# Perceived Risk Factors of Using Digital and Social Media in the General and Dental Professional Contexts

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# Perceived Risk Factors of Using Digital and Social Media in the General and Dental Professional Contexts

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# Dedication

***This thesis is dedicated to my parents, who gave me everything and continuously seem to find a way to provide more.***

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All praise is due to ***Allah***, by whose honour and majesty this work has been accomplished.

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*Rayan Mansour Sharka*
*07/03/2022*

# Research Abstract


## Background

Digital and social media (DSM) have been transforming the landscape of society, business and education. However, since the rapid growth in DSM uptake, there is a lack of in-depth understanding of its perceived risks amongst dental students and dental professionals. Perceived risks are a crucial factor in DSM uptake in the e-commerce context; but whether this is true in the dental professional context has not been investigated fully.

## Aim

This PhD research aims to identify and analyse the perceived risk factors of using DSM in the general and dental professional contexts, to provide a better explanation of the uptake of these technologies within the dental profession.

## Methods

An exploratory sequential mixed methods was adopted in two complementary studies conducted at the Faculty of Dentistry, Oral & Craniofacial Sciences (FoDOCS), King's College London, in the UK. Study 1 (the qualitative study) involved 21 semi-structured interviews with N=10 dental professionals and N=11 dental students in undergraduate and postgraduate programmes. The participants were recruited using a purposive sampling technique. The interviews were audio-recorded and transcribed verbatim. The interviews were analysed and categorised using a thematic framework analysis. Data from Study 1 provided preliminary risk themes, and results from this study were then utilised to inform the development of the Study 2 questionnaire, and to further validate the identified risk factors. The risk factor questionnaire was developed, piloted and validated, and then administered to undergraduate and postgraduate dental students, and dental professionals: N=188, N=51 and N=62, respectively. The responses were analysed using the Exploratory

Factor Analysis (EFA) method, and Cronbach's α-coefficient reliability test to determine the internal consistency of the extracted factors. The overall mean scores for the derived factors were calculated to indicate the salient factors. Also, the differences of perceived risk factor scores between groups, based on their education level, were compared using a Kruskal-Wallis test.

**Results**

Nine perceived risk themes were identified in Study 1. Six themes were related to the use of DSM specific to the dental professional context (e.g., breaching patient confidentiality – which concerned the challenge of withdrawing patient information once it had been uploaded on DSM). Three themes were relevant for all users of DSM in the general context (e.g., privacy risk, which pertained to the challenges of protecting and managing personal information on DSM).

From nine perceived risk factors in total, EFA in Study 2 extracted eight perceived risk factors with an acceptable Cronbach's α of 0.9. The resulting risk factors were refined and re-categorised (e.g., the questionnaire items for two factors, identified previously as social and psychological risks, were loaded into one factor and labelled as negative impact on self-image). The comparison of DSM risk factors between undergraduate, postgraduate students and dental professionals' groups indicates significant differences in some risk factors, one of which is the negative impact on self-image ($P$ values $<0.05$).

**Conclusion:**

This research provides evidence that helps to understand and validate the perceived risk factors of DSM. The studies show that there are risks associated with all DSM users in the general context, but that some perceived risks are specific to the dental professional context. In addition, the results indicate higher agreement ratings for risks pertaining to

ethical and professionalism issues, such as disclosure of patients' confidential information, and sharing deceptive information related to dental and oral health. Further investigations are required to assess the effect of these risk factors on the DSM uptake.

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# List of Abbreviations

The following list describes abbreviations and acronyms used throughout the thesis.

**ANOVA:** Analysis of Variance

**BDM RESC:** Biomedical Sciences, Dentistry, Medicine and Natural & Mathematical Sciences

**BDS:** Bachelor of Dental Surgery

**COVID-19:** Coronavirus Disease 2019

**DSM:** Digital and Social Media

**EFA:** Exploratory Factor Analysis

**FoDOCS**: Faculty of Dentistry, Oral & Craniofacial Sciences

**FtP:** Fitness to Practice

**GDC:** General Dental Council

**HIPAA:** Health Insurance Portability and Accountability Act

**KCL:** King's College London

**MSA:** Measure of Sampling Adequacy

**PIS:** Participant Information Sheet

**SPSS:** Statistical Package for the Social Sciences

**TAM:** Technology Acceptance Model

**UK:** United Kingdom

**US**: United States

# 1 Chapter One: The Research Problem and its Background

## 1.1 Background to the Research and Statement of the Problem

Digital and social media (DSM) are defined as a group of internet-based and mobile applications that enable people to obtain information, create and exchange user-generated content; the term also refers to the associated digital technologies adopted in this creation and exchange. This definition has been adopted and modified in this PhD research, based on the definition of social media by Kaplan and Haenlein (2010).

A review of the literature shows that there is currently no agreement on the definitions used to describe social media (Carr & Hayes, 2015). Thus, multiple developing definitions have been proposed in previous research. For example, Lewis (2009) used "digital technologies" as an umbrella term to encompass social media. In particular, she described social media as a "label for digital technologies that allow people to connect, interact, produce and share content" (p. 2). Similarly, Hoffman et al. (2013) pointed out that social media are not simply the software applications, but also the digital equipment that facilitate communications: "The set of web-based and mobile tools and applications that allow people to create (consume) content that can be consumed (created) by others and which enables and facilitates connections" (p. 29). These definitions, which refer to digital technologies that accentuate user-generated content and information interchange, make sense.

With the continuous development of technological devices (including but not limited to smartphones, tablet devices, sensors, and location settings), social media platforms' uses have changed; this has vast implications for the associated digital technologies. Such rapid digital development has impacted how users' access and interact through social media. In

addition to boosting accessibility, it also affects how those platforms operate through digital applications (i.e., apps); sometimes without requiring a web browser. One of the distinctive components of DSM is that users are as crucial as the content they upload and share, and such content is indexed or connected to the user's personal profile. Thus, the blending of general and professional uses on DSM is common.

Moreover, DSM offer numerous modes for sharing digital contents. Users can represent themselves in videos, photos, audio, or using a fusion of various components, rather than text alone; these digital formats of manifestation greatly facilitate diffusion and interaction (e.g., commenting, liking, sharing). Based on the above discussion, there are various types of DSM where users can create and exchange information. These include a range of social networks platforms (e.g., Facebook, Twitter and Instagram), instant messaging apps (e.g., WhatsApp, WeChat), and video conferencing platforms (e.g., Zoom, MS Teams), which are accessed through user technologies such as smartphones, tablets and computer devices. These DSM have played a pivotal role in transforming the landscape of society, business, communication and education.

In recent years, DSM have become an almost integral part of most users' personal and professional lives, with a current 4.20 billion DSM users globally (Global Overview Report, 2021). In the UK, in 2021, more than two-thirds (78%) of the total population are active DSM users. Furthermore, the average amount of time per day spent using DSM is almost two hours (Global Overview Report, 2021). The past decade has seen the fast integration of DSM in many aspects. For instance, there has been growing recognition of the importance of DSM not only for social networking, but also for amplifying customer relationships in business and marketing, enhancing communication between government and citizens, accelerating query and complaint resolution, and delivering education and

knowledge (Khan et al., 2014; Wang & Kim, 2017; Istanbulluoglu, 2017; Chugh & Ruhi, 2018).

The recent trends of using DSM among the general population, as in the examples mentioned above, have led to a proliferation of studies that investigate DSM use amongst dental students and professionals. Evidence from the UK suggests that dental students and dental professionals use DSM extensively, with more than 90% of dental students and 70% of qualified dental professionals reporting that they use DSM both for the general and the dental professional context. Usage within the general context may involve interacting with friends, colleagues, and family members to maintain social and friendship ties, for posting photos of social events, and looking for entertainment to fulfil the leisure demand (Arnett et al., 2014; Kenny & Johnson, 2016; Parmar et al., 2018; Dobson et al., 2019). Furthermore, in recent years, there has been a surge of interest in using DSM within the dental professional context, which may include the following: utilising DSM to support online and blended learning by disseminating teaching materials and distributing educational resources (Alshiekhly et al., 2015; Naguib et al., 2018; Nguyen et al., 2021); facilitating professional communication between faculty members and students (Gonzalez & Gadbury-Amyot, 2016; Poblete & Nieto, 2020); and as a resource to promote dental practice services, share oral health information with the community, and increase patient awareness (Snyman and Visser, 2014; Parmar et al., 2018).

However, although the uptake of DSM is encountering fast growth amongst dental students and dental professionals in their general and dental professional contexts, it is not clear which factors are affecting the uptake. Perceived risk theory, which has its roots in the e-commerce literature, can be an integral part of developing a better and more comprehensive explanation for DSM uptake amongst dental students and dental

professionals (Featherman & Pavlou, 2003; Khan et al., 2014). Also, despite the considerable benefits and advantages of DSM use mentioned above, it seems that dental students and professionals need to be cautious about integrating DSM, as there are some concerns and uncertainty regarding the adoption of DSM, especially in the dental professional context (Spallek et al., 2015a; Bhola & Hellyer, 2016).

It is hoped that this research will offer a better understanding, categorisation and analysis of DSM risk perceptions specific to dental students and dental professionals, as recommended by previous researches (Oakley & Spallek, 2012; Spallek et al., 2015a).

## 1.2 Research Aim, Questions and Objectives

This research aims to identify and analyse how dental students and dental professionals perceive the risks of using DSM in the general and dental professional contexts that may help explain possible reasons for differences in its uptake.

The main research questions are:

1. What are the perceived risks of DSM use that can be identified amongst dental students and dental professionals?
2. Are the identified risks associated specifically with their use in the professional context and/or general context?
3. What are the underlying factors of perceived risks related to DSM use amongst dental students and dental professionals?
4. Which types of perceived risks of DSM use are salient to dental students and dental professionals?
5. To what extent do dental students and dental professionals differ in their agreement regarding the identified DSM perceived risk factors?

To achieve the above aim and to answer the research questions, the research objectives are as follows:

- Review previous literature that identifies perceived risks in general and the dental professional contexts.
- Conduct interviews to identify perceived risks of using DSM, exemplified by dental students and professionals.
- Develop and administer a questionnaire to analyse the perceived risk factors.
- Assess the salient perceived risk factors and the differences in perception of risks between dental students and dental professionals.

The following working hypotheses are investigated:

- The risk perceptions associated with DSM use are different between the general and professional contexts in dentistry.
- There are certain DSM perceived risk factors that can be identified as more salient amongst particular dental groups.

## 1.3 Research Design

Figure 1. 1 below for quick reference. The detailed methods of the studies and their corresponding justification are described in Chapter Three. As an overview, Figure 1. 1 shows:

- The literature review, to identify DSM use pertaining to the general and dental professional context and perceived risks, from previous empirical research.
- Study 1, to identify risks and understand the characterisations of these risks, which are investigated in a questionnaire to collect more generalisable responses about DSM perceived risk.

- Study 2, to refine the DSM risk factors identified in the previous study, and to establish salient factors amongst dental students and dental professionals.
- Overall, to relate the findings of Study 1 and Study 2 to previous literature, regarding how dental students and dental professionals perceived the risks of using DSM in the general and professional context.

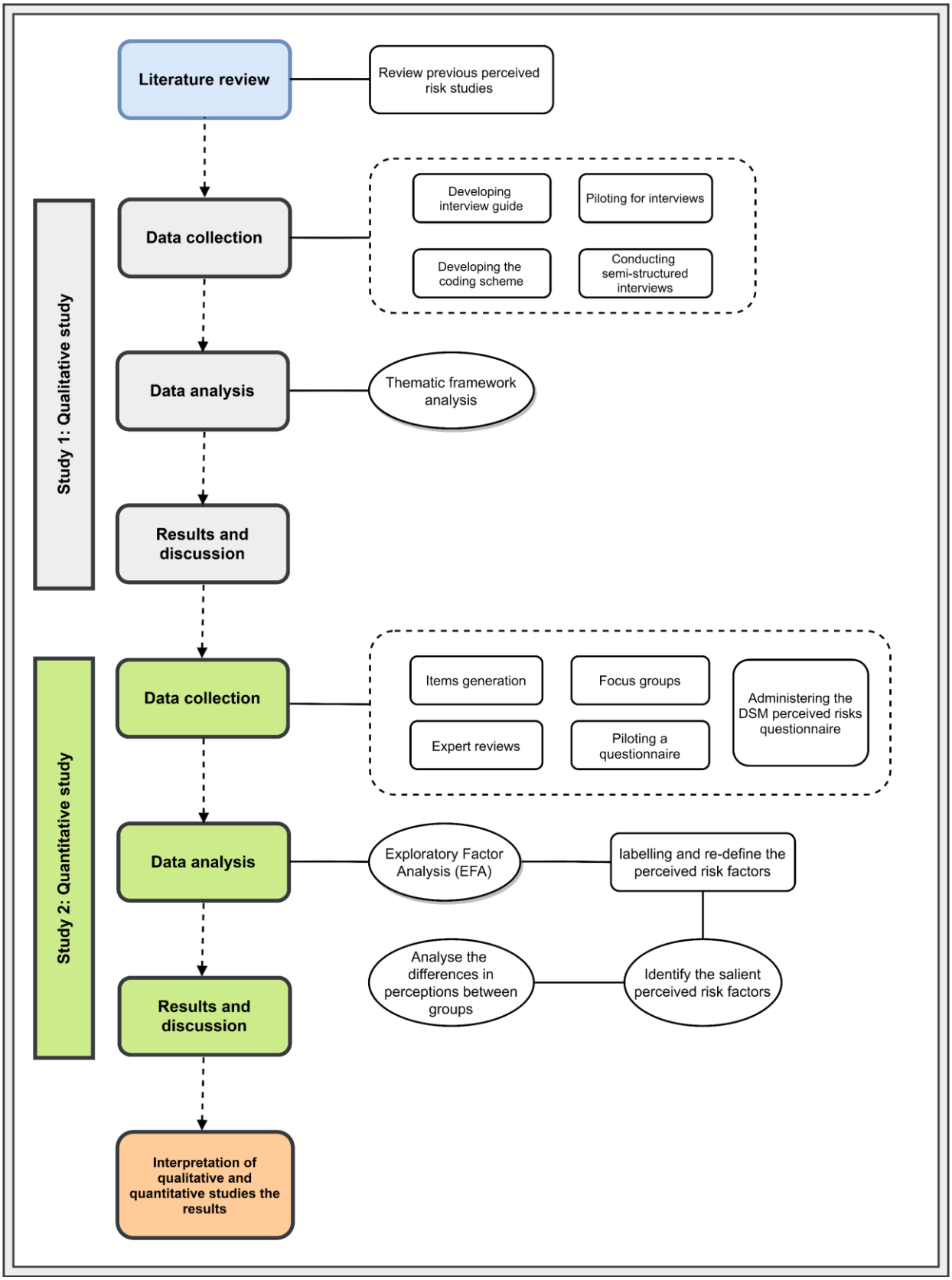


Figure 1. 1 The Research Design

## 1.4 Theoretical Framework

Risk as a theory was initially introduced into the field of marketing research by Bauer (1967). This has been linked to marketing research studies that investigate consumers' behaviour, and how certain perceived risk factors are supposed to influence their decisions in purchasing products. Risk has formally been defined as "a combination of uncertainty plus seriousness of outcome involved" (Bauer, 1967).

With the advent of the internet and online services in the past two decades, scholars have been interested in understanding perceived risk factors that affect the uptake of such technologies in the e-commerce context. One of the most popular theoretical models of perceived risk was proposed by Featherman and Pavlou (2003); they described the perceived risk of using online services as a user's subjective expectations or thoughts of potential losses when deciding to complete online purchases. In their empirical study, they proposed multi-dimensional perceived risk factors that have a potential influence on the uptake of online purchases.

