research Participation

This survey should be completed by the **caregiver**, for example the mother or the father, of the person with Autism Spectrum Disorder (ASD). It is for providing general information regarding the person with ASD, and some information in regards to the study.

الرجاء تعبئة هذا الاستبيان من قبل ولي الأمر كالوالد أو الوالدة وليس من قبل الشخص المصاب بالتوحد. الغرض من استكمال هذا الاستبيان هو التأكد من بعض المعلومات عن الشخص المصاب بالتوحد التي تفيد استكمال هذه الدراسة. وشكرا

Question 1.

Where are you from?

من أي بلد انت؟

Country البلد

City المدينة

Question 2.

Please describe your relationship to the person with ASD (Autism Spectrum Disorder).

ما هي علاقتك بالشخص المصاب بالتوحد؟

- ☐ Mother الوالدة
- ☐ Father الوالد
- ☐ Step-mother زوجة الأب
- ☐ Step-father زوج الأم
- ☐ Sibling شقيق/شقيقة
- ☐ Grandmother جده
- ☐ Grandfather جد
- ☐ Aunt خالة/عمة
- ☐ Uncle خال/عم
- ☐ Cousin قريب
- ☐ Other أخرى

Question 3.

What is the highest level of education that you (the caregiver) achieved?

ما هو مستواك التعليمي؟

Please select



Question 4.

What is the gender of the person with ASD?

ما هو جنس الشخص المصاب بالتوحد؟

☐ انثى

☐ ذكر

Question 5.

How old is the person with ASD? (e.g. 25)

ما هو عمر الشخص المصاب بالتوحد؟

مثال: ٢٥ سنة

Question 6.

What functioning level is the person with ASD?

ما هو مستوى تركيز الشخص المصاب بالتوحد؟

☐ Severe Autism صعوبات مزمنة في التركيز

☐ Low-functioning تركيز منخفض

☐ High-functioning تركيز عالي

Question 7.

What is the nature of education the person with ASD is receiving?

ما هو نوع التعليم الذي يتلقاه الشخص المصاب بالتوحد حالياً؟

- ☐ Specialised Autism school or centre مركز أو مدرسة خاصة بالتوحد
- ☐ Mainstream school (مع طلابه غير مصابين بالتوحد) مدرسة عامة
- ☐ University/College جامعة أو كلية
- ☐ Home education تعليم بالمنزل
- ☐ Other أخرى

Question 8.

Does he/she have a smartphone/tablet/computer? (please note you can choose more than one option)

هل الشخص المصاب بالتوحد يمتلك أحد الأجهزة التالية؟

(يمكن اختيار أكثر من إجابة)

- ☐ Smartphone (e.g. iPhone, Samsung Galaxy) هاتف ذكي
- ☐ Tablet (e.g. iPad, Google Nexus) لوحة ذكية
- ☐ Laptop لاب توب
- ☐ Desktop جهاز كمبيوتر مكتبي
- ☐ None لا يمتلك أي من هذه الأجهزة
- ☐ Other أخرى

Question 9.

Does the person with ASD use any of the following technologies? (please choose all that applies)

هل الشخص المصاب بالتوحد يستخدم أحد التقنيات التالية؟ (الرجاء اختيار كل التقنيات المستخدمة)

- ☐ Social Networks شبكات التواصل الاجتماعي
- ☐ Computer Games ألعاب الكمبيوتر
- ☐ Educational Apps تطبيقات تعليمية
- ☐ Social Activity Apps تطبيقات للمهارات الاجتماعية
- ☐ Communication Skills App تطبيقات لمهارات التواصل
- ☐ Other أخرى

Question 10.

Do you personally use any social media network/s?

هل انت شخصياً لديك حساب في إحدى شبكات التواصل الإجتماعي؟

☐ Yes نعم

☐ No لا

Question 11.

Do you support the idea of using social media networks for the person with ASD?

هل انت تدعم فكرة استخدام شبكات التواصل الإجتماعي للأشخاص المصابين بالتوحد؟

☐ Yes نعم

☐ No لا

☐ I do not mind لا امانع

Question 12.

Do you know if the person with ASD uses any social media networks?

هل انت على علم اذا كان الشخص المصاب بالتوحد يستخدم اي من شبكات التواصل الإجتماعي؟

☐ Yes نعم

☐ No لا

☐ Not sure لست متأكداً

Question 13.

Do you think you need to monitor the person with ASD when using Facebook?

هل تعتقد ان الشخص المصاب بالتوحد يحتاج إلى رقابة عند استخدام الفيس بوك ؟

☐ Yes نعم

☐ No لا

☐ Not sure لست متأكداً

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Question 14.

As a caregiver, are you happy for the person with ASD who is under your care to participate in the study?

كونك ولي أمر، هل توافق للشخص المصاب بالتوحد بالمشاركة في الدراسة؟

☐ Yes نعم

☐ No لا

Survey Progress

Start  Finish

Save and Finish 

Once this button is pressed you will not be able edit your responses

Appendix D Thematic Analysis



Figure D.1 Figure Categorising the coded data to themes

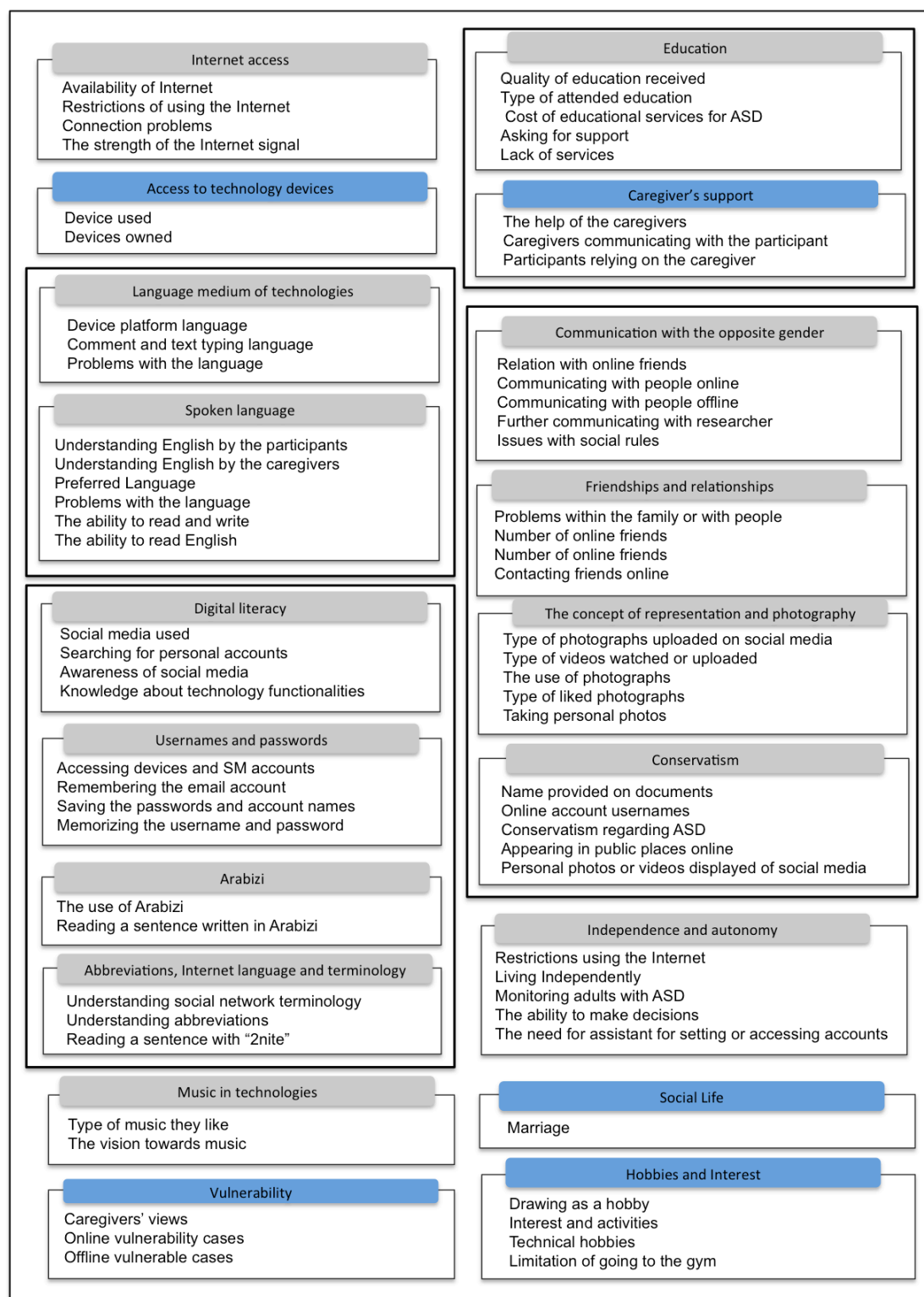


Figure D.2 Re-categorising the coded data

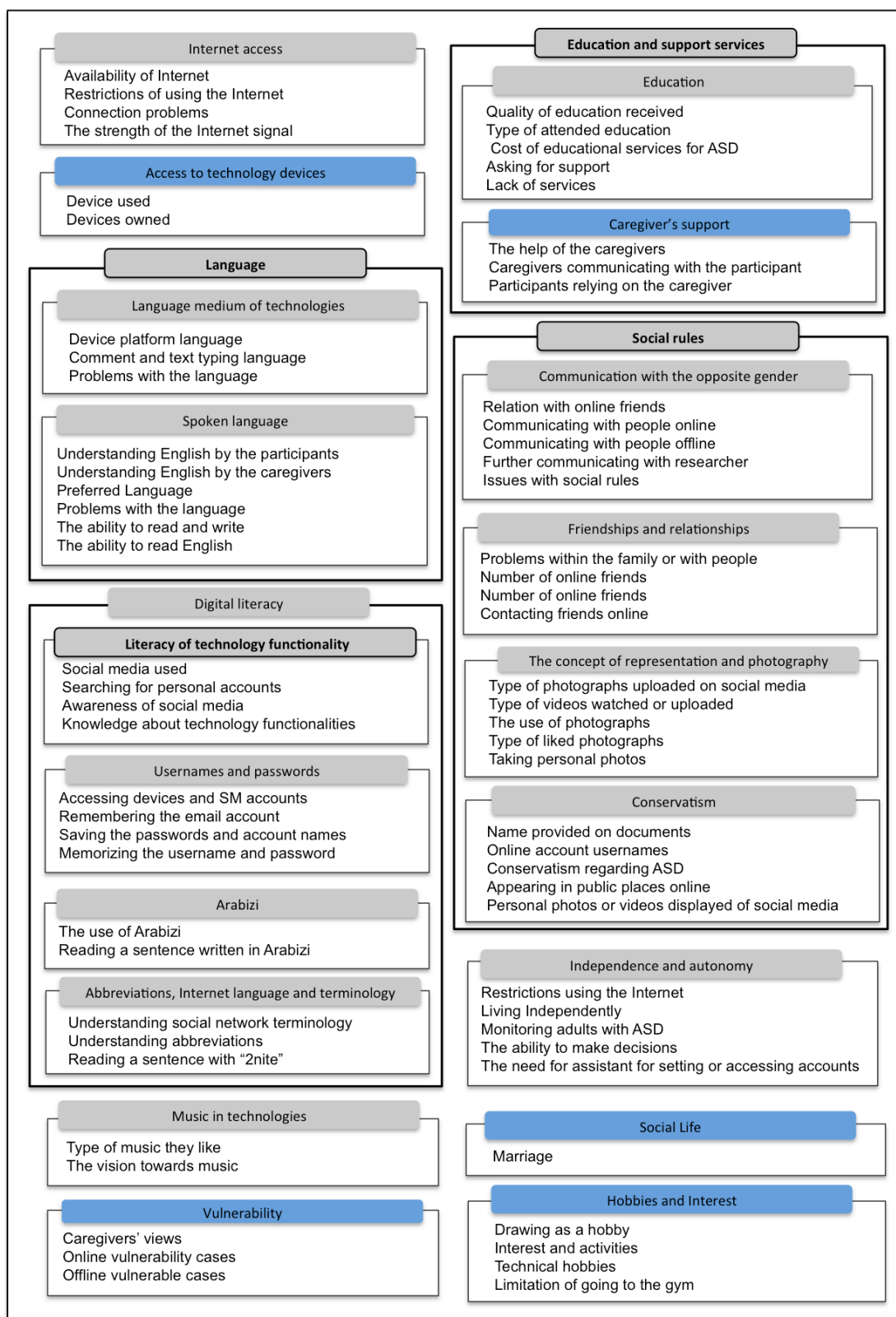


Figure D.3 Re-labelling the themes after modifying the coded data

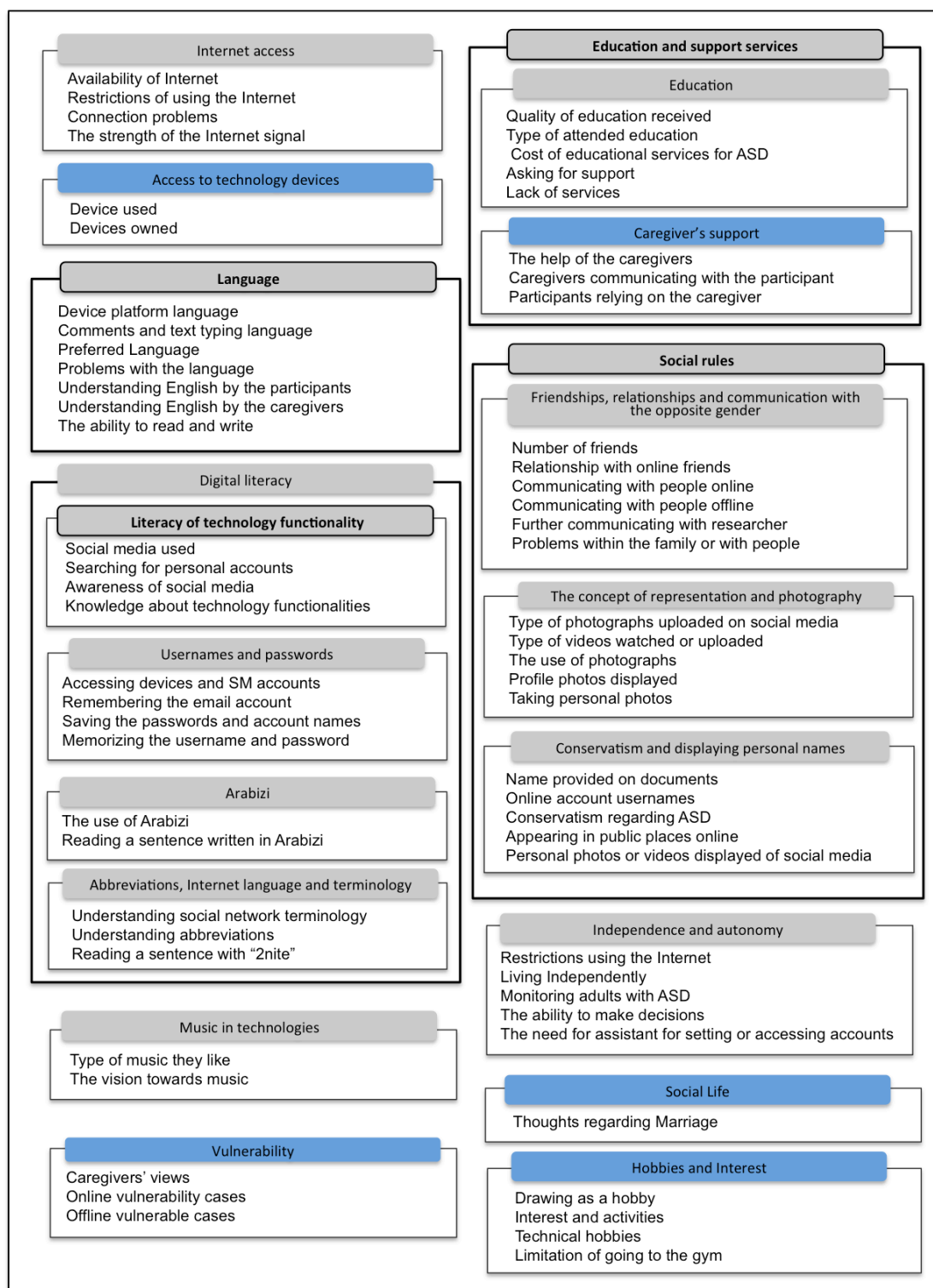


Figure D.4 Final thematic categorisation

Appendix E Content Analysis

Table E.1 Internet access (Content analysis)

Factor	Participant	Tracking example	Connection problems during the interview	Connection availability at home	Mobile connection problems	Restrictions of using the Internet	Inability to connect to the wifi network
Internet Access	P1	Researcher: can I check the Internet, cause this Wi-Fi connection is weak	1				
		P: only iPad the apple, very low P: it does not have Internet		1			
	P2	<i>"The internet signal was not very good"</i>	1				
		P: need to connect to the Internet Researcher: ok. Can you connect to the Internet? Try this one. The password is: ***** Caregiver: its wrong <i>"He tried many attempts"</i>					1
	P3	P: no, I don't have it on my			1		

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		mobile when I go out.					
		Researcher: but here in this part of the house its not good? P: yes		1			
		P: I will go upstairs to do it	1				
	P4	Researcher: these are your friends? It is not clear cause the Internet is not very good.	1				