However, although the perceived risk factors derived from Featherman and Pavlou (2003) were adopted and redefined to fit into several research contexts, such as online banking (Lee, 2009), internet government services (Bélanger & Carter, 2008), and public social media services (Khan et al., 2014), they do not entirely reflect the risk perceptions of DSM use in dentistry, amongst dental students and dental professionals.

Evidence from dental literature reveals that dental students and dental professionals used DSM for their general and professional lives, as well as bounded by governing bodies' guidelines (Neville & Waylen, 2015; Spallek et al., 2015a). Also, dental students and dental professionals could adopt DSM in ways that are different from the public, in the e-

commerce context (Parmar et al., 2018; Aboalshamat et al., 2019; Dobson et al., 2019; Rajeh et al., 2020). Therefore, additional perceived risks, differences and similarities related to their use might be identified. The theoretical framework underpinning this research considers perceived risks in their broader sense, by including all theorised factors in the e-commerce literature, and extending that approach to fill this gap and provide a better theoretical understanding of DSM perceived risks in dentistry (Figure 1. 2).

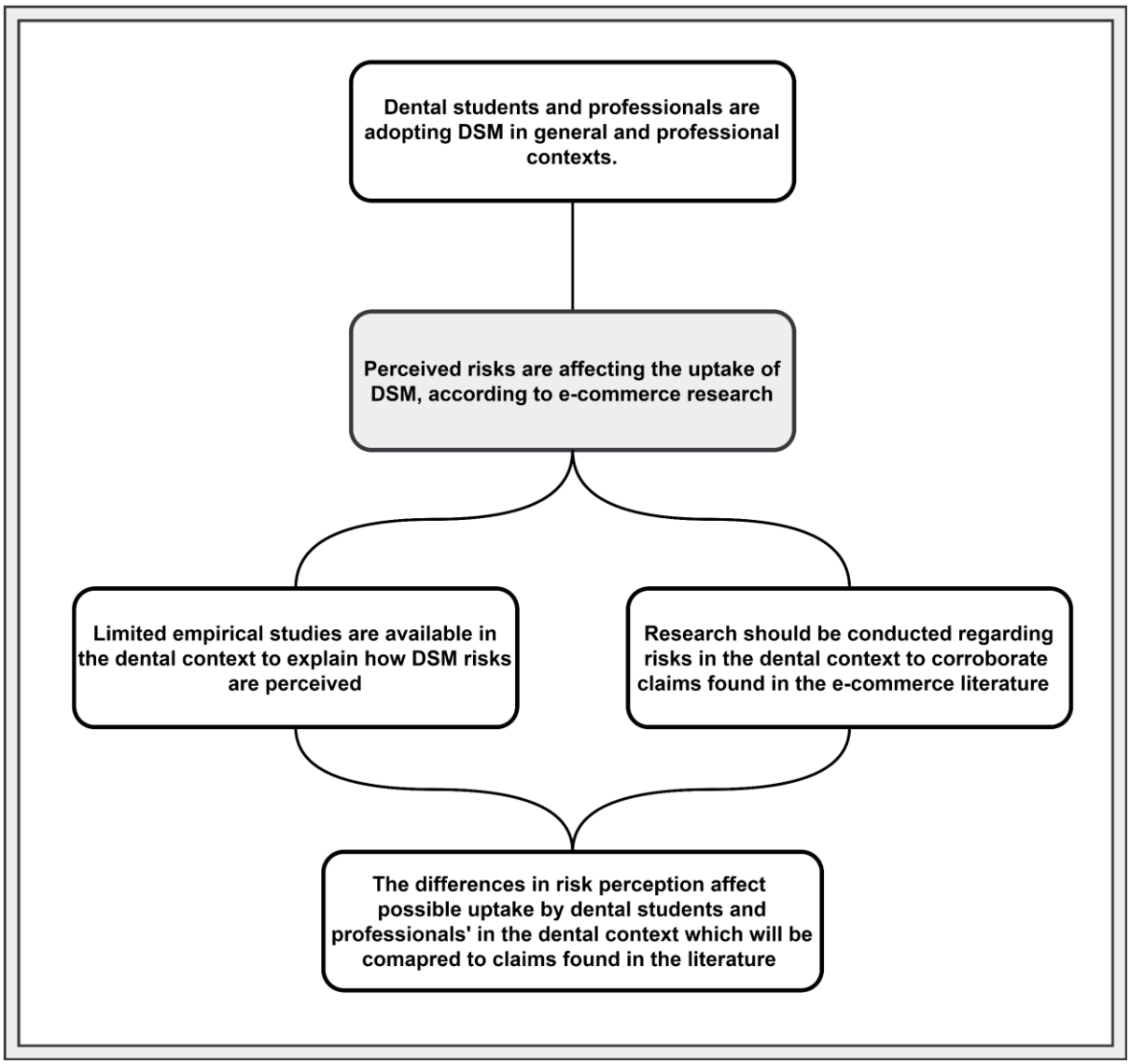


Figure 1. 2 Theoretical framework of the research.

## 1.5 The Scope of the Research

A crucial aspect influencing the design of this research was the coincidental COVID-19 pandemic that occurred during data collection. The research started in October 2018; the aim, objectives, research questions and hypotheses were formulated based on what was understood from the literature at that time. Thus, the research was designed and planned before COVID-19 happened: specifically, the Study 1 (the qualitative study) interviews were conducted between 22 May and 27 November 2019. The Study 2 (the quantitative study) questionnaires were administered during national lockdown, between 1 June and 29 August 2020.

The pandemic led to a complete suspension of university and faculty on-site educational activities, including at the dental school, except for some urgent and emergency dental care. This unprecedented situation forced KCL and other educational organisations in the United Kingdom to move rapidly to adopt DSM and digital technologies for online and distance learning. As recently highlighted in numerous editorials, commentary articles and empirical studies, dental educators and students had to devise new, innovative ways of ensuring the continuity of knowledge dissemination – based principally on utilising online platforms to deliver curricula modules and maintain the education for dental students (Liu et al., 2020; Quinn et al., 2020).

Such a sudden shift to the use of digital technologies and the DSM experience may have affected or biased dental students' and dental professionals' responses to the questionnaire items. It can be argued that certain factors might have affected DSM risk perceptions, because the study period was affected by the COVID-19 pandemic. However, it is beyond the scope of this research to investigate the impact of COVID-19 on the use of DSM or measure the pandemic's effect on the perceived risks of DSM at different time points; this

might warrant further research. The discussion of the impact of COVID-19 on the interpretation of DSM perceived risks, as identified in this research, will be highlighted in Chapter Seven.

## 1.6 Thesis Outline

This thesis is composed of seven chapters, as follows:

- Chapter One explains the background of this research; it begins with an introduction to DSM use by dental students and dental professionals and provides a statement of problem. Also, it presents the research aims, objectives, central research questions, the research design. Subsequently, it concludes by presenting the scope of the research and an outline of the thesis.
- Chapter Two commences with a brief explanation of DSM definition. Then, as this research adopted the perceived risks of using online services to analyse the results, this chapter reviews its relevant literature. It presents a literature review of the existing empirical studies on the topic of perceived risks with a thorough review of the types of risks perceived by people in general, towards using DSM in the e-commerce context; these include online services for marketing, digital banking services, and recently in DSM. It also defines and summarises the identified perceived risks. Next, it presents the existing literature on a specific range of risks associated with DSM use by dental students and dental professionals and discusses the potential differences between groups in dentistry. A summary and description of the explored risks is given. Also, justification for using the perceived risk theory is presented, which describes its suitability for this research. This chapter ends by highlighting what is missing in the literature, and synthesising all perceived risks identified from the existing literature.

- Chapter Three outlines the methods utilised, and the research design employed in this research; it also discusses the rationale for choosing such methods and procedures. It also describes in detail the data collection procedures for Study 1 (the qualitative study), developing and piloting the questionnaire, and conducting Study 2 (the quantitative study), and illustrates all their practical steps, to provide a clear understanding of the methods used in this research.
- Chapter Four presents the results of Study 1. This chapter explicitly explains and defines the DSM perceived risk themes that emerged from semi-structured interviews and categorises them according to the use of DSM in the general and dental professional context. It further presents an in-depth discussion of each identified theme.
- Chapter Five presents the results of Study 2. This chapter validates the perceived risks presented in Chapter Four and introduces a reliable and valid measure of DSM perceived risks for dental students and dental professionals. It also discusses how the validated perceived risks differed from the perceived risks identified in previous studies, presented in Chapter Two.
- Chapter Six presents the salient perceived risks, as assessed by dental students and dental professionals. It also describes how dental students differ from dental professionals in their perceptions of DSM risks. The chapter ends by interpreting the results and explaining the contrasts and similarities, in light of the existing studies.
- Chapter Seven discusses and draws upon the overall thesis results, and the in-depth interpretation of dental students and dental professionals' perceived risks regarding using DSM in the general and dental professional contexts. Then, it concludes by highlighting the research limitations and summarising the various implications for

dental education and policymakers, principal conclusions, recommendations for future research.

## 1.7 Chapter Summary

In this chapter, the definition of DSM was introduced, and brief data on DSM use have been presented. The unique benefits that DSM can offer to dental students and professionals have been highlighted. However, there is still a lack of understanding regarding the uptake of DSM in the dental professional context. Next, the research aims, objectives and questions were outlined. This chapter can be summarised in the following paragraphs, as follows:

- DSM could provide a ubiquitous opportunity for dental students and professionals to create a learning environment, and to advance professional communication. Also, it affords a worthy means to promote dental practices and connections with patients. However, the uptake for this is somewhat limited.
- Perceived risks can play a significant role in explaining the uptake of DSM in the dental professional context. However, there is a lack of evidence, and few studies with empirical results indicate what types of risks dental students and dental professionals perceive when using DSM.
- It is crucial to identify and recognise the perceived risks, in order to provide a better understanding of the DSM uptake and inform education and training. This will advance DSM implementation in dentistry, which is the central concern of this research.

# 2 Chapter Two: Literature Review

## 2.1 Introduction

The previous chapter presented the background of this research and the prevalence of DSM usage amongst dental students and dental professionals. It also stated the primary aim of conducting this research, which is to identify and analyse dental students' and dental professionals' perceived risks of using DSM in the general and dental professional contexts. It is therefore considered imperative to commence this chapter by providing a brief understanding of DSM definitions. Also, this chapter provides a critical narrative review of the existing literature on the DSM perceived risks topic. This approach helped to identify DSM risks from previous empirical studies known from the e-commerce context, including online shopping services, online banking services and social media. Also, it established a basis for determining the types of risks that are being perceived by the public and shed light on the existing formulated definitions of perceived risk factors. Moreover, it presents a critical review of the existing studies in the dental literature, to identify previous research on potential risks that influenced the uptake of DSM among dental students and professionals. Also, the potential differences in perceptions of risks that are specific to dentistry will be highlighted. Furthermore, this chapter will end with a section summarising the gaps identified in the literature.

## 2.2 Literature Review Approach

A critical narrative literature review using a tabular matrix was carried out to identify DSM perceived risks from previous studies in the e-commerce context. Other aims of the review were to highlight areas of DSM risk in the literature on this topic in dentistry and to flag up gaps in the literature.

A literature search was conducted using the databases PubMed and Google Scholar, with an agreed set of search terms (e.g., “digital media”, “social media”, “perceived risks”, “risks”, “online services”, “dentistry”, “dentist”, “dental student”, “dental education”), focusing on studies published between 2001 and December 2021. Articles were included if they discussed the risks of DSM in the broad sense of online services, including online shopping services, online banking services and DSM, specifically in dentistry. Articles were excluded if they did not focus on DSM risks or if they were not published in English. References in the papers found were also searched for additional articles. At the end of each of the following sections, there is presented a tabular matrix which summarises the key DSM risks that emerged from the literature search.

The approach adopted for conducting the literature review had limitations; mainly, the review was not systematic and did not include dissertations, conference abstracts, or grey literature. This may have resulted in the review missing articles. However, the empirical studies included in this chapter provided a comprehensive overview of the DSM risks identified in the existing literature from the e-commerce context, including online shopping services, online banking services and social media. Moreover, the studies established a basis for determining the types of risks that are being perceived by the dental students and professionals, whilst they also shed light on the existing formulated definitions of perceived risk factors. It is expected that there will not be many other DSM risks left unidentified.

## 2.3 General Use of DSM and the Associated Perceived Risks: Evidence from the E-commerce Literature

There has been a rapid diffusion of DSM in the social and general life of people. According to Khan et al. (2014), individuals utilise DSM to create new connections,

encounter old companions, and strengthen social ties in day-to-day life. Moreover, DSM allow users to share and attain information about their issues and topics of interest. Due to this benefit, DSM can, for instance, be an excellent medium for obtaining feedback and complaints from citizens, regarding government actions in the public sector. This can produce beneficial information for governments and is used to enhance government services (Khan et al., 2014). Additionally, DSM provides a supplemental channel for businesses and shoppers to share product information, amplify advertisements, and potentially facilitate the purchasing process and expand product selection (Bashir et al., 2021). Along with the above general uses, various other functions have also been noted by researchers, such as accelerating customers' query and complaint resolution (Wang & Kim, 2017) and providing a virtual entertainment community and enjoyment (Whiting & Williams, 2013). In this literature review section, empirical studies on perceived risks in the e-commerce context are critically reviewed. Because the concept of perceived risk in this context is well defined and has been studied extensively, this maximises the comparability of the results and provides a basic knowledge of potential risks that affect DSM use. Furthermore, most of the risks identified in the e-commerce studies are not unique to this specific context; for example, privacy risks can arise from browsing conventional internet sites and using social media platforms. Such risks now also occur through the use of DSM, as explained by previous studies, such as Khan et al. (2014) and Munnukka and Järvi (2014). With this in mind, this section reviews the factors of perceived risks that apply to the e-commerce context, and then summarises and categorises the key perceived risks that could be relevant to using DSM in the dental profession.

One of the well-established perceived risk categorisations, which is applied across different disciplines and presented in the e-commerce literature, was proposed by Featherman and Pavlou (2003). This perceived risk model was selected as a preferred theoretical lens in the

current research due to its appropriateness to the project's aim, i.e., to identify and analyse risks pertaining to dental students and professionals. Furthermore, the examined risks were adopted and redefined to fit into several research contexts, such as online banking (Lee, 2009), internet government services (Bélanger & Carter, 2008), and public social media services (Khan et al., 2014). However, it is assumed that these risks do not entirely reflect the perceptions of DSM use in dentistry amongst dental students and dental professionals. Further, additional perceived risks, differences and similarities related to DSM uses might be identified.

Additionally, articles discussing a wide range of specific potential risks of DSM pertinent to the dental context were based on commentaries and review opinions that lacked empirical evidence to support their risk assumptions (e.g. Spallek et al., 2015, Bhola and Hellyer, 2016; de Peralta et al., 2019).

Featherman and Pavlou (2003) conducted an empirical study to identify the most salient perceived risks that affect the acceptance of using online shopping services; this gave business organisations a comprehensive guide to planning risk-reducing strategies and increasing service adoption. The authors developed a survey that combined specific risk factors with the Technology Acceptance Model (TAM) items. In their conceptual development stage, they proposed the following hypothesis: perceived risk comprises the factors of performance, financial, time, social, psychological, and privacy factors, as potential risks that affect the acceptance of internet services. Featherman and Pavlou (2003) distributed a survey to two samples of undergraduate business students in two sequential stages in a US university. The factor analysis for first sample provided an excellent model, and the factor loadings presented were fit and supported the proposed hypothesis. However, the social risk items attributed to online services adoption were

neither significant nor important and were dropped from the second analysis. The findings from the second sample showed that the time, privacy, performance, and financial perceived risks were salient and had a significant influence on internet service adoption, but the psychological risk was not a significant concern. Although this empirical study offers a primary glimpse of the risk perceptions affecting the adoption of internet services and their associated technologies, the defined risks were specific to online services and business-context research.