	Pb5	Researcher: there is no Internet here, But.. P: no, Internet	1				
		Researcher: is there wireless network in the center? Caregiver: I never tried it, everyone is using their own mobile data if we needed		1			
		Caregiver: ask your sister if you can create an Instagram Researcher: can you text her now? P: she is at university. She is busy. She does			1		

		not have Internet.					
	Pb10	P: I don't think the Internet gets here	1				
		P: wait, I think the Internet doesn't work very well when you're down here. wait wait its working now.		1			
	Pb12	Researcher: the Internet is not working here very well. "I even have my device"	1				
	Pb13	Caregiver: first we gave him the mobile, but he over used it. But when I controlled it, and I specified the time, he is now following my rules.				1	
Total			7	5	2	1	1

Table E.2 Access to technology devices (Content analysis)

Factor	Participant	Tracking example	No devices owned	Restrictions on using the devices
Access to technology devices	P1	<p>Researcher: so doe he have an iPad now?</p> <p>Caregiver: no, he has some problems. I will tell you later</p> <p>P: I have an apple iPad <i>(he said Apple in Arabic then he said 'Apple; in English)</i></p> <p>Caregiver: your sister did not take it from you?</p>	1	
	Pb13	<p>Researcher: so is it once a week?</p> <p>Caregiver: almost, no like two days.</p> <p>Researcher: the weekend</p> <p>Caregiver: yes</p>		1
Total			1	1

Table E.3 Language (Content analysis)