In the same vein, Forsythe et al. (2006) designed and validated a survey to measure the perceived risks and benefits of online shopping. In their study, they employed a mixed-method approach including qualitative and quantitative phases. They identified and examined three perceived factors associated explicitly with purchasing products through online services (i.e., financial, product quality, and time/convenience risks). After conducting a preliminary qualitative inquiry and developing the survey items, they distributed the survey to a national sample of online shoppers (N=960), to initially purify the items. The results from the first sample were analysed in terms of internal consistency, exploratory factor analysis and confirmatory factor analysis. Then, the authors validated the survey items with a new sample of online customers (N=598). The findings presented three perceived risk factors associated explicitly with purchasing products through online services: financial, product quality, and time/convenience risks. Forsythe et al.'s study (2006) captured a wide variety of explanations for why people decide not to purchase online through a digital medium and showed how they were influenced by different risk factors relevant to digital technologies. However, this study was designed mainly for online shopping; therefore, the risks identified must be applied with caution to other contexts.

Similarly, according to Hong and Cha (2013), using digital media as a mode of purchasing produces risks, because transactions are conducted remotely, involving no face-to-face contact between seller and customer. Their empirical study investigated the relationship between perceived risks and intention to purchase, by examining the mediating role of consumer trust in such associations. They examined six perceived risk aspects: financial, performance, psychological, social, delivery, and online payment. The survey was distributed online to undergraduate students at a university in Korea. The results showed that performance, psychological, financial and online payment risks negatively influenced the intention to purchase; in more specific, the authors also found that performance and psychological risk had a negative and significant impact on trust.

Owing to these efforts to examine perceived risks in e-commerce, several researchers have used the established models and categorisations of perceived risks in online shopping, and utilised them in online banking empirical studies. Especially with the fast growth of internet applications, online banking has become an imperative component of the e-payment sector, which implements an online transaction platform to support various e-commerce applications. However, many customers resist adopting such services due to risk perceptions. For example, Aldás-Manzano et al. (2009) investigated how perceived risks could influence online banking adoption, by administering an online survey collected from 511 internet banking users in Spain. In their empirical research, they employed five perceived risks as variables – privacy, performance, security, time, and social risks – which had a negative effect on use of online banking services. Their results evidence the key role of user perceived risks in the adoption of internet banking. The risks perceived to have the most prominent effect in internet banking adoption were security and performance concerns. By contrast, other risk perceptions, such as privacy and social risk, were less

relevant, and time loss risk was a definitely an irrelevant risk for users. Lee (2009) and Lifen Zhao et al. (2008) found comparable results.

It can be observed from the above studies that the perceived risk factors were focused on using digital media in services such as banking and shopping. However, some of these studies were conducted nearly two decades ago, before the advent of popular DSM, and it is difficult to apply these risks to the recent developments in DSM use. Therefore, with the emergence of social media platforms, many studies became interested in identifying and examining the risk factors applicable to social media use in several contexts (e.g., Khan et al., 2014; Munnukka & Järvi, 2014). Munnukka & Jarvi (2013) believed that the perceptions of risk strongly influence the adoption and use of social media for organisational marketing. In their study, they investigated the principal risks that businesses perceived when using social media in their marketing and communication and examined the practical strategies (procedural control and proactive focusing) for reducing these risks. Structured interviews were conducted with 147 representatives of business organisations. The results showed that approximately 97% of the organisations had experience with social media, while 41% used sharing sites such as Facebook, YouTube and LinkedIn), and 38% employed content production and publication services (Wikis, podcasts and blogs). The findings from the analyses revealed that time and functional risks significantly impacted the organisation's use of social media, whereas the psychological and financial risks did not play a significant role.

Taking into account the perceived risks identified from the empirical studies presented in this section, it is possible to summarise a group of the main perceived risks from the perspective of the e-commerce and online services context. These perceived risks will be described in the following paragraphs.

***Privacy***

Following the perceived risk factors proposed by Featherman and Pavlou (2003), this factor was defined as the possibility of losing personal and sensitive information, such as when details of users are given or revealed without their permission.

Other definitions and characterisations of this factor have been introduced more recently by other researchers in the social media context. Khan et al. (2014) described the privacy factor as identity fraud, or the possibility of revealing personal information to third parties without the user's approval. Their questionnaire included items such as "*I am not comfortable with giving personal information on social networks sites*" and "*I feel that the privacy of my personal information is not protected by social networks sites.*"

The researchers in internet banking have used the same above definition to describe "security" risk, because online banking users are more concerned about the digital system's ability to protect their sensitive information, such as card numbers and bank account details, when performing digital transactions (Lifen Zhao et al., 2008; Lee, 2009; Aldás-Manzano et al., 2009).

In DSM, the speculation around privacy has become more accentuated because users are required to provide their personal information in order to join or use any form of DSM. Moreover, sharing information online in the form of photos and videos has become a norm of DSM use, which raises additional privacy threats such as phishing, tracking and hacking (Baccarella et al., 2018). For example, uploading data containing information regarding the user's location, devices, and use of other websites which have integrated social media services, can be tracked and disclosed to other third parties (Orekondy et al., 2017).

***Time***

This perceived risk factor may refer to losing time due to making a wrong purchasing decision, or by navigating through disorganised or complicated websites, as well as potential delays in accepting payments or responding to queries (Featherman & Pavlou, 2003; Lee, 2009; Aldás-Manzano et al., 2009).

However, the definition of time risk in the social media context has been extended to include the risk of consuming and wasting time due to engaging in the activities that DSM platforms provide. Khan et al. (2014) described this factor as the risk of consuming time in socialising and browsing social media platforms, which have a negative effect on the user's productivity, especially during working time.

According to statistical figures presented in Chapter One, people spend an average of more than two hours per day on social media (Global Digital Overview, 2021). Based on recent empirical studies, this excessive time spent on DSM can become a sign of addiction to use; Turel et al. (2018) acknowledged this as a state in which the individual is overly interested about being active on social media, is motivated by an uncontrollable impulse to perform the behaviour, and dedicates much time and effort to it, so that it intervenes in various pertinent life areas. In several recent empirical studies, a similar factor called "screen time" has been used to examine the association between the amount of time that users devote to DSM, and negative consequences on health (Hrafnkelsdottir et al., 2018; Barthorpe et al., 2020).

***Social***

This risk factor is defined as the possibility of objection and criticism from users' relatives, colleagues and friends, due to the use of internet services (Featherman & Pavlou, 2003). According to Khan et al. (2014), in addition to the previous definition, social risk in the social media context can be explained as the state of spending more time socialising and

communicating online than engaging with people face to face, which leads to missing out on a social life. Colleagues and relatives who disregard social media may perceive users less favourably. Scales items used in previous studies (e.g., Featherman & Pavlou, 2003: Khan et al., 2014) involved statements such as "*Using social networks sites will negatively affect the way others think of me*" and "*My signing up and using social networks sites would lead to a social loss for me because my friends and colleagues would think less highly of me*". Similar factors have been utilised in perceived risk studies of online banking services (Lifen Zhao et al., 2008; Aldás-Manzano et al., 2009; Kansal, 2016). These extended the characterisation of the factor and added other perspectives, as people have different attitudes towards adopting online services for banking, and some people are clearly not in favour of using such digital services. Furthermore, other people may lack the skills required to use online services, so they ignore the users (Aldás-Manzano et al., 2009).

***Psychological***

This type of perceived risk is described as the customer's negative effect on self-perception or peace of mind, due to performing inappropriate purchasing or buying an unsuitable product using online services (Featherman & Pavlou, 2003; Hassan et al., 2006). According to Khan et al. (2014), using social media could affect self-esteem due to the negative comments that users might receive when sharing and posting information. Such adverse feedback results in low self-esteem and has a negative influence on peace of mind. In both scales, the authors used self-concept and self-image to represent the psychological risk such as "*Social networks sites will not fit in well with my self-image or self-concept.*" Kircaburun (2016) also identified a relevant factor for social media use problems, which

they called “self-esteem”, and defined as a positive or negative attitude towards oneself due to using social media.

***Performance***

This perceived risk factor in the e-commerce context has a significant influence on the adoption of online services. It may refer to the potential concern about how well the product/service will function relative to expectations (Khedmatgozar & Shahnazi, 2018). Consumers are afraid of a malfunction of digital system servers or disruption on the internet while carrying out online transactions, because such circumstances may result in unanticipated losses (Aldás-Manzano et al., 2009; Lee, 2009). Similarly, Featherman and Pavlou (2003) defined this factor as the potential presence of a defect or malfunction in the product, different from how it was promoted. Also, they extended the characterisation of this factor to include items about the possibility of poorly performing e-services generating problems with the purchasing and payment process.

In the social media context, the performance risk was not included in Khan et al.’s scale (2014). This might be because they thought that social media does not pose any perils in performance, as perceived by public users. Similarly, Munnukka and Järvi (2014) applied a factor called “functional risk” as an alternative to performance risk. They incorporated statements concerning social media’s effectiveness in delivering the intended marketing communication, and the capacity of social media features to accomplish the indicated tasks such as “*Uncertainty about the technical quality of marketing communication in social media*” and “*Uncertainty about reaching the objectives set for the marketing communication in social media*”.

***Financial***

This perceived risk factor can be explained as the potential financial loss due to personal account misuse or transaction errors (Lee, 2009). This could include the possibility of identity fraud while using e-services, which leads to financial loss (Featherman & Pavlou, 2003). According to Littler and Melanthiou (2006), many customers are worried about losing money while conducting digital banking transactions or transferring money using online services. In addition, users may struggle in asking for compensation when transaction failures happen (Khedmatgozar & Shahnazi, 2018).

This factor was also examined by Munnukka and Järvi (2014), in research associated with using social media in marketing. They showed that the expenses invested in advertising, and the uncertainty of using social media to achieve the intended organisational marketing goals, could lead to financial risk. Moreover, this factor might overlap with the previously discussed privacy risk factor, as both factors could lead to financial loss. However, privacy risk may be more associated with the service providers' ability to protect the users' data and raising their awareness of using DSM safely.

See Table 2. 1 for a summary of the perceived risk factors' definition, based on the e-commerce literature.

Table 2. 1 The definition of the main perceived risks from e-commerce literature.

| Perceived risks | Definition | Evidence from literature |
|---|---|---|
| **Privacy risk** | The potential of breaching or lack of control over the release of personal information to unauthorised third parties without users' permission.<br>The possibility of losing sensitive information due to fraud or hackers' (criminals) intrusions. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Lifen Zhao et al., 2008; Lee, 2009; Aldás-Manzano et al., 2009; Hong & Cha, 2013; Khan et al., 2014; Nepomuceno et al., 2014; Orekondy et al., 2017; Baccarella et al., 2018) |
| **Performance risk** | The possibility that the product bought using online services might not function or perform as expected, and consequently will not achieve the desired advantages. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Khan et al., 2014; Nepomuceno et al., 2014; Munnukka & Järvi, 2014; Khedmatgozar & Shahnazi, 2018) |
| **Social risk** | The possibility of disapproval from users' family or colleagues due to using online services.<br>The potential for reducing face-to-face social interactions as a result of adopting online services. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Aldás-Manzano et al., 2009; Hong & Cha, 2013; Khan et al., 2014; Kansal, 2016; Khedmatgozar & Shahnazi, 2018) |
| **Time risk** | The potential loss of time when browsing and engaging in a variety of interactions and exploring features of DSM, which may affect an individual's productivity.<br>The potential loss of time through making a wrong purchasing decision, by wasting time navigating and making the purchase, or possible delays in digital services such as the refund process or query response. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Khan et al., 2014; Nepomuceno et al., 2014; Khedmatgozar & Shahnazi, 2018; Hrafnkelsdottir et al., 2018; Turel et al., 2018; Barthorpe et al., 2020) |

| Perceived risks | Definition | Evidence from literature |
|---|---|---|
| **Psychological risk** | The potential adverse influence on feelings and peace of mind, as well as anxiety about the loss of self-esteem and self-image due to using online services. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Khan et al., 2014; Kircaburun et al., 2019) |
| **Financial risk** | The potential commercial expense associated with the use of online services, as well as the subsequent support and maintenance charges. Also, the potential financial loss due to phishing or fraud. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Khedmatgozar & Shahnazi, 2018; Munnukka & Järvi, 2014; Nepomuceno et al., 2014) |

***Summary of Section 2.3***

This section has indicated that perceived risk is a multi-factor, complex and dynamic concept. It is shown that the evidence in e-commerce literature has been structured around the above six key perceived risk factors, which have been revisited and examined across several digital media applications; see Table 2. 1. However, some points need to be considered, as follows:

- These perceived risks were identified and tested among a specific sample: for instance, undergraduate business students in Featherman and Pavlou's study (2003), and employers in the public sector in Khan et al.'s research (2014). These results may be difficult to generalise beyond those specific samples and research contexts.
- These perceived risk factors were developed initially and examined to investigate consumers' perceptions of information technology and online services in the e-commerce context. These risks differed from study to study and from context to context; this makes the operationalisation of the research instrument challenging and may affect the scale's validity to examine perceptions accurately in other specific contexts (i.e., this research context: using DSM in the dental profession).
- Most previous perceived risk studies utilised the quantitative method, in the form of questionnaire scales, to examine the effect of these risk perceptions. However, the qualitative method using in-depth interviews could provide a better understanding and identify additional potential risk perceptions that are specific to the research context studied.

## 2.4 Uses Associated with Dentistry and Corresponding Perceived Risks

As reported in Chapter One, empirical studies have shown that dental students and dental professionals use DSM as a means of entertainment, social communication and engagement (Arnett et al., 2013, 2014; Dobson et al., 2019; Rajeh et al., 2020). A United Kingdom cross-sectional study, employing paper-and-pen questionnaires among 88 undergraduate dental students, illustrated that approximately more than 80% of participants used social media tools for social connectivity purposes such as chatting to friends and posting photos (Dobson et al., 2019). Similarly, a more recent multi-institutional study conducted in Saudi Arabia, among dental students in undergraduate programmes, found that 81% used social media for fun and entertainment purposes (Rajeh et al., 2020). In another survey study in Saudi Arabia, dental faculty members (N=380) in three public dental schools, 67% of participants used social media for entertainment and making friends (Rajeh et al., 2020). A comparable figure was found in a study conducted among 221 dental faculty members from five US dental schools (Arnett et al., 2013).

These general DSM uses were somewhat similar to usage by the general public, as presented in the previous section (2.3). However, in addition to the above general uses by dental students and dental professionals, DSM demonstrated its utility within a dental professional context. This is due to the functional characteristics of DSM, for creating and sharing educational material – not only in text format, but also in more interactive forms, such as photos and videos, which can be easily watched and retrieved at any time and place. For instance, DSM can be utilised for teaching and learning dentistry, oral healthcare delivery, and marketing purposes; especially when considering its rapid growth and accessibility among patients (Gonzalez & Gadbury-Amyot, 2016; Parmar et al., 2018; Aboalshamat et al., 2019). This extensive use has generated a broad spectrum of new

applications and opened several opportunities in dental education and the professional context.