Factor	Participant	Tracking example	Limited reading and writing literacy	Problems with typing and pronunciation	Difficulties with Arabic language	Difficulties with English vocabulary	Limited English abilities
Language	P1	P: what is "omniyat" in English? How can I type it?					1
	P2	P: lipaly from, choose from lipaly <i>"he meant library"</i>					1
	P4	<p>P: let me see. Letsa, letsa com coming comingcat.</p> <p><i>"he was trying to read lets communicate"</i></p>					1

	Pb5	Researcher: can you read this: <i>"a given example"</i> . P: I do not know how to read it correctly					1
	Pb9	Researcher: is it in Spanish? Caregiver: English. <i>"when the caregiver was asked regarding the language of an app, which was not in English"</i>					1
	Pb10	P: not really, I don't like Facebook, I don't know how to spell very well. I am sort of "dylexial" <i>she means "dyslexia"</i> . I guess I don't like "belling" <i>she means "spelling"</i> , I bell ok but I guess I need some help, to remember the letter and how to pronounce. I got an English teacher so I got better, but still you know, I don't like when people see me.		1			
		P: I do understand Arabic, I have problems writing it. Its kind of confusing for			1		

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		me.					
		P: can I ask you a question? What does this mean? P: this is a tragedy game, like you are a prime minister or like a mayor				1	
	Pb13	Caregiver: sometimes he even writes messages mashallah, Arabic, with Indian with things you don't really know what he is writing... I feel sorry for him. He wants to be like us. I always feel disappointed by the teachers.	1				1
Total			1	1	1		6