A systematic review of the dental literature identified seven empirical studies that supported the effectiveness of implementing Twitter in an educational environment, as it enhanced didactic and interactive teaching (van Schaijik et al., 2021). In the same vein, in a cross-sectional study, Gonzalez and Gadbury-Amyot (2016) integrated a combination of DSM platforms (Twitter, Pinterest and a blog website) in an oral and maxillofacial radiology course among second-year undergraduate students (N=45) at the University of Nebraska Medical Centre College of Dentistry in the US. The course director created a Twitter account to interact with students outside lecture time and offered a one-hour question and answer session the day before each quiz and the final examination. During that session, students could prepare and post questions and get a quick answer that all students could view. Additional course materials and discussions about the cases posted on Twitter could be accessed through Pinterest and a website. A questionnaire was used to elicit dental students' perceptions towards adopting these technologies in the dental course. Approximately half of the respondents (49%) stated they enjoyed using Twitter in other dental courses; however, 46% of them preferred not to use Twitter in the classroom for discussion during the lecture. In addition, more than 75% of the students believed that the Twitter session was beneficial, especially in terms of improving accessibility to the instructor. However, although this study showed a positive perception among dental students, it was conducted at one dental school, with a small sample size. Also, the survey was carried out before Twitter reached its prominent popularity, which could have affected dental students' perceptions.

In another cross-sectional study, Alshiekhly et al. (2015) described using Facebook to teach a supplementary course about medical emergencies in dental practice at the dental school in Syria. The administrator created a Facebook group especially for this course. Joining the course was voluntary, and educational contents offered and discussed within the group would not affect students' grades. After completing the course, 388 dental students joined the group; almost all students (97.2%) reported that the Facebook group improved the discussion and connection between the instructors and students. Furthermore, 92.8% favoured the use of digital learning tools in dental education. When comparing dental students' knowledge before and after the course, the scores improved significantly on completion of the course ($P < 0.001$). The study suggested that the integrated use of Facebook, as an example, could be beneficial for educational purposes.

Similarly, Naguib et al. (2018) assessed gender differences among third-year undergraduate dental students' (N=210) perceptions towards incorporating Facebook in a dental biomaterials course at King Abdul Aziz University, Saudi Arabia. At the end of each lecture, educational materials associated with the course were provided in the form of videos, presentations, and assignments, uploaded on the Facebook group by the course director. Overall, approximately 80% of the students preferred to utilise Facebook as a learning tool, and nearly 75% believed that Facebook groups made the course easier to study. It was noted that female students were significantly more pleased to use Facebook for the course than males ($P = 0.009$). Also, they desired to adopt Facebook in other dental courses to a significantly greater extent than males ($P = 0.012$). Although this study reported interesting differences in perceptions between genders, the possible reason for these differences was not clearly explained.

Tsai et al. (2020) evaluated the unique features of some DSM platforms such as Instagram, especially in countries with insufficient resources. They adopted the Instagram Stories feature to deliver a dental diagnosis course to (N=106) senior dental students at Hue University of Medicine and Pharmacy in Vietnam. The educational materials in the form of slides were uploaded as modules on Instagram stories, and all participants were granted access to the Instagram account using their smartphones. The participants were tested before the course to obtain a baseline score, then re-tested after studying the course through Instagram. After studying the posted educational material, dental students presented a significant increase in their test scores ($P < 0.05$). Nearly 67% of the students preferred the Instagram course to conventional lectures, for learning about oral diagnostics. Also, more than 90% of students desired more of their dental courses to be taught using such digital media. Although this study presented an innovative way to deliver dental education, it did not assess the barriers and limitations that might affect the use of such a DSM platform.

Another example of DSM implemented in dental education is Instant Messaging (IM) multimedia applications, such as WhatsApp and WeChat. These apps have become one of the most favoured options for communicating and accomplishing group work, amongst dental students and dental professionals. A qualitative study conducted by Khatoon et al. (2015) interviewed (N=20) dental students and (N=6) dental faculty members at the dental school of Birmingham University in the UK, to explore their views towards using IM in dental education. Students stated that they desired to communicate with their tutors by IM, if feasible in the future. They mentioned some reasons, mainly that IM let them know if their messages had been received, unlike other means such as emails. However, the dental faculty gave mixed views about using IM with their students. They did not prefer the idea of using such technologies, due to privacy concerns and potential violation of professional boundaries. Others preferred face-to-face communication with students, rather than digital

and virtual means. This qualitative study presented valuable views from both groups; in particular, it showed that the dental faculty members anticipated some risks of using DSM in the dental school setting.

In a descriptive study, Santos et al. (2017) used a WhatsApp group to teach oral radiology courses for Year Two undergraduate dental students (N=30) at the Dental School of the University of Brasília in Brazil. After delivering the lecture face to face, the tutor posted a quiz related to the course in a photo format in the WhatsApp group, and students were asked to answer the questions and further discussion about the topic conducted in the group. Also, students utilised the group to ask questions about lectures and the course. At the end of the course, students' satisfaction was assessed using a questionnaire. The responses indicated that students were satisfied with using WhatsApp; they agreed that the questionings resembled the face-to-face content and perceived the WhatsApp group as beneficial.

Furthermore, DSM can help dental practices and dentists to find a voice within digital marketing environments, maximise their online presence, and direct patients to the particular practice team. In a large online survey study in the UK, involving 588 patients and 532 dental practitioners, Parmar et al. (2018) investigated patients' and dentists' attitudes to DSM usage. The majority of dentists and patients reported that they had a Facebook account (77% and 98%, respectively). Approximately more than 80% of dentists revealed that using DSM was a valuable tool to attract new patients. Nearly 70% believed that using DSM for marketing purposes would increase the practice's financial performance. Likewise, 79% of patients agreed that dental practices should have an online presence, and 47% of them admitted that they had visited their dental practice's Facebook page. This study gave an insight into the efficiency of social media for dental

professionals with a special interest in marketing purposes. However, the risk regarding the quality of the promoted contents remains uncertain and underexamined.

Comparable results were found in a cross-sectional study conducted by Aboalshamat et al. (2019) across three dental schools in Saudi Arabia, which included 779 dental students and dental professionals. In this study, nearly 63% believed that using DSM is better than conventional methods for advertising dentistry. Furthermore, overall, 58% agreed that DSM is essential for acquiring new patients and increasing the marketing outcome of dental practices. However, a significant difference was recognised within groups, as 41% of dental professionals disagreed, compared with only 31% of dental students ($P < 0.05$) (Aboalshamat et al., 2019). This study presented valuable results regarding the difference of attitude between dental students and professionals towards using DSM for marketing purposes. However, the results were based on a closed-ended questionnaire, which prevented an in-depth understanding of this difference.

On the other hand, several researchers have recognised some risks and potential challenges associated with DSM use within the dental context. Thus, the following section will present and discuss a review of multiple issues related to what challenges dental students and dental professionals might encounter when using DSM.

***Privacy and time***

In a longitudinal study, Arnett et al. (2014) surveyed 1,162 BDS dental students and dental hygiene students at Loma Linda Dental School, US, in two separate years (2011 and 2013), to investigate their use of DSM. The survey was designed to gauge dental students' perceptions about using DSM in the dental profession, and whether their perceptions about DSM varied from 2011 to 2013. Of all respondents (N=351), 16% mentioned time as the main factor restraining their use of DSM, followed by issues with privacy and not being

interested in interacting with others online (12.8% and 7.1% respectively). Interestingly, although responses towards all restraint factors increased by 2%, the use of DSM also increased between the 2011 and 2013 responses. Although this study presented some preliminary perceptions of dental students' uncertainty regarding DSM, the methodology was based on questionnaires that included very limited items on restraining perceptions. For example, respondents may have had additional perceptions other than those mentioned in the questionnaire. Also, the study did not include a qualitative method to extract further perceptions from responses.

Comparable findings were found in a cross-sectional study conducted by Arnett et al. (2013), among dental professionals. They attempted to capture a snapshot of how dental professionals used DSM applications, and how they perceived barriers to adopting DSM for teaching purposes. They invited 443 dental professionals from four dental schools in the US, and one dental school in Canada, to complete an online survey. Among the (N=221) respondents, the most mentioned reasons for not using DSM were lacking time and having privacy concerns; each of them was chosen by almost 50% of the participants. Other responses, such as uncertainty about the usefulness of DSM, and lack of experience, each gained nearly one-third of the responses. Although this study highlighted some uncertainty about using DSM among dental professionals from multiple dental schools, the responses were based on a self-reported questionnaire, which might have omitted other perceived barriers.

A recent cross-sectional study included 1,034 undergraduate dental students and foundation year trainees at three public dental schools in Saudi Arabia. Rajeh et al. (2020) aimed to measure the perceptions of using DSM as a learning tool in dentistry. Part of the study questionnaire was aimed to evaluate some potential problems of adopting DSM in

dental education. Approximately 20% of respondents believed that using DSM might cause intrusion into their privacy and be time-consuming. The mean scores showed that the salient problems that could hinder them from adopting DSM were the possible time taken, the potential for addictive behaviour, distraction from studying, and having affairs with contacting supervisors through DSM. The strength of this study was the large sample from different dental schools, which supports generalisability. In addition, it partially touched upon some important perceptions that were previously discussed in section 2.2 and could affect DSM use. However, this study neither focused on perceived risks to provide a full picture, nor utilised qualitative methods (i.e., interviews) to obtain more accurate views and thoughts from respondents. Moreover, the part of the questionnaire that concerned the perceived problems was limited to ten items; this could not accurately measure the risk perceptions comprehensively.

It can be noticed that several studies have concerns about the intensive use of DSM and its possible adverse influence on students' performance. In particular, Halboub et al. (2016) conducted a cross-sectional study to examine the impact of DSM on the academic achievement of undergraduate dental students at a university in Saudi Arabia. Of the 348 respondents, more than half (57%) believed that using DSM had a negative impact on their studies, and 65% assumed that their GPA would increase if they reduced their DSM use. Also, the study reported that the number of days dedicated to studying declined when more days were assigned to DSM ($P = 0.002$). Although this study provided new insight into the possible negative impact of using DSM on dental students' academic performance due to being time-consuming, a sound conclusion cannot be extracted from the findings. The use of a questionnaire to elicit participants' responses about their academic performance was based on guessing and recall, which might give inaccurate results.

In the same vein, a scoping review by C. Greer et al. (2019) included 33 articles investigating the conflicting demands dental professionals experience when using DSM. They reported lack of time, lack of knowledge, and privacy concerns as the central conflicts to use DSM for marketing their dental practices. Other problems associated with using DSM for academic purposes mainly consisted of concerns about maintaining professional boundaries, violations of policy, and breaching patient confidentiality.

### *Maintaining appropriate professional relationship*

Building friendships and interactions with people on DSM is one of the primary intentions of using these platforms; whether with present colleagues in offline environments, or for finding new companions who have similar interests. Nevertheless, building a friendship between dental faculty members and their students can be a controversial topic in academic settings. In this context, in a multicentre study, Wyatt et al. (2016) explored dental hygiene faculty members' attitudes and perceptions towards their Facebook interactions with current undergraduate dental hygiene students. Participants were drawn from 33 dental hygiene schools in three US states: New Mexico, Texas and Oklahoma. Among the 94 faculty member respondents, more than two thirds (69%) thought it was improper for dental educators to communicate or interact with their students on Facebook. Also, more than two-thirds stated that the line between faculty members and students became blurred because of Facebook interactions (68%). Furthermore, the majority (78%) believed that they should keep their personal and professional lives separate. These results clearly show that dental educators have concerns about using DSM for academic purposes and communicating with their students, as they think that it could violate professional boundaries.

Another aspect of this issue is the dentist–patient communication through DSM. Unsurprisingly, the rise of DSM has transformed how dental professionals interact with their patients and deliver different types of dental care services. For example, dental practices use Facebook pages, Instagram profiles and blogs in order to promote their practice brand and earn patient referrals (Parmar et al., 2018; Aboalshamat et al., 2019). Parmar et al. (2018) found that 86% of dentists in the UK believed that investing in DSM could improve dental practices' financial performance.

By contrast, Ventola (2014) claimed that healthcare professionals who interact with their patients through DSM platforms might violate the boundary between patients and healthcare professionals, even if patients begin the online communication. In addition, there are comparable viewpoints from other scholars; for instance, Chretien and Kind (2013) indicated that healthcare professionals might also breach a patient's personal boundary through the improper use of information obtained through DSM.

***Compliance with DSM guidelines***

There are various regulations, standards and guidelines that exist in the UK to guide healthcare professionals and dentists' behaviour, and which apply to DSM use. Registered dental professionals are regulated by the General Dental Council (GDC). GDC has a number of standards that reference DSM use, either in the professional context or generally; they also address the privacy and confidentiality of patients, boundaries in the dentist–patient connection, and the duty of dental professionals to report their colleagues when they observe unethical practice, including online breaches of patient confidentiality (GDC, 2013). These standards apply to "a number of internet-based tools including, but not limited to, blogs, internet forums, content communities and social networking sites" (GDC, 2016). Also, specific guidance on advertisements and products endorsement through dental

marketing websites was issued describing how legal and ethical adherence with the GDC regulations could be attained (Raimundo & Robinson, 2014; Budd et al., 2016; Donnell et al., 2021).

The principal reasons for issuing such guidance are to describe dental professionals' obligations to the public and improve the appropriateness and professionalism of DSM use within the dental profession. Such guidelines can be seen as a restraint or a barrier to adopting DSM. However, dental students assume they can turn off their professional identity outside the clinical setting. Studies have shown that students can become detached from the DSM guidelines and fail to comply when they go online, because of a sense of anonymity or a lack of knowledge. In a cross-sectional study conducted at Cardiff Dental School in the UK, Kenny and Johnson (2016) investigated 155 BDS dental students' perceptions regarding their professional behaviours associated with DSM use. More than half (55%) of students indicated that they posted and shared unprofessional contents on DSM, such as pictures of students drinking, and approximately one-third (29%) reported that they posted images of intoxication or sexually suggestive pictures. Moreover, 19% witnessed their colleagues negatively address members of staff or other students in open/public groups. A third reported that they posted dental procedures, and over two thirds (76%) of students had noticed this online. Interestingly, this study showed that students' gender influenced their perceptions of the risky scenarios and statements presented in the questionnaire. For example, females were more inclined to post photos of students at social gatherings ($P < 0.005$) and interact with their patients online ($P < 0.05$) than males. However, while this study presented useful knowledge about dental students' reported behaviours, it was focused on one specific dimension of risk, and examined three cohorts (Year Two to Year Four) of BDS students only. Also, the results relied on a self-reported questionnaire which could limit other important perceptions concerning DSM use.

Another study utilised a mixed-method approach: Knott and Wassif (2018) recruited dental students who had enrolled in a graduate entry BDS curriculum at the University of Central Lancashire (UClan) Dental School in the UK. They aimed to explore if their knowledge and perception of using social media differed from those of students enrolled in the standard BDS programme. Of the 22 participants, approximately half of them (N=9) were unconscious of any published guidelines that they were required to adhere to when using social media. The other participants showed partial knowledge of existing ethics and guidelines. Furthermore, half of the participants raised an issue about the privacy settings of social media. Interview findings indicated that this group of dental students reported their acceptance of friending with patients if they received an invitation, or communicating with patients if there were strict parameters, such as if the digital media platforms were designed for this purpose, or if they knew the patient outside work. Similarly, they reported that interacting with staff and faculty members should be fine in specific circumstances, such as keeping in touch with them, and for learning and research purposes. This study presented an insight into mature dental students' perceptions and knowledge of DSM use. However, this study was based on a small sample and participants were from a single cohort, which could affect the generalisability of the findings.

Dobson et al. (2019) conducted a questionnaire-based study at the Dental School of Bristol University in the UK, to investigate the awareness of GDC guidelines on social media among BDS students in preclinical and clinical years. Eighty-eight dental students were involved, from Year Two and Year Four. There was a statistically significant difference between Years Two and Four regarding their knowledge of the guidelines published by GDC ($P = 0.007$). Furthermore, there was a significant difference between these two groups in terms of unprofessional situations, such as posting photos under the influence of

alcohol online (P = 0.019). This study suggested different perceptions and knowledge between BDS students in preclinical years and those in clinical years. However, this study utilised a self-reported questionnaire, which raised the possibility of subjective bias in responses, as well as the limitation of a small sample size, which could affect the results' generalisability.