Table E.4 **Digital literacy (Content analysis)**

Factor	Participant	Tracking example	Literacy of technology functionality	Understanding terminologies or abbreviations	Arabizi	Lack of digital support
Digital Literacy	P1	Researcher: I don't have Google. I have safari. They always look for Google. You can search using Safari P: does it work	1			

		properly?				
		Researcher: do you know what an email is? P: no, wallah	1			
	P2	Researcher: do you know what "tag" means? P: tag (he pronounced it Tog)		1		
		Researcher: didn't you say your email is **** **** (first and last names). Here you just wrote **** (first name). should we change it? Without a space.	1			
		Researcher: do you have your friends Facebook names? Is it written in English or Arabic on Facebook? P: English Me: do you know how to search for them? P: in Arabic	1			
	P3	P: al, a, al 7			1	
		P: 'like' means the same. What does it mean?		1		
	P4	Researcher: do you know what is 'Wall'? On Facebook. 'Timeline' ? P: what is Wall and this?		1		

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	Pb5	Me: do you take selfies? P: what is this?		1		
		Researcher: You you know what 'like' is? P: what?				
		Researcher: do you know how to find your name on WhatsApp?	1			
		Researcher: do you know how to create an email? P: I do not know the email; I did not have a laptop	1			
	Pb6	Caregiver: they used to teach him on a computer only on the word, but not more advanced programs.				1
	Pb10	P: how i'm I suppose to read it! ke ke Kf seven ala, K K, what the heck is that.			1	
		P: yes I am a teenager of course. 'Oh My Globe'. Researcher: What is this one (OMG)? P: Oh My Globe.		1		
	Pb12	Caregiver: I don't have a problem Arabic or English, but is there is or not, honestly I haven't				1

		looked.				
	Pb13	<p>Researcher: ok, can you find your self from here? Are you one of these?</p> <p><i>"he was searching for his account on Facebook"</i></p> <p>P: write my name</p>	1			
		<p>Caregiver: someone from a mobile shop did it for him.</p> <p><i>"downloading and creating an account on social media"</i></p>	1			
Total			8	5	2	2

Table E.5 Digital literacy (usernames and passwords) (Content analysis)

Factor	Participant	Tracking example	Inability to access personal accounts	Inability to retrieve the password	Remembering Login information
Usernames and passwords	P2	<p>Researcher: didn't you say your email is **** * (first and last names). Here you just wrote **** (first name). Should we change it? Without a spaces?!</p>	1	1	1
		<p>P: I opened Facebook, the the the information entered are incorrect.</p>	1		1
	P3	<p>Researcher: when you want to open your email do you memories it? Or is it saved?</p> <p>P: it is saved</p>			1

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	Pb10	P: its always open by itself. I do close it and open and always it's open. P: I don't remember very well. I have a memory loss. I blame my grandma.			1
	Pb13	Caregiver: we couldn't find the account	1		1
		Researcher: ok, you write your email. Do you know your email? P: no, I don't know	1	1	1
Total			4	2	6

Table E.6 **Education and support services (Content analysis)**

Factor	Participant	Tracking example	Poor quality of education	Lack of services for ASD	High cost of education or services
Education and Support Services	Pb6	Caregiver: I would like to ask you for a favor please? If you know any school or center for adults with Autism but in Saudi, please let me know.		1	
		Caregiver: currently at home, a private teacher to teach him Quran			
		Caregiver: there are also other extra expenses, not only the school fees.			1
	Pb7	Caregiver: he stopped for a year. afterwards we started taking him to private centres. Researcher: is there private centres who accept 16 year or older? Caregiver: yes, but not good.	1	1	
	Pb8	Caregiver: The expenses are high and difficult to manage			1
		Caregiver: currently home education		1	

	Pb9	Caregiver: There is still other expense other than the one which is covered. Some people need some supplements. Also you need some tools at home and this is also expensive.			1
		Caregiver: yes of course, there is only one public "Jeddah Autism Centre. King Abdullah before he dies he ordered building three more, so hopefully.		1	
		Caregiver: we have a problem in the diagnosis system.		1	
	Pb11	They don't have anything, no services, even a gym we couldn't find one who can accept him.		1	
		Caregiver: I went twice to Dubai for him			
		Caregiver: The expenses are high, but I can manage it			1
	Pb13	Especially here in Makkah. We do not have any services here and we need it. So what should we do like I quit my job and move to Jeddah!		1	
		So if he was aware enough like a person in his age, who is responsible for his case??			
		Even if he is a Saudi or not a Saudi, who is responsible?!			
		Caregiver: the third one. I have other sons two who should be married soon and I cannot cover everything.			1
		Caregiver: first he was first grade, then in the middle of the year they upgraded him to second grade. In two years they took him out elementary school. In two years they will take him out of primary school. They don't teach him anything. I am very disappointed	1		
Total			2	7	5

Table E.7 **Caregiver's support (Content analysis)**

Factor	Participant	Tracking example	Limited technology consideration by the caregivers	Assistance Limitations	Online communication between the caregiver and the participant
Caregiver's Support	P1	Caregiver: I am doing this for him. I am really busy with my research.		1	
	P2	Caregiver: he didn't used to use Facebook, its my first time seeing him using it.			1
	Pb6	Caregiver: ok we will see and download some apps for him.	1		
	Pb9	Caregiver: ABC autismo (and she showed my trying letting her daughter play) Me: is it in Spanish? Caregiver: English.		1	
	Pb10	P: my mom don't know English, she is not very bright		1	
	Pb11	Caregiver: you know, you just made me realise that we haven't taught him these things. Like he needs to learn the thing first to be able to use it.	1		
	Pb12	Researcher: so have you even thought of downloading any autism apps and communication for him to use? Caregiver: no we	1		

		never thought about it. I don't think there are any apps for him.			
	Pb13	Researcher: ok, do you know his name on Instagram exactly? Caregiver: not really			1
Total			3	2	2

Table E.8 **Social rules (Content analysis)**

Factor	Participant	Tracking example	Limited number of friends	Restrictions with online contact	Conservatism in displaying personal names and reputation concerns	Conservatism in displaying personal photos
Social rules	P1	Researcher: then you can talk with your friends. Do you have friends? Researcher: no one? Not even your teacher "the caregiver" ? P: my teacher, I know him very well.	1			
	P2	Researcher: you have friends on Facebook, right? How many? do you remember? P: three	1			
		Researcher: so does he have his cousins? Caregiver: no Researcher: no Caregiver: like I don't know. I only want who I can trust that they will give him something.		1		

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		<i>The mother asked him only to write the first name and middle name but not the family name.</i>			1	
		<i>Does not post any personal photos online</i>				1
	Pb10	<p>Researcher: so do you have friends? P: I only have one friend Researcher: at school? P: yes</p> <p>P: yes, I am very lonely P: you don't know my life</p>	1			
	Pb12	Caregiver: now after the media and stuff it has become more common. But if the individual is a girl the people get embarrassed if they said she has Autism for her future and her sister's future, like this family has something in there genes.			1	
	Pb13	<p>Researcher: does he have friends? Caregiver: no, only at school Researcher: so the other 5</p> <p>Caregiver: They are six students and 1 each one has a different special need.</p>	1			
Total			4	1	2	1

Table E.9 **Independence and autonomy (Content analysis)**

Factor	Participant	Tracking example	The need for permission	Need for assistance for online tasks and accessing SM	Depending and relying on the caregivers
Independence and autonomy	P1	Caregiver: you will do an email for him, not use my email?			1
		Caregiver: yes, I will download it to make an account for him. I don't have one.		1	
		Caregiver: can I download Instagram on my iPad if you created it			
	P2	Caregiver: That's why we added Whatsapp so we can chat.		1	
	P3	Researcher: ok, can you find my name and add me? Researcher: where can you find the name? P: I don't know. My older sister did it for me		1	
		P: mum, tell her about the marathon.			1
		Researcher: ok, can you find my name and add me? Researcher: where can I find the name? P: I don't know.		1	

Appendices

		My older sister did it for me			
	Pb5	P: I will have to ask my mother first Caregiver: ask your sister if you can create an Instagram Researcher: can you text her now? P: she is at university. She is busy. She does not have Internet.	1		
	Pb6	Researcher: does he write anything? Caregiver: he asks what he want to watch and we play it for him.		1	
	Pb7	Caregiver: and he even asks when he wants to see something specific, like if now he wants to listen to a specific song he asks for it and we play it for him.		1	
	Pb9	Caregiver: no, only if we opened it for her.		1	
	Pb10	Researcher: If I want to speak to you how can I speak to you? P: I don't know call my mom			1
	Pb11	Caregiver: The mobile is in his room. <i>"Explaining what he said"</i> Caregiver: I should teach			1

		him again how to take pictures			
	Pb13	Caregiver: his stepfather is the one who goes with him everywhere			1
		Caregiver: He is telling you, go to the mobile shop, he will put the email and password and then it can work. He is trying to describe how you can make it work.		1	
		<p>Researcher: only call? This is video, you can see also</p> <p>P: no ...</p> <p>Caregiver: he is afraid of me cause ...</p> <p>P: no, there is a camera</p> <p>Researcher: so is it once a week?</p> <p>Caregiver: almost, no like two days.</p> <p>Researcher: the weekend</p> <p>Caregiver: yes</p>	1		
Total			2	8	5

Table E.10 **Independence and autonomy-2 (Content Analysis)**

Factor	Participant	Tracking example	Saving Login information	Need Assistant to login
Independence and autonomy	P1	Caregiver: I can ask one of my daughters to help him		1
	P2	P: I cant remember Researcher: ok, can you open your email? Researcher: I opened the email Researcher: not from Facebook Researcher: yes without spaces, delete the space. Ok yes complete now. No spaces. Delete the spaces, type @		1
	P3	P: it is saved	1	
		Researcher: ok, now if you logged out of Snapchat, can you access it again? Or do you need your sister? P: I need my sister		1
	Pb10	P: its always open by itself. I go close it and open and always it's open.	1	
	Pb13	Caregiver: the emails, because they are many, we write them on a paper incase we forgot them	1	
		Researcher: you can write that you forgot your password, but it will go to your email, and you don't know your email.		1
Total			3	4