In the same vein, Karveleas et al. (2020) conducted a cross-sectional study to examine undergraduate dental students' perceptions about unprofessional contents and student–patient relationships, when using the social networking platform Facebook. Five hundred and twelve BDS students at the Dental School of the University of Athens, in Greece, participated in the study. More than two-thirds (71%) of students stated they had shared photos of their vacations online. Other unprofessional photos of nightclub occasions and unprofessional dressing were reported by 41% and 26% of students respectively, which is similar to Kenny and Johnson's (2016) results. Students in clinical years showed more significant awareness about the legal sanctions associated with Facebook use, compared to preclinical students (P = 0.002). However, the study was based on a closed-ended questionnaire, which could limit the reported perceptions of students. Also, the participants had to remember their experiences to answer the questions, which might represent a potential for recall bias.

Similarly, Leal et al. (2018) conducted an observational study at a private dental teaching institution in Brazil, to investigate the knowledge of undergraduate students in healthcare professions, including medicine and dentistry, regarding the handling of patients' clinical images. More than two-thirds (73%) of students stated that they did not know about any legislation regarding the use of patients' photos. Moreover, 63% obtained verbal approval only from patients, compared with 23% who obtained written permission. The majority of

the students did not disclose to the patient the reason for the photograph and where it would be presented.

A prior study conducted by Nason et al. (2018) was able to access the Facebook profiles of 177 dental students enrolled in different undergraduate programmes (dental hygiene, dental nursing, dental science and dental technology) at the Dental School of Trinity College Dublin in Ireland. Approximately one-third (34%) of profiles showed questionable posts, and a quarter of them (25%) contained inappropriate photos, such as of improper dress and alcohol.

From a different perspective, Shah et al. (2019) carried out an audit study to evaluate dental students' and staff's compliance with GDC guidelines, and university and hospital policies associated with social media use, at Eastman Dental Hospital in the UK. The researchers were able to access 219 Facebook profiles. They assessed the approachability of private information, affiliations to a university/trust, personal views, and online conduct. From the identified profiles, no serious professional misconduct was recognised among dental students and staff, such as violations of patient privacy. However, 6% of profiles displayed some sort of unprofessional behaviour, such as alcohol abuse and inappropriate dress; this finding was in line with Nason et al.'s (2018) study. Although this audit study provided valuable information about how dental students comply with the guidance and apply their knowledge to real-life practice, it was conducted at one specific dental hospital. Also, the possibility of an inaccurate search for students and staff profiles on DSM platforms might have biased the results.

The two above-mentioned studies, by Nason et al. (2018) and Shah et al. (2019), were conducted in dental schools based in the UK, and their results were consistent with studies conducted in other countries. Henry and Molnar (2013) conducted a similar study that

involved all dental students (N=499) from BDS and dental hygiene programmes at the Dental School of Ohio State University in the US. Out of the 239 Facebook profiles accessed and analysed, more than half (60%) had their photograph albums open to the public. Only 6% of these profiles included unprofessional posts such as photos of excessive alcohol consumption.

In a cross-sectional study, Henry and Webb (2014) sent an online survey to deans of the academic affairs of dental colleges in the US. They aimed to determine how they used DSM and evaluated cases of policy violations in their schools. Twenty-six dental schools' deans responded to the survey. Nearly all dental schools (N=23) reported that they applied a code of conduct policy associated with DSM. Thirty-nine percent stated that potential breaches of the Health Insurance Portability and Accountability Act (HIPAA) and patient privacy had happened in their dental schools. Also, they reported that the policy violations were recorded among the dental faculty, staff and students, and there were no associations between having DSM guidelines and breaches of policies on DSM ($P = 0.07$). This study's results are corroborated by findings in other countries, such as by Kenny and Johnson (2016) in the UK and Karveleas et al. (2020) in Greece. However, Henry and Webb's study (2014) was based on closed-ended survey questions, which could include inaccurate responses. Moreover, the study had a small sample size and low response rate, which was inadequate for generalising the findings.

In a retrospective study, Neville (2017) aimed to identify the number of Fitness to Practise (FtP) cases relating to DSM, and the penalties authorised by the General Dental Council (GDC), between 2013 and 2016 in the UK. By accessing the GDC website, it was found that 2.4% (N=6) of the total FtP cases were linked to DSM and investigated by GDC. After reviewing the nature of each case, Facebook was found to be the most common platform

with online violations recorded; this included sharing patient information, publishing abusive and racist comments about colleagues, and inaccurate dental treatment, on a Facebook page. The sanctions for the FtP in those cases ranged between suspension with a 12-month review or a reprimand for 12 months. This study highlighted that with the growing popularity of DSM among dental professionals, there might be a rise in the number of DSM posts related to FtP cases, and non-compliance with guidelines could be a salient perceived risk. This study presented valuable insights into a substantial risk associated with DSM use. However, it was conducted at one point in time, which did not include other cases when the GDC website was updated. Thus, a further longitudinal study could be considered, to give a complete analysis.

Staud and Kearney (2019) studied how online DSM behaviours affect the licensure practices of dental professionals in the US. They sent a survey to the licences' directors board that investigated violations of regulations of the state or the dental board, regarding DSM use and the outcomes of the disciplinary actions executed. The most frequently reported unprofessional behaviour was the online misrepresentation of credentials, then of clinical competencies, followed by improper communication with patients online. The outcomes of disciplinary actions ranged from a letter of reprimand (31%) to an ethics and professionalism refresher course or continuing education (23%), and revocation of licence (8%).

***Patient confidentiality***

Photographs and radiographs of clinical cases are indispensable resources for dental professionals. Such sensitive personal data can be utilised to show a clinical procedure or determine personalised care planning, and for keeping patient records. Disseminating any patient-specific information online is prohibited without explicit consent (GDC, 2016).

A qualitative study by Costa et al. (2020) explored 52 dentists' views of using and sharing digital patients' photos and radiographs on DSM in Brazil. The participants were dentists with more than two years of clinical practice, and who had used DSM for more than ten years. Concerning patients' photos, 46% stated that they had received verbal consent, and 6% said that they had not gained patients' consent to publish their photos on DSM. Furthermore, 75% of dentists reported that they had published photos without identification of patients, and approximately 6% said they had published with facial recognition. Also, approximately 44% believed that consent is not necessary for digital radiographs, and 23% requested verbal consent only. Although this study presented useful preliminary perceptions of using digital patients' photos and radiographs on DSM, further quantitative studies are required to better understand this issue. It is noteworthy that signed consent is crucial in order to use digital patients' photos and radiographs, as this provides a record of the request, and gives patients a comprehensive knowledge of the aim of using their clinical data.

In another study, Martorell et al. (2015) searched the Facebook profiles of dental and medical professionals in Brazil, to identify if they posted their patients' photos online. A total of 39 patients' photos were extracted from their Facebook albums; 27 were posted by dental professionals and 12 by medical practitioners. These identified patients' photos had attracted a total of 310 comments and 800 likes. Of this group of photos, in 11 it was possible to recognise the patient's identity. Also, 15 photographs showed dental professionals' faces, with the potential for identification. This study showed some risky behaviours being conducted by dental professionals, which could break laws and lead to legal consequences; this is in line with an above-mentioned study conducted in the UK (Neville, 2017). However, the searching methodology of this study was not clear and

systematic. Therefore, a deeper understanding is required, by examining the reason for publishing patients' photographs and conducting such behaviours.

### *Additional DSM use concerns from commentaries, editorials and opinion papers*

In a position review paper by Spallek et al. (2015), they described how DSM could reshape dental education, in terms of its utility for teaching purposes. However, they also discussed some risks associated with the use of DSM in the dental school environment, and how dental students could comply with policies of their academic dental institutions. It was highlighted that when dental students interacted on social media during their dental school years, members of the public could access information that is regularly omitted from the patient–healthcare provider relationship; this potentially violated a professional boundary. It was determined that more research is required to address these emerging risks, which might have a negative impact on dental education and the profession.

Some opinion papers and experts' commentaries have discussed other professional aspects of risks associated with DSM use among dental students. For instance, Das et al. (2017) noted two of the main risks: privacy, and validity of study materials. They argued that students prefer to keep their private activities separate from professional life, and also claimed that the information and study materials that dental students circulated and shared on DSM lacked expert reviews, leading to uncertainty about validity. The authors concluded that although DSM is growing in terms of its usage among dental students, there is a knowledge gap in understanding the risks associated with this use, and there are several untapped potential risks that require more research.

Likewise, Bhola and Hellyer (2016) proposed that the quality of information on DSM is dangerous for dental students – especially in their training years, when they form the foundation of their practising years in the future. Although a similar dilemma was

encountered in using conventional online websites, the interactive and sharing facilities of DSM increased the danger of sharing poor information content. In addition to the previous risks, it was claimed that using DSM to post and share inappropriate or possibly unprofessional posts could be damaging to the students'/schools' affiliated institutions and the dental profession.

***Summary of Section 2.4***

This section has attempted to recognise and understand the main DSM risks from the dental literature (Table 2. 2). Some risks overlapped with those previously identified in the e-commerce context, such as time and privacy risks. Others pertain to DSM use in the dental professional context, such as breaching patient confidentiality. This indicates that the factors of perceived risks are different in various contexts. Also, there is still a gap that requires further clarification and development – specifically, the understanding of perceived risk factors still needs to be expanded in the dental profession, due to the following reasons:

- Most previous empirical studies were too specific to investigate dental students' compliance with DSM policies, which can be considered as one of the salient DSM perceived risks among dental students. Although this body of knowledge about dental students' compliance and professionalism is crucial, there are several other risk factors that need to be explored.

- Using DSM in the dental context has a huge and promising potential. However, the previous studies were not aimed or explicitly designed to examine the underlying factors of perceived risks that might hinder DSM adoption.

- The research in this area is relatively new and poorly understood. Moreover, most of previous studies were based on questionnaires. This could perhaps ignore a wide variety of risks that might be uncovered using other research methods, such as interviews.

Table 2. 2 The definition of the main potential perceived risks obtained from the dental literature review.

| Potential perceived risks | Definition | Evidence from literature |
|---|---|---|
| **Privacy** | The possibility of lacking control over personal information. | (Arnett et al., 2013, 2014; Snyman & Visser, 2014; Nelson et al., 2015; Rajeh et al., 2020) |
| **Time** | The possibility of losing time or time consuming when browsing and engaging in a variety of interactions on DSM. | (Arnett et al., 2013, 2014; Rajeh et al., 2020) |
| **Non-compliance with DSM policies** | The act of violating DSM policy set out by governing bodies. | (Henry & Molnar, 2013; Kenny & Johnson, 2016; Nason et al., 2018; Knott & Wassif, 2018; Shah et al., 2019; Dobson et al., 2019; Karveleas et al., 2020) |
| **Breaching of patient confidentiality** | The act of publishing patients' information on DSM without explicit consent. | (Martorell et al., 2015; Kenny & Johnson, 2016; Leal et al., 2018; Costa et al., 2020) |
| **Concerns about dental information quality** | The act of using invalid or non-evidence-based information. | (Spallek et al., 2015; Bhola & Hellyer, 2016; Das et al., 2017) |
| **Blurring professional boundary** | The possibility of blurring the professional line between dental faculty members and their students when interacting on DSM. | (Spallek et al., 2015; Wyatt et al., 2016) |

## 2.5 Differences in Perceptions of Risks Between Groups in Dentistry

The previous section highlighted some potential DSM risks in dentistry, as reported by different groups in terms of participants. Some risks were investigated by studying undergraduate dental students, while others were examined among qualified dental professionals.

With regard to dental students, it can be noticed that several studies raise concerns about their intensive DSM use and self-disclosure, and the potential negative impact on their professionalism and professional reputation (Henry & Molnar, 2013; Kenny & Johnson, 2016; Knott & Wassif, 2018; Nason et al., 2018; Dobson et al., 2019; Karveleas et al., 2020).

In addition, Neville (2016) provided some possible explanations for particular challenges of using DSM among dental students. The first problem discussed was the difficulty of maintaining professional standards online due to the feeling of being elsewhere from patients – especially with the absence of professional context elements, such as the dental uniform, dental clinic environment, and the dental team's presence. The second problem was the expressive nature of DSM, which encouraged users' self-expression and disclosure of their personal issues, such as posting feelings, opinions and preferences, and making them accessible for everyone. The third problem presented was the blurring of the professional boundary. The presence of personal data on DSM means that the social distance that traditionally isolated people from each other has been reduced. Dental students in the early stage of transitioning to dental school require early guidance in managing relations and boundaries with colleagues, staff and prospective patients when using DSM.

Spallek et al. (2015) claimed that preparing dental students in undergraduate programmes for professional DSM use is a complex task because of the generational differences between dental students and qualified dental practitioners or faculty members. There is often insufficient agreement between the two groups on what constitutes inappropriate behaviour – particularly in the grey zones between general and professional communication. The regulatory bodies' regulations and university DSM guidance may be difficult to understand or too broad to be effective, as previous empirical studies have shown (Kenny & Johnson, 2016; Knott & Wassif, 2018; Dobson et al., 2019).

Concerning the qualified group of dental professionals, the evidence initially confirmed that time and privacy are the most critical risks in this particular group. Snyman and Visser (2014) conducted a cross-sectional study using mixed-method research to investigate dentists' perceptions about using DSM for marketing dentistry in South Africa. They invited registered dentists in the South African Dental Association to complete an online questionnaire. Among 334 respondents, only 13% of dentists were using DSM for advertising and marketing their dental practices, but 33% reported that they intended to employ it in the future. The primary reasons for choosing not to use DSM in marketing were lack of time and security issues (65% and 48%, respectively). This study offered informative results for understanding qualified dental professionals' reasons for not choosing DSM, with a particular focus on dental marketing usage. However, it was based mainly on a questionnaire at one point in time, whereas repeated observations would be required to determine the patterns of DSM usage over time.

A comparable finding was found in Nelson et al.'s (2015) study in the US, which investigated orthodontic dentists' and patients' perceptions of using DSM. The 189 dentists

reported reasons that included mainly time constraints (63%), followed by having issues with privacy, and ethical concerns (43% and 37%, respectively).

Although the above claims suggest possible differences in risk perceptions between dental students and dental professionals, possibly due to variations in their DSM usage, the literature is inconclusive about specific risks pertaining to particular groups. For example, in their empirical studies of DSM uses among undergraduate dental students and dental educators in the US, Arnett et al. (2013, 2014) showed that both groups perceived similar main barriers to using DSM in the dental professional context, such as privacy concerns and time loss. Comparable results were found by other researchers (Rajeh, Aboalshamat, et al., 2020; Rajeh, Sembawa, et al., 2020) in their multi-centre empirical studies in Saudi Arabia.

Given that the literature appears inconclusive on whether there are significant differences in DSM risk perceptions, it is worth understanding which particular DSM risks are more salient to dental students, and which are more relevant to dental professionals. This will provide an insight into the education and training required to use DSM in the dental professional context.

## 2.6 Chapter summary

This chapter has presented a detailed description and categorisation of a set of risk factors that have appeared in the e-commerce literature, in order to provide a theoretical foundation of DSM perceived risks in the general context. Moreover, a review of existing literature concerning the potential risks of using DSM in the dental profession was provided.

Previous empirical studies in e-commerce drew our attention to distinctive perceived risks that were well defined, and which significantly impacted DSM uptake in e-commerce (see Table 2. 1). However, in dentistry, the topic of DSM risks remains largely unexamined. So far, there have been few such studies, which have usually approached them indirectly, or considered only one type of risk. For instance, the body of the literature has examined risk perceptions using a narrow lens, such as breaching patient confidentiality or lack of compliance with DSM guidelines (e.g., Kenny & Johnson, 2016; Knott & Wassif, 2018; Dobson et al., 2019).

Moreover, other works highlighted a wide range of specific potential risks of DSM use in the dental profession (e.g., Spallek et al., 2015, Bhola and Hellyer, 2016; de Peralta et al., 2019). However, their claims were based on commentaries and review opinions that lacked empirical evidence to support them. Therefore, the existing assessment of the risks of using DSM in the dental profession is inconclusive and provides no comprehensive view of the DSM risks based on empirical results. Dental students and dental professionals could be influenced by a wide range of risks that have so far been neither explored nor discussed in depth.

Furthermore, a body of research also reported results that were focused on students at the undergraduate level. However, these works rarely studied the differences in perceptions between dental students and dental professionals. Such assessments are of great importance for obtaining a better understanding of DSM risks. Hence, this PhD research begins to address this gap.

# 3 Chapter Three: Research Methodology

## 3.1 Introduction

The identification and assessment of DSM perceived risk factors are of great significance for both dental students and dental professionals, as well as for researchers, dental educators and policy makers. Indeed, the previous researchers (e.g., Spallek et al., 2015; Bhola & Hellyer, 2016) endeavoured to highlight some risks that they believed affected DSM uptake in the dental profession. However, to provide an accurate understanding of DSM perceived risks in particular research context, it is necessary to investigate such perceptions from the specific groups that might have certain criteria and be subject to professional regulations (i.e., in this research: dental students and dental professionals). As highlighted in the previous chapter, the earlier questionnaire studies available in the dental literature, which can assist researchers in analysing DSM perceived risks in the dental profession, are not sufficient to provide a complete picture. Therefore, an exploratory sequential mixed methods design has been utilised in this research, similar to the previous empirical studies that investigated perceived risks in e-commerce context (Featherman & Pavlou, 2003; Forsythe et al., 2006).

This chapter begins with an overview of the research methodology and provides a brief description of the rationale for choosing a mixed-methods approach. It also contrasts the differences between the qualitative and quantitative studies utilised. Then, this chapter outlines the key procedural steps in Study 1, as follows: participants recruitment, developing the interview guide and coding scheme, and conducting and analysing semi-structured interviews.

In addition, this chapter describes the detailed methods of Study 2, which employed the perceived risk questionnaire: specifically, generating the perceived risk items, conducting

focus groups, the pilot study, and administering the questionnaire. The chapter then concludes with a focus on the data analysis methods used in both studies.

## 3.2 Overview and Justification of the Research Methodology

To achieve the aim of this research and answer the research questions stated in Chapter One, a mixed-methods approach which combined collecting data from qualitative and quantitative studies was chosen (Johnson et al., 2007; Creswell, 2017). This was believed to be useful for this research because, as mentioned in the previous chapter, previous studies in the dental context looked at DSM perceived risks using a narrow lens. Hence, this approach is deemed to be justified, in order to gain an in-depth understanding and draw a more complete picture of specific DSM risks that might be perceived in the dental profession, along with developing accurate questionnaire items that fit the context and aim of the current research.

The research methodology is designed to meet the research objectives, as outlined in section 1. 2. Study 1 begins by collecting data using face-to-face interviews, by using semi-structured interviews as a data collection method to ask open-ended questions. The flexibility of semi-structured interviews, especially compared to structured interviews, enables exploration and discuss dental students' and dental professionals' perceptions at a granular level, by providing a thorough description of the identified perceived risks (Gill et al., 2008). Furthermore, analysing the interviews will yield a better understanding, in terms of confirming DSM perceived risks in existing questionnaire instruments, or forming categories of information that can be investigated further in a quantitative phase. However, a qualitative study alone would neither provide robust evidence for generalising the identified DSM risks from the sample nor allow to examine differences between groups' perceptions of DSM risks based on statistical analysis (Creswell, 2017).

In order to establish the underlying DSM perceived risk factors within the questionnaire items and provide more accurate explanations drawn from a larger sample, in Study 2 an online self-administered questionnaire was developed, piloted, and then administered to dental students and dental professionals. Consequently, it is hoped that the findings gained from the mixed-methods approach will offer a consolidated understanding of the research problem presented in Chapter One.

## 3.3 Research Settings and the Dental Curricula

This research was conducted at the Faculty of Dentistry, Oral and Craniofacial Sciences (FoDOCS), King's College London, and its educational partners, including Guy's and St Thomas' NHS Foundation Trust Hospitals.

This setting provides a relevant and representative research sample pool for answering the research questions and addressing the objectives of this research, for the following reasons:

- FoDOCS is one of the largest dental schools in the UK, with approximately 150 dentists a year graduating from the undergraduate BDS degree programme (King's College London, 2021). Also, the faculty offers postgraduate programmes for qualified dentists with different educational experiences and backgrounds.
- Dental students and dental professionals must adhere to specific guidance when using DSM in these settings i.e., the guidance on using social media published by GDC (GDC, 2016), and KCL's social media communications policy (King's College London, 2016).
- Within dental curricula for both undergraduate and postgraduate programmes, there is a course called Digital Professionalism in Dentistry, where dental students and qualified dental professionals at FoDOCS are educated in ethics and professionalism as applied to DSM.

### 3.3.1 Study 1: Qualitative Study Setting

All interviews were conducted face-to-face in private rooms (i.e., a pre-booked classroom, iTEL hub room or available clinical setting); this helped participants to focus on the conversation without interruptions from others. Also, it facilitated the accurate audio recording of the interviews and created a more neutral environment for the interviews. In most interviews, only the PhD researcher and the interviewee were present. The recording was carried out with the full awareness and permission of the interviewee, and a paper-and-pen consent form was signed by each participant. The average interview duration was 16 mins, and the interviews were conducted in English, between May 2019 and January 2020.

The concept of reflexivity was considered, to acknowledge that the researcher's background and understanding of the research problem investigated in this study could influence the conduct of interviews and the analysis procedure (Dodgson, 2019). The PhD researcher was the primary interviewer. This author is a qualified dentist and clinical teacher, with five years' experience of teaching prosthodontics and digital professionalism in a dental school in Saudi Arabia. However, within this research setting, the author had no role in teaching undergraduates or postgraduates during the data collection period. Furthermore, he described his role as a PhD researcher at the start of all interviews with participants.

The supervisory team was closely involved in the study's conceptual development, and in validating the interview guide and analysis procedure, as the following sections will present. This has helped to alleviate potential researcher bias by creating the opportunity to listen to alternative points of view, validate the interview questions, and conduct the thematic framework analysis.

### 3.3.2 Study 2: Quantitative Study Setting

An online platform (http://forms.microsoft.com) was utilised to administer the questionnaire in Study 2. This method helped to recruit and access dental students and dental professionals remotely, typically during the challenging time of the COVID-19 pandemic. Moreover, it enabled convenient distribution via email, as well as efficient data analysis, by reducing the potential human errors when entering data into analysis software (Van Selm & Jankowski, 2006). All responses were collected without the pressure or the presence of the researcher.

The online questionnaire was sent by contacting the course leads of each undergraduate BDS year group, class representatives, postgraduate programmes officers and clinical teachers' coordinators. Distribution took place between 1 June and 29 August 2020; reminder emails were sent out four weeks after the first email.

Developing a questionnaire involves testing whether the items accurately measure what the questionnaire is supposed to measure (validity), and if they exhibit consistency and stability in their responses (reliability) (DeVellis, 2017, p. 39). In Study 2, developing the DSM perceived risks questionnaire constituted a critical phase of the research methodology. In order to ensure that the questionnaire items obtained the pertinent information in the most valid manner, and to address the reflexivity, multiple steps were conducted, including focus groups, expert review and a pilot study, to address the face and content validity (see section 3.6: Study 2 Methods).

## 3.4 Ethical Consideration

King's College Ethics Committee (BDM RESC) granted ethical approval for the research on 23 April 2019, with reference number: LRS-18/19-8867 (Appendix A, Figure 9. 1).

A modification was requested, to include Study 2 in the previous fully granted ethical approval of Study 1: LRS-18/19-8867. The request received full approval from King's College London BDM Research Ethics Panel on 13 March 2020, under reference number: MOD-19/20-8867 (Appendix A, Figure 9. 2).

## 3.5 Study 1 Methods: Qualitative Study

### 3.5.1 Participants Recruitment and Sampling

The participants of Study 1 included dental students from BDS1 to BDS5 cohorts and postgraduates' programmes, including MClinDent and Clinical PhD cohorts, during the 2019/2020 academic year; as well as dental professionals, including clinical teachers, specialists and consultants, who provided dental care and were available in the same year at FoDOCS, King's College London, and Guy's and St Thomas' NHS Foundation Trust Hospitals. They were recruited using emails and invitation posters, and with purposive sampling to give participants an opportunity to participate in this study voluntarily (Ritchie et al., 2003, p. 91) (see Appendix C, Figure 9. 3 The invitation poster for the interviews.

The non-probability purposive sampling is the intentional choice of participants based on their ability to satisfy the study's specific aims. The reason for using this sampling method was to draw a broad range of views and obtain well-balanced perceptions of dental students and dental professionals (Bryman, 2016, p. 418).

### 3.5.2 The Topic Guide

Data were collected using semi-structured interviews with the aid of a topic guide, to fulfil the purpose of this study. The literature review informed the development of the topic guide (e.g., Featherman & Pavlou, 2003; Khan et al., 2014; Spallek et al., 2015; Kenny & Johnson, 2016; Dobson et al., 2019). The aim of semi-structured interviews was to identify and provide a broad and in-depth understanding of DSM risk perceptions, with some flexibility to discuss DSM issues that participants felt were important but may not have previously been considered pertinent by researchers (Gill et al., 2008). The topic guide comprised four key sections, each of which contained two levels of questions. Central open-ended questions incorporated the main content of the research queries, and follow-up questions encouraged interviewees to give more information about their experiences and perceptions or provide an example of the particular issue that arose during interviews, as follows. The first section included questions about participants' current use and activities of DSM use in their daily life (i.e., "Can you tell me about how you use DSM in your personal and social life?"). The follow-up questions elicited more information (e.g., "Why are DSM important for your social life?").

The next section of the interview guide focused specifically on exploring the respondents' experiences and perceptions of DSM use in their professional and academic context, such as perceived risks that influence their usage (i.e., "Can you tell me how you use DSM in your dental professional life?"). The follow-up questions included "Can you give a specific example of how DSM use is useful in your dental professional context?".

The third section discussed certain activities and behaviours conducted on DSM in the general and dental professional context. It was assumed that interviewees would be made more comfortable and familiar with the research topic by discussing some scenarios (i.e., "Can you tell me your opinion about posting dental procedures, including photos, videos,

x-rays that include patient data in DSM?", "What is your opinion about disclosing your personal data on DSM? e.g., name, occupation, interests?").

The final section was focused on some general perceptions and suggestions for the future of using DSM in dentistry (i.e., "Do you see that these DSM tools will become more useful or risky to you as a dental professional/student, and to the dental profession in the future?").

The topic guide questions were reviewed and discussed in joint meetings with the supervisory team, who had experience in teaching professionalism as applied to DSM, ethics, and technology-enhanced learning, in order to check that the questions were relevant, clearly worded, not leading, and appeared in a logical sequence. At this point, some questions were identified for subsequent revision, due to a potential leading question (e.g., "Do you think that it is risky to post the dental treatment of an identified patient?" was changed to "Can you tell me your opinion about posting dental treatment photos on DSM?"). This modification encouraged the interviewees to say what they truly thought, instead of leading the interviewee in a specific direction.

Then, the topic guide was piloted with the supervisory team and one volunteer undergraduate dental student before the actual interviews were started, in order to check whether the questions were well formulated, with no possibility of misunderstanding by interviewees. Importantly, piloting interviews train the researcher to learn the appropriate interviewing skills, conversation flow, and to practise conducting semi-structured interviews (Abdul Majid et al., 2017).

Two main adjustments were made to the topic guide. Firstly, two questions were added to the first section, because it was noticed that asking relevant questions to gain basic information about DSM use at the beginning of the interviews gave necessary hooks to

inform the discussion throughout the course of the interviews (e.g., “Do you have any DSM daily activities, i.e., posting photos, videos and stories?”, “Why are DSM important for your social life?”).

Secondly, the researcher identified the need to explain to interviewees what “professional context” meant explicitly, and added sequentially aligned probing questions to clarify this concept (e.g., “Can you tell me about how you use DSM in your professional context? For example, with your colleagues and patients.”). This allowed participants to give more profound answers when speaking about their DSM use in their professional context (Appendix C. Table 9. 1 Interviews guide.

Each interview was recorded using a digital audio recorder (Olympus LS-12, Japan).

### 3.5.3 The Participant Information Sheet and Consent Form

The participant information sheet was sent to all participants, who agreed by email to participate in the interviews. Moreover, before conducting the interviews, a detailed verbal description of the nature of the interviews was presented to the participants, and each obtained a copy of the participant information sheet (see Appendix B, Study 1 Participant Information Sheet).

It was emphasised that the interviewees’ participation was voluntary, and they had a right to withdraw from the interview at any time. Participants who agreed to proceed with the interview then completed and signed a consent form paper (see Appendix B, Study 1 consent form). Each participant also filled in a brief questionnaire to establish their demographic data, such as age and gender.

### 3.5.4 Conducting Semi-structured Interviews

After developing the topic guide as highlighted in section 3.5.2, the interviews were conducted until the obtained interview responses reached saturation (no additional views or new perceived risk codes were reported while analysing the interview content). The saturation principle has achieved broad acceptance as a criterion for ceasing further interview collection in a qualitative study (Saunders et al., 2018). After conducting 21 interviews, data saturation was achieved, and further interviews were not considered necessary.

The overall interview procedures can be summarised in four stages, as follows:

- **Stage one:** Introduction and establishing rapport. In this stage, the PhD researcher welcomed the participant and started the conversation by introducing himself and establishing a friendly and relaxed environment.
- **Stage two:** Introducing the research and signing the consent form. This stage incorporated several crucial information about the research study (i.e., explaining the aims and objectives of the research, signing the consent form, emphasising the voluntary participation and confidentiality of the interviews), as outlined in section 3.5.2.
- **Stage three:** Beginning the interview. This stage followed the order of the interview guide described earlier in this section. It began with asking the participants opening questions about their DSM use; then, the interviews moved to the substantial interview guide sections.
- **Stage four:** Ending the interview. Before finishing the interview, the participants were asked to raise any points not yet discussed, which they believed to be relevant. Then, the PhD researcher ended the interview and explained what would happen

next with the data and recording. An incentive Amazon voucher worth £10 was offered to each participant at the end of the interview in appreciation of their time.

### 3.5.5 Interviews Transcription

The audio file of interviews was then uploaded on a secured PC at KCL and transcribed verbatim by the PhD researcher; this helped him to become familiar with the interview data. The transcripts were then reviewed by the supervisory team, to ensure accuracy and identify language mistakes. The transcriptions were performed using the MS Word program (MS Word for Windows 10, 2019, USA). Each interview file had a cover page, including initials to maintain anonymity, and the interview's time and date. An example of transcript files can be seen in Appendix C, **Error! Reference source not found.** & **Error! Reference source not found.**.

### 3.5.6 Defining Unit of Analysis and Coding Scheme

After conducting the first round of semi-structured interviews, which involved two interviews and transcribing the data, the PhD researcher started reading the interview transcripts and highlighted interesting pieces of text that could create potential codes.

The PhD researcher then had a series of discussions with the supervisory team regarding the highlighted texts, to determine the potentially relevant codes. In this stage, to enhance the transparency of the codes and recognise conceptually meaningful codes, the codes from interviews were categorised into two groups: perceived risk codes and perceived non-risk codes. In addition, it was decided to concentrate on the level meaning of the code instead of line-by-line coding. This process has allowed a code to consist of either a sentence or paragraph, as long as it represented the same code (Y. Zhang & Wildemuth, 2009).