Table E.11 **Vulnerability cases (Content Analysis)**

Participant	Tracking example	Online vulnerable cases	Offline vulnerable cases
P2	Caregiver: eeeh. I do not want him to waste time or let people make fun of him	1	
P3	<i>He is following "Fifty Shades of Grey" on Instagram</i>	1	
Pb10	P: you know when people stare at me when I'm noisy it make me quit nervous P: Only were out in this depression life and the or under suicide		1
Pb11	Caregiver: It is difficult in this country to make people understand their situation and help, the society. These people do not have rights, even though it should be the opposite. It's the minimum of our duties. Maybe because when they see my son, they wouldn't believe that he has a disability.		1
Pb13	They are six students and each one has a different special need. Caregiver: Each one wants to hit and bully the other.		1
	P: wallah uncle look the pictures. A lady picture. In the mobile there are photos Caregiver: what did we say about this?? Its not polite P: no, no, no Caregiver: he is saying its not polite to do these things so he wont get a women in the photos.	1	
		3	3

Appendix F Survey Addressed to Adults with ASD



Accessibility toolbar

UNIVERSITY OF
Southampton

استبانة لدراسة استخدام مواقع التواصل الاجتماعي من قِبَل الأشخاص ذوي التوحد أو متلازمة أسبرجر

يقوم هذا البحث بدراسة استخدام شبكات التواصل الاجتماعي من قبل العرب ذوي التوحد أو متلازمة أسبرجر، وكذلك مدى تأثير العوامل الثقافية عليهم في استخدام مواقع التواصل الاجتماعي. الهدف من تعبئة هذه الاستبانة هو التعرف على بعض الخصائص التي تفيد في استكمال هذا البحث. إذا كنت شخصياً لديك توحد أو متلازمة أسبرجر وعمرك ١٦ سنة أو أكبر يُرجى تعبئة الاستبانة التالية، علماً بأن ذلك يساهم في خدمة أبحاث فئة التوحد في العالم العربي

تعبئة الاستبانة يستغرق حوالي ١٠ دقائق

إذا كان لديك استفسار الرجاء التواصل معي على

email: a.mashat@soton.ac.uk

Twitter: @AlaaMashat

شكراً لكم على المشاركة

الاستبانة تتكون من ٣ صفحات

الرجاء الضغط على المربع الصغير ومن ثم الضغط على (اضغط هنا لبدء الأسئلة) لبدء الاستبانة

☐ Please tick (check) this box to indicate that you consent to taking part in this survey الرجاء وضع علامة صح للموافقة على المشاركة في هذه الاستبانة

[اضغط هنا لبدء الأسئلة](#)

استبانة لدراسة استخدام مواقع التواصل الاجتماعي من قِبَل الأشخاص ذوي التوحد
أو متلازمة أسبرجر

الصفحة الأولى

أين مكان إقامتك؟

البلد

المدينة

ما هو جنسك؟

☐ أنثى

☐ ذكر

كم عمرك؟

مع من تسكن؟

☐ بمفردي

☐ مع أهلي

☐ مع زوجي/ زوجتي وأطفالي

☐ مع أصدقائي

☐ أخرى

ما هو وضعك الحالي؟

☐ طالب/ طالبة في المدرسة

☐ طالب/ طالبة في الكلية أو الجامعة

☐ موظف/ موظفة

☐ في المنزل

☐ طالب/طالبة في مركز متخصص بالتوحد

☐ أخرى

من أي شبكة تستطيع الدخول على الانترنت؟

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ في المنزل
- ☐ في العمل
- ☐ في الجامعة أو المدرسة
- ☐ عن طريق الجوال في أي وقت
- ☐ في المركز
- ☐ أخرى

ماهي الأجهزة التي تمتلكها؟

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ جهاز كمبيوتر مكتبي (PC) Desktop
- ☐ جهاز كمبيوتر محمول -لاب توب Lap top
- ☐ أي باد - لوحة ذكية (eg: iPad, galaxy tab) Tablet
- ☐ أي فون - هاتف ذكي (eg: iPhone, samsung galaxy phones) Smartphone
- ☐ أي بود iPod
- ☐ لا أمتلك أي من هذه الأجهزة
- ☐ أخرى

Appendices

الرجاء اختيار كل شبكات التواصل الإجتماعي التي تستخدمها

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ Facebook فيس بوك
- ☐ Twitter تويتر
- ☐ Instagram انستجرام
- ☐ Snapchat سناب شات
- ☐ Whatsapp واتس اب
- ☐ Tumblr تمبلر
- ☐ YouTube يوتيوب
- ☐ Path باث
- ☐ Google+ غوغل بلس
- ☐ Skype سكايب
- ☐ LinkedIn لينكد إن
- ☐ أخرى
- ☐ لا استخدم شبكات التواصل الإجتماعي

من بين الشبكات أو المواقع التي قمت بإختيارها، ما هي أفضل شبكة تواصل إجتماعي تفضل استخدامها