The coding scheme was developed deductively from previous studies presented in chapter two (e.g., Featherman and Pavlou, 2003; Khan et al., 2014, Bhola & Hellyer, 2016). Also,

open coding of the interviews' transcripts was commenced to prove the utility of the perceived risk theory and ensure the meaningful aspects of the codes were not missed. Moreover, this allowed for new codes to be included in the coding scheme for a complete analysis.

During this time, the perceived risk codes that emerged from interviews were compared with those informed by the literature. The new codes that did not exist in the preliminary coding scheme were added to the coding scheme (see chapter four, section 4.4).

### 3.5.7 Identification of the DSM Perceived Risk Themes

All interview transcripts were then imported into Nvivo12 software (QSR International, 2018, USA). Each code was entered as a node (Appendix C, Figure 9. 4). Using such software facilitated the research team's management and organisation of the extracted interview codes, and saved time compared to manually assigning the interesting interview quotes to their relevant codes. Following MacPhail et al. (2016) method for establishing the coding scheme's reliability, the PhD researcher and a member of the supervisory team (MN) coded 10% of the original transcripts using the developed coding scheme independently. The inter-coder reliability (ICR) assessment and consistency scores were suitably high (the overall Kappa score = 0.70). In a subsequent meeting of the research team, the inconsistent codes were identified and discussed. For example, the "scrutiny" code and "receiving negative comments" code were combined, as they share the same essence. This code was redefined as "scrutiny and negative comments concerns".

Once the ICR was established, the interview codes were indexed by the PhD researcher, using the coding scheme. Finally, the whole research team engaged in thematic analysis. The researchers examined the indexed codes, distinguished patterns of codes into sub-themes, and categorised them into two main themes ("Perceived risks associated with the

use of DSM in a professional context" and "Perceived risks associated with the use of DSM in a general context").

The results of identifying further codes from the transcripts of the interviews, and sorting the codes into DSM perceived risk themes, will be presented in Chapter 4. The process of conducting Study 1 and analysis of the interviews is summarised in Figure 3. 1.

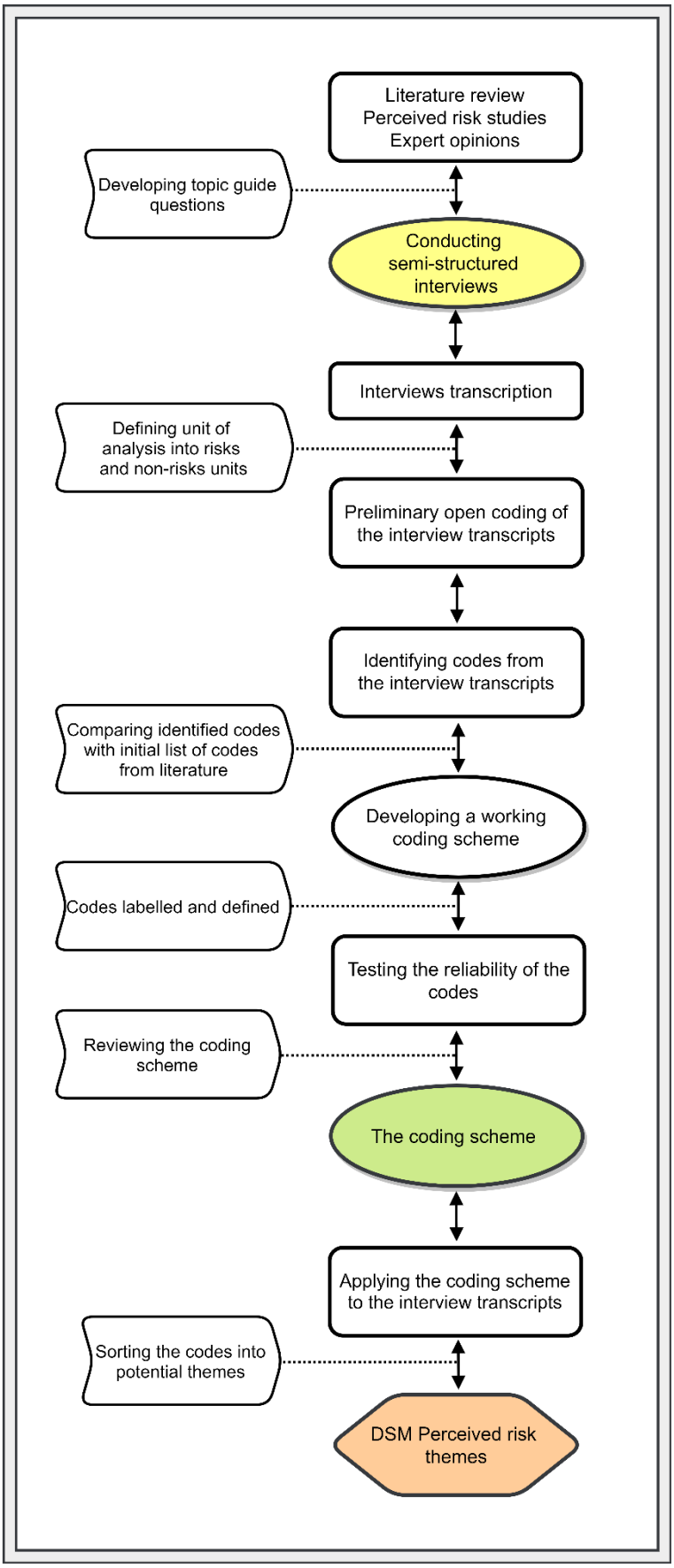


Figure 3. 1 Illustrative summary of Study 1 methods.

## 3.6 Study 2 Methods: Quantitative Study

### 3.6.1 Participants Recruitment and Sampling

The participants were recruited from a population of dental students (undergraduates: BDS1 to BDS5 cohorts; and postgraduates: MClinDent and Ph.D. cohorts) during the 2020/2021 academic year. Dental professionals, including clinical teachers, specialists and consultants who were providing dental care and available in the same year at FoDOCS, King's College London and Guy's and St Thomas' NHS Foundation Trust Hospitals, were also invited to complete the online questionnaire.

The online questionnaire was sent by contacting the course leads of each BDS year group, postgraduate programme officers and clinical teachers' coordinators, between 1 June and 29 August 2020. Reminder emails were sent four weeks after the first email (Appendix D, Table 9. 5 The invitation email for study two.

A convenience sampling was used to ensure that relative representative proportions of undergraduate and postgraduate dental students and dental professionals were invited, and to guarantee that the invited sample was representative as much as possible (Bryman 2016, p. 201).

The sample size was calculated based on the ratio of the number of items (p) in the questionnaire to the number of respondents (N), as suggested by various authors (Yong & Pearce, 2013; Hair et al., 2014; Kyriazos, 2018). The recommended *N*:*p* ratio varies in the literature from 3 to 20. In this study, the desired average ground ratio of 5 participants per item has been applied, as recommended by Hair et al., (2014). Since this study included 38 items in the perceived risk questionnaire, the following formula was used to estimate the sample size: N = 5*38 = 190, with a confidence level of 95% and a sampling error of 5%.

The completed questionnaires were processed and transferred to an Excel spreadsheet (MS Excel for Windows 10, 2019, USA), where participant responses were scanned to identify data inputting errors and missing or duplicated replies. A total of 328 complete responses were received. The initial screening identified 27 duplicated responses, which were then removed before proceeding with statistical analyses. No missing data were observed among responses. The participants' demographic data are presented in Chapter Five.

### 3.6.2 Study 2 Design

Figure 3. 2 presents a flow chart of significant steps in designing Study 2's methodology, which focused on developing, validating, and analysing the DSM perceived risk questionnaire. These steps are discussed in subsequent sections.

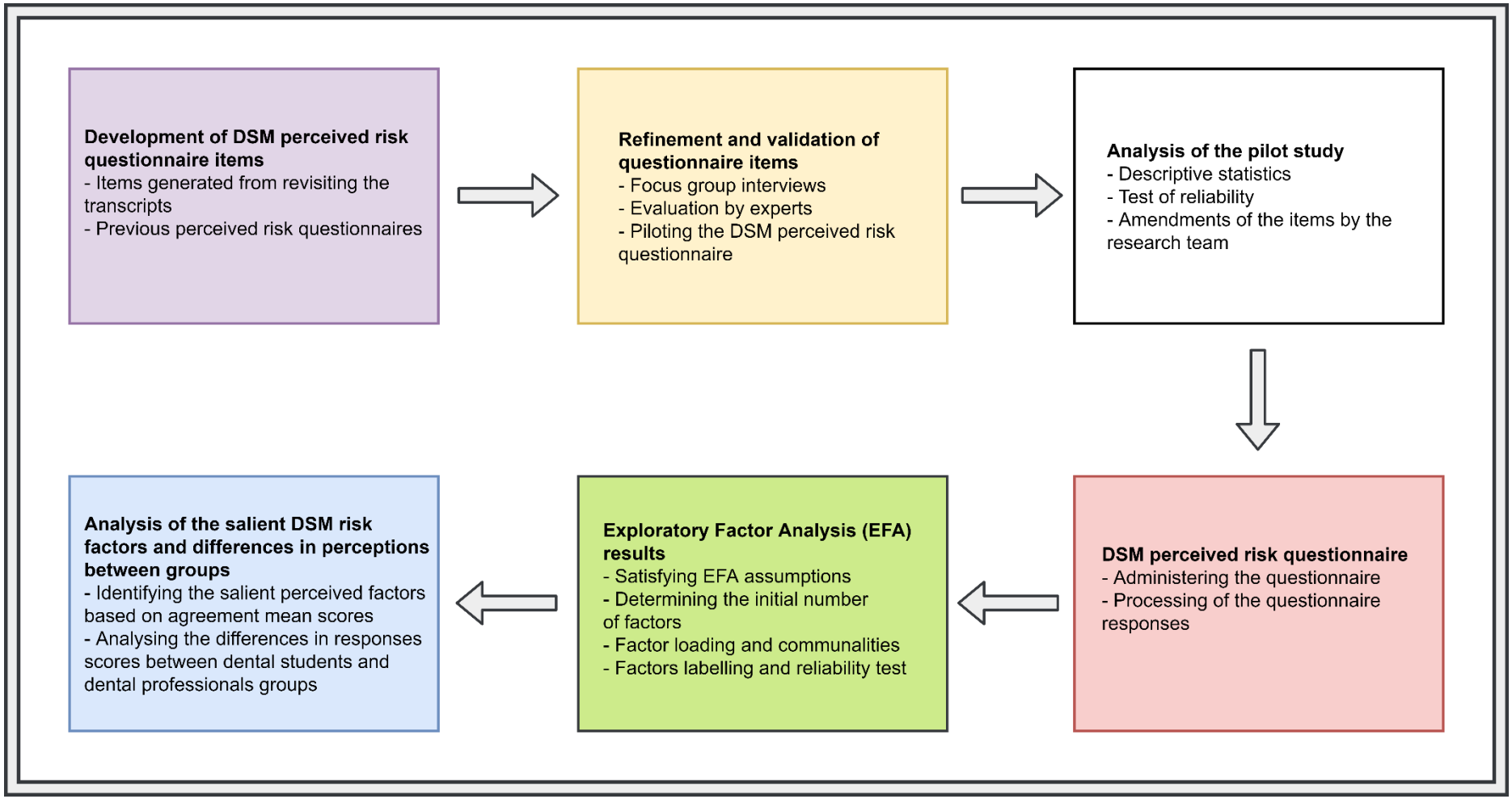


Figure 3. 2 A flow chart of key steps in designing the Study 2 methods.

### 3.6.3 Development of the DSM Perceived Risk Questionnaire Items

#### 3.6.3.1 Generation of items by revisiting interview transcripts and the literature review

A thorough literature review was conducted in Chapter Two, to examine and evaluate existing questionnaires related to the perceived risks of using DSM. These included the online perceived risks questionnaire developed by Featherman and Pavlou (2003), the social media perceived risks questionnaire by Khan et al. (2014), and the e-banking services perceived risks questionnaire by Aldás-Manzano et al. (2009). As a result, relevant items were identified that would fit this study's aims (see Table 3. 2).

Table 3. 1 Examples of items adopted from the literature review to inform the current study questionnaire.

| Perceived risk questionnaire items | Evidence from literature |
|---|---|
| - Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept.<br>- Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals).<br>- Using DSM payment service subjects my checking account to potential fraud.<br>- DSM are time consuming.<br>- Using DSM is a waste of time.<br>- It is risky to have the possible time loss from having to set up and learn to use DSM.<br>- Using DSM worsens the image my friends and colleagues have of me.<br>- Using DSM would negatively affect the way others think of me.<br>- I think DSM could provide my personal information to other companies without my consent<br>- I think DSM endanger my privacy by using my personal information without my permission | (Featherman & Pavlou, 2003; Aldás-Manzano et al., 2009; Khan et al., 2014) |

Moreover, after conducting the qualitative study and completing the thematic framework analysis, the PhD researcher reviewed and read the quotes representing each DSM perceived risk theme (see Chapter Four) and noted the pertinent phrases that could form a relevant questionnaire item. These identified phrases were reworded to fit the purpose of the questionnaire (see Table 3. 3).

Table 3. 2 Examples of quotes from interviews that served to develop the questionnaire items.

| Interview quotes | Perceived risk questionnaire items |
|---|---|
| "*There are lots of variation of the information posted on DSM, and there is no formal quality assurance*" (AE, DS7). | - I find it risky to use information shared on DSM because it is not subjected to quality control. |
| "*DSM is very time consuming, and it keeps you away from daily physical activities*" (RA, DP8). | - There is a risk of DSM being too time-consuming.<br>- There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks. |
| "*I should not accept friend request from patient because it is not professional*" (JJ, DS8). | - There is a risk of blurring professional boundaries if I accept a friend request from a patient on DSM. |
| "*The public can get false expectations from digital and social media promotion*" (KA, DP7). | - There is a risk of the public deception form the dental promotion shared on DSM. |
| "*Using DSM could be an issue with patient confidentiality*" (MS, DS10). | - There is a risk of using DSM for sharing dental procedures with identified patient information. |

This process ensured that the early stage of developing the questionnaire included an extensive collection of items that represented the perceived risks of DSM usage by dental students and dental professionals, rather than being derived from a theoretical basis and existing studies only (DeVellis, 2017; Boateng et al., 2018). Once the process of item

generation discussed above was completed, the PhD researcher met with the supervisory team for three hours to review the initial pool items, in order to identify redundant items, and ensure that the developed items reflected the study's aims and were pertinent and specific to DSM perceived risks. As a result, a total of 64 perceived risk items were generated for the next validation process (see Appendix D, Table 9. 6 The initial items pool derived from the literature review and interviews for eventual inclusion in the perceived risk questionnaire.

#### 3.6.3.2 Perceived risk questionnaire

In this study, categorical (nominal scale) and continuous (interval scale) response scales were used in the questionnaire. The former scale was used to obtain the demographic data (e.g., gender and age) and DSM use information. The latter scale was utilised to capture respondents' perceptions of the DSM perceived risk items. A labelled five-point Likert scale from (1) Strongly Disagree to (5) Strongly Agree was utilised in this study, to provide higher-quality results by lessening the respondents' cognitive load, and to yield a satisfactory discrimination of responses. Moreover, many previous empirical studies on perceived risks have confirmed that five-point Likert scale data can be analysed effectively, and supported the use of such a scale format with inferential statistics, such as factor analysis (Hong & Cha, 2013; Munnukka & Järvi, 2014; Khedmatgozar & Shahnazi, 2018; Bashir et al., 2021). This also helps to produce results that can be efficiently compared with those obtained from existing perceived risk empirical studies (DeVellis, 2017, p. 127).