لماذا تفضل هذا الموقع؟

الصفحة الثانية

مع من تتواصل عبر شبكات التواصل الاجتماعي؟

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ مع أهلي وأصدقائي
- ☐ مع زملاء المدرسة أو العمل
- ☐ مع أشخاص لا أعرفهم شخصياً
- ☐ أخرى

كم عدد أصدقائك تقريباً على شبكة التواصل الاجتماعي التي تستخدمها غالباً؟

- ☐ أقل من ١٠
- ☐ ١٠ - ٥٠
- ☐ ٥١ - ٩٩
- ☐ ١٠٠ - ٥٠٠
- ☐ أكثر من ٥٠٠

بالنسبة لحسابك على موقع التواصل الاجتماعي الذي تستخدمه غالباً، من يستطيع رؤية حسابك؟

- ☐ قائمة الأصدقاء
- ☐ عام لجميع الناس
- ☐ بعض الأشخاص فقط من قائمة الأصدقاء

ما هو معدل استخدامك لشبكات التواصل الاجتماعي؟

- ☐ مره الى مرتين اسبوعياً
- ☐ من ٣ الى ٤ مرات اسبوعياً
- ☐ يومياً

Appendices

كيف تقوم بالدخول على حسابك في مواقع التواصل الاجتماعي؟

- ☐ أتذكر اسم المستخدم وكلمة المرور
- ☐ أكتب اسم المستخدم وكلمة السر على ورقة
- ☐ أقوم بتسجيل اسم المستخدم وكلمة السر في الموقع لأتمكن من فتحه بدون ادخال كلمة السر في كل مره
- ☐ أقوم بطلب المساعدة من شخص من العائلة
- ☐ أخرى

هل تقوم بإضافة أو إرسال صور على مواقع التواصل الإجتماعي؟

- ☐ نعم
- ☐ لا

هل تقوم بإضافة أو إرسال مقاطع فيديو على مواقع التواصل الإجتماعي؟

- ☐ نعم
- ☐ لا

ما هو عدد الصور أو الفيديوهات التي تضيفها على شبكات التواصل الإجتماعي؟

- ☐ نادراً ما اقوم بإضافة صورة او فيديو
- ☐ ١ - ٢ اضافات يومياً
- ☐ ٣ - ٥ اضافات يومياً
- ☐ اكثر من ٥ اضافات يومياً

كيف تصف استخدامك لشبكات التواصل الاجتماعي؟

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ دردشة مع الأهل والأصدقاء
- ☐ محادثة صوتية أو تصويرية مع الأهل أو الأصدقاء
- ☐ للبحث عن أصدقاء
- ☐ التواصل مع أشخاص جدد لديهم نفس اهتماماتي
- ☐ للبحث عن معلومات مفيدة
- ☐ مشاركة الصور أو الفيديو هات
- ☐ مشاركة المعلومات
- ☐ إضافة تعليق أو الإعجاب بالصور
- ☐ تقديم عمل يبرز شخصيتي
- ☐ المشاركة في مجموعات مفيدة للتعلم وتبادل الخبرات
- ☐ استخدامة لكسب الشهرة
- ☐ لاستخدام الألعاب
- ☐ لتصفح ومشاهدة حسابات الآخرين فقط
- ☐ أخرى

بالنسبة لاسم المستخدم على مواقع التواصل الاجتماعي، ماذا الاسم الذي تفضل استخدامه؟

- ☐ اسمك الحقيقي واسم العائلة
- ☐ اسم مستعار
- ☐ اسم آخر

الرجاء اختيار سبب عدم ذكر اسمك الحقيقي

(ملاحظة: يمكنك اختيار أكثر من إجابة)

- ☐ التحفظ على اسمي واسم العائلة
- ☐ لاختفاء هويتي
- ☐ أسباب أخرى

هل تضع صورتك الشخصية على موقع التواصل الاجتماعي أو أي موقع عبر الانترنت؟

- ☐ نعم
- ☐ لا

الصفحة الثالثة

Question 1.

ما هي اللغة التي تفضل استخدامها عند كتابة تعليق أو الدردشة على وسائل التواصل الإجتماعي؟

- ☐ اللغة الانجليزية
- ☐ اللغة العربية
- ☐ عربي وانجليزي
- ☐ عربي (كتابة كلام عربي بحروف انجليزية)

Question 2.

الرجاء اختيار الجملة المطابقة للجملة التالية

Kol 3am o antom b5eer

- ☐ كل سنة وانت طيب
- ☐ كل عام وانتم بخير
- ☐ دمت على خير
- ☐ أخرى
- ☐ لا أعلم

Question 3.

هل قمت بطلب المساعدة لاستكمال هذا الاستبيان؟

- ☐ نعم
- ☐ لا

Question 4.

إذا كان لديك أي تعليق إضافي الرجاء كتابته هنا

Question 5.

بعد الانتهاء من الاستبيان الرجاء الضغط على الزر الأخضر

إتمام

أو Save and Finish

ولنتمكن من التواصل معك وافادتك بما يخص البحث يمكنك ادخال معلوماتك، مع العلم ان معلوماتك سوف تكون سرية

الاسم

الايمل

رقم الجوال

Survey Progress

Start



Finish

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[إتمام](#)

Once this button is pressed you will not be able edit your responses