### 3.6.4 Refinement and Validation of the Questionnaire Items

Developing questionnaire involves testing whether the items accurately measure what it is supposed to measure (validity) and exhibits consistency and stability in its responses (reliability) (DeVellis, 2017, p. 39).

Three stages were undertaken to validate this questionnaire: focus groups, expert evaluation, and a piloting study.

#### 3.6.4.1 Focus groups

In this study, focus groups with dental students and dental professionals were conducted to provide validity evidence and further purify the perceived risk items. The following are some of the main aims of conducting the focus groups:

- Minimise dental students' and dental professionals' response fatigue when answering a long list of questionnaire items, by identifying and eliminating repetitive and poorly phrased items.
- Confirm that the questionnaire items are understood by and meaningful to dental students and dental professionals and ensure face validity by ascertaining whether the questions are a good measure of the perceived risks.

Two focus group interviews were conducted with four undergraduate BDS students and three postgraduates/dental professionals in the iTEL Hub room at Guy's Hospital, King's College London. The participants' demographic data are presented in Table 3. 4. The median age of the dental students was 21 years (range 20–22 years) and for the dental professionals, the median age was 33 years (range 30–35 years). Dental students and dental professionals were recruited purposively from clinical settings. The interviews were conducted face-to-face in February 2020, and each focus group session lasted approximately one hour.

Table 3. 3 Participants' demographics (number of focus groups = 2 and number of participants = 7).

| Focus group | Gender | | Age range |
|---|---|---|---|
| | Male | Female | |
| **Dental students** | 2 | 2 | (20-22) |
| **Dental professionals** | 2 | 1 | (30-35) |

The focus group interviews consisted of two main phases, as follows:

1. The first 10 minutes consisted of preliminaries (e.g., welcoming, ensuring that participants understood the information sheet and signed the consent form, and a summary of the background and aims of the focus group).
2. During the next 50 minutes, the facilitator (PhD researcher) invited participants to sort the items (printed on cards) representing each potential construct into groups. They were instructed to read the cards aloud to help identify unclear and complicated items. At the end of sorting (each stack of cards), the PhD researcher asked questions (e.g., "Can you tell me in your own words what this group or categories mean?" or "Why did you group these specific questions under one category?"). This provided a better understanding of what they thought about the meaning of each sorting card, and interpretations of items. The focus groups helped to identify 27 redundant and unclear items, to be excluded from further analysis. Consequently, a total of 37 items were retained for expert evaluation in the next phase.

Examples of quotes representing dental students' and dental professionals' explanations for their card-sorting and difficult items are presented in Table 3. 5 and Table 3. 6.

Table 3. 4 Examples of quotes representing dental students' and professionals' explanations for their card-sorting and the items retained for expert evaluation.

| Sorted statements | Example of quotes from interviews |
|---|---|
| - I find it risky to use DSM because it is easy for someone to create fake accounts and post stuff as yourself. (omitted)<br>- Internet hackers (criminals) might take control of my checking account if I used a DSM. (retained) | "*These statements are same. It is about fear of disclosure of personal privacy by digital criminals. It's like when your DSM account get hacked and it's about the DSM services itself.*" |
| - I find it risky to use DSM because the information shared is not evidence-based. (retained)<br>- I find it risky to use DSM because I do not know the reference of the information. (omitted) | "*This group is more about concerning the evidence-based information.*" |
| - I do not use DSM because I do not want to put myself in an unfavourable position with the university policy. (retained)<br>- I do not take part in group discussions about cases on DSM because there is a policy from King's trying to limit the use of social media to discuss cases. (omitted)<br>- If you are a dental student and professional, you have to be aware and must not make mistakes, to avoid disciplinary action. (retained) | "*These statements talk about the potential harm of using DSM without following the policy and guidelines.*" |
| - There are chances that using DSM will lead to losing money. (retained)<br>- My signing up for and using a DSM would lead to a financial loss for me. (omitted)<br>- Using an internet bill-payment service subjects your checking account to financial risk. (omitted) | "*All of these statements are about the financial and loss of money risks.*" |

Table 3. 5 Examples of difficult to understand and unclear items

| Examples of difficult to understand and unclear items | Comments from focus group |
|---|---|
| - There is a risk of receiving negative feelings from people when you over-show or over-share on DSM.<br>- There are always risks of humiliation, shame or embarrassment if I post or share something on DSM. | *"I do not get the meaning of these items."* |
| - I find it risky to use DSM because the policy is quite restrictive for me. | *"I do not understand this item, why policy could stop me to use DSM."* |
| - My signing up and using a DSM would lead to a social loss for me because my friends and colleagues would think less highly of me.<br>- Using DSM affects the image your friends and relations have of you. | *"I cannot see this actually happening. I think it would not be an important case when using DSM. It is not relevant."* |

#### 3.6.4.2 Expert review

As mentioned in the previous section, the focus group helped to recognise the repetitive items and complex items that should be removed; it also ensured the face and content validity of the drafted perceived risk items. As a result, the questionnaire items were reduced to 37, and were subjected to expert evaluation, for the following reasons:

- To further validate and assess the content of the items.
- To determine how accurately the items measure the potential perceived risks.
- To re-evaluate and review the clarity and phrasing of items when necessary.

The questionnaire was reviewed by the second and third supervisors independently, to scrutinise the questions and make corrections regarding the wording, organisation and structure of the questionnaire. They identified a few problematic items and reworded them to increase precision or simplify them: for instance, "*My signing up for and using DSM would lead to a loss of privacy for me because my personal information would be used without my knowledge*" was amended to "*There is a risk of shared personal information on DSM being disclosed to third parties without my knowledge*".

Moreover, based on this feedback and discussions during supervisory meetings, one additional item was suggested: "*There is a risk of using DSM inappropriately because of my lack of technical know-how*." This was added because in the DSM context, the use of DSM raises concerns with technical issues such as a lack of technical skills, and knowledge of how to use DSM to accomplish the planned task was believed to be more relevant. Examples of questionnaire items revised based on feedback from expert reviews and discussion meetings with the supervisory team are provided in Table 3. 7.

Table 3. 6 Examples of questionnaire items revised based on feedback from expert reviews and discussion meetings with the supervisory team.

| Questionnaire items | The modified items after expert reviews |
|---|---|
| 1. My signing up for and using DSM would lead to a loss of privacy for me because my personal information would be used without my knowledge. | 1. There is a risk of shared personal information on DSM being disclosed to third parties without my knowledge. |
| 2. I decrease posting on DSM because the negative feeling that people show when you over show or oversharing. | 2. Using DSM would expose me to negative comments from others which negatively affect my self-esteem. |
| 3. There are chances that using DSM will lead to lose money. | 3. Using DSM payment service subjects my checking account to potential fraud. |
| 4. The public unfortunately get a lot of wrong information from all DSM platforms. | 4. There is a risk of the public getting misleading information related to their oral/dental health on DSM. |
| 5. I find it risky to use DSM because the policy is quite restraining. | 5. I find it risky to use DSM without complying with the guidelines set by governing bodies. |
| 6. I find it risky to discuss anonymised cases without their explicit consent. | 6. There is a risk of using DSM to discuss anonymised cases / material without explicit consent. |
| 7. Using DSM could be informal, and people could cross the professional boundaries. | 7. There is a risk of blurring the professional boundary between dental students and dental professionals when interacting on DSM. |
| 8. If I publish something on DSM I have to think because maybe this should not be seen by my patient. | 8. There is a risk of damaging the profession if I share unprofessional content on DSM. |

The final set of perceived risk items included 38-items were carefully reviewed, and the wording of the questionnaire items improved (see Appendix D, Table 9. 8).

#### 3.6.4.3 Piloting the DSM perceived risk questionnaire items

Once the final changes from expert review discussions were made, the developed perceived risk items were subjected to a piloting phase, for final revision and testing of the questionnaire sections.

A paper-and-pen questionnaire draft was designed for a pilot study. Participants were recruited on a convenience basis from dental students and dental professionals. Recruitment was carried out with the assistance of class representatives, who were asked to provide invitations to their classmates; dental professionals from clinical settings were also approached and asked to participate.

A total of 18 participants completed the questionnaire (four undergraduate students, seven postgraduate students and seven dental professional staff) between 1 and 9 March 2020. The PhD researcher was present, who took notes and asked participants whether they noticed any unclear questions or had recommendations for further improvement. The demographic data of participants are represented in Table 3. 8.

Table 3. 7 Descriptive statistics of the demographics of the pilot study participants (N=18).

| Variables | N (%) |
|---|---|
| **Gender** | |
| Male | 8 (44.4) |
| Female | 10 (55.6) |
| **Type of participants** | |
| Undergraduate dental students | 4 (22.2) |
| Postgraduate dental students | 7 (38.8) |
| Dental professionals' staff | 7 (38.8) |
| **Age** | |
| 16 to 24 | 4 (22.2) |
| 25 to 34 | 13 (72.2) |
| 35 to above | 1 (5.6) |

Descriptive statistics of the perceived risk items for the pilot study are provided in Appendix D, Table 9. 9.

Generally, dental students and dental professionals found the questionnaire questions to be simply worded and straightforward. The number of items that provoked discussion was relatively small; most of these were related to minor differences in how they interpreted item wording.

The wording and phrasing of some perceived risk items were modified accordingly, to be clearer and more understandable. For example, for the item "*I find it risky to accept a friend request from a patient*", some students were uncertain about the issue described. Students suggested changing the wording of the question to add the reason why such

behaviour might be risky, in order to answer more accurately: "*There is a risk of blurring the professional boundaries if I accept a friend request from patients when using DSM.*"

Similarly, for the "*DSM are wasting my time*" item, the students wondered if this included using DSM during the weekend. What about using DSM during break-time? The main response was that it depends on what time the DSM are used. That is, instead of asking about the possibility of wasting time while using DSM, a possible reason why DSM usage could waste time was added to this item, to enhance clarity: "*There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks.*"

Moreover, four dental students and six dental professionals considered the questionnaire to be quite long; the average time to complete it was approximately 7-8 mins.

Based on the pilot study, the initial assessment of the questionnaire items' reliability was conducted using Cronbach's alpha. The perceived risk questionnaire items demonstrated an excellent overall reliability, with an alpha coefficient of 0.892 (Tavakol & Dennick, 2011). Generally, piloting the questionnaire helped to evaluate and revise the phrasing and content of the questions, explore issues with the overall questionnaire structure, and estimate the time needed for responses.

### 3.6.5 Questionnaire Administration

As mentioned in section 3.3.2, the questionnaire was administered online and consisted of five main sections, as follows:

A. Participants Information Sheet (PIS).
B. Consent form statements.
C. Demographic information (3 items).
D. Types of DSM platforms and frequency of use (2 items).
E. DSM perceived risk items (38 items).

**Section (A): Information sheet for participants.** To ensure that the invited participants were sufficiently informed about the study, a participant information sheet (PIS) was placed as the first page of the study online form (Mahon, 2014). Participants were also given an option to download a copy of the PIS before accessing the next section.

This page included succinct detail that allowed dental students and professionals to make an informed decision about taking part in the study (e.g., an invitation paragraph, the purpose of the study, the content of the questionnaire, the possible risks of participation, and how data will be handled) (see Appendix B, Study 2 participant information sheet).

**Section (B): Consent form.** The second section of the questionnaire included eight items of the consent form and a checkbox selection. Participants ticked and provided an affirmative answer to allow access to the next page (see Appendix B, Study 2 consent form).

**Section (C): Demographic information.** This section consisted of three demographic questions related to the respondent's gender, age, education level and curriculum, with a categorical scale.

**Section (D): Type of DSM platforms and frequency of uses.** This part included two questions to obtain the most used DSM platforms and hours that participants spent on DSM per day.

**Section (E): Perceived risk items of using digital and social media.** Overall, this section consisted of 38 items to measure perceived risks of using DSM (see Appendix D, Figure 9. 7 Study two DSM perceived risks questionnaire.

### 3.6.6 Statistical Procedures for Data Analysis of the Questionnaire Responses

The statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS®) computer package (Version 27, IBM Corp. Chicago, IL). Statistical advice and support were sought from FODOCs Oral Clinical Research Unit. The following statistical procedures were carried out:

#### 3.6.6.1 Descriptive statistics

The descriptive statistics were calculated to examine the means, standard deviations, median and interquartile range of the 38 DSM perceived risk items (see Appendix F, Table 9. 12). Categorical data of demographics, type of DSM platforms and frequency of DSM use were presented in percentages and frequencies in Chapter Five.

#### 3.6.6.2 Exploratory Factor Analysis (EFA)

Study 2 aimed to explore the underlying perceived risk factors among the questionnaire items in the analysis. Thus, an iterative Exploratory Factor Analysis (EFA) was performed to obtain a factor structure of DSM perceived risks, with both empirical and conceptual support. The EFA method provided evidence of factors' validity and unidimensionality by establishing a simplified structure and a parsimonious solution of factors (Hair et al., 2014; DeVellis, 2017). Furthermore, the EFA method was considered suitable in the present study because the developed questionnaire was being administered for the first time in the dental context.

*Testing Assumptions of Factor Analysis*

Before computing EFA, two statistical tests were conducted to determine the suitability of collected data, as follows:

- *Measure of Sampling Adequacy (MSA):* The MSA index ranges between 0 and 1. An MSA measure close to 1 indicates sampling adequacy (i.e., 0.8 and higher are

recommended, and less than 0.5 is undesirable) (Mvududu & Sink, 2013; Yong & Pearce, 2013; Hair et al., 2014).

- A statistically significant result of *Bartlett's test of sphericity* (sig. < .05) should be obtained. The significance indicates that sufficient correlations exist among the questionnaire items, in order to proceed to EFA (Williams et al., 2010; Samuels, 2016).

After the assumptions of EFA were met, an iterative EFA principal component factor analysis (PCA) approach with a varimax (orthogonal) rotation method was applied, for building solutions to determine the number of factors that will account for the maximum variance explained (Williams et al., 2010; Yong & Pearce, 2013).

*Determining the number of factors*

The number of factors to retain was decided by applying the following criteria:

- *Latent root criterion (eigenvalue).* This criterion suggests keeping any factors having eigenvalues greater than 1.
- *Percentage of variance criterion.* This criterion recommends that the extracted factors explain a large amount of variance, with an average > 50% of variance accounted for (Williams et al., 2010; Peterson, 2020).
- *Scree test criterion.* This criterion presents a visual illustration of eigenvalues and factors before rotation. Two ways to inspect the scree plot were applied: by drawing a line from the smaller eigenvalues point until the break appears, or by considering the data points that occur before the break (elbow) to indicate the number of factors (Williams et al., 2010).
- *Prior research/theory criterion.* This criterion determines the approximate number of factors that can be extracted, based on previous studies and theories.

*Factor loadings and labelling*

The factor loading represents the correlation between a specific item and its factor. In this study, items with loadings > 0.35 were considered to have practical significance (see Hair et al., 2014, p. 115). Previous authors suggest that any item with loading values of > 0.35 on more than one factor, or a load of less than 0.4, should be omitted from further analysis (Costello & Osborne, 2005; Yong & Pearce, 2013; Hair et al., 2014). This procedure will produce a stable factor structure and makes interpreting the factors easier. The results of the EFA analysis will be presented in Chapter Five.

Moreover, the communality values of items were analysed, to assess how much variance in a particular item is accounted for by the factor solution. The communality value of > 0.5 was considered acceptable (Hair et al., 2014).

Finally, the extracted factors were labelled to give each factor a meaningful definition and meaning for interpretation. Williams et al. (2010) noted that the process of labelling factors is a "subjective, theoretical, and inductive process and ultimately dependent on researcher definition". As a general rule, items with the highest loadings on each factor are supposed to be expressive of the factors underlying them (Yong & Pearce, 2013; DeVellis, 2017). Figure 3. 3 below summarises the steps of exploratory factor analysis (EFA) carried out in this study.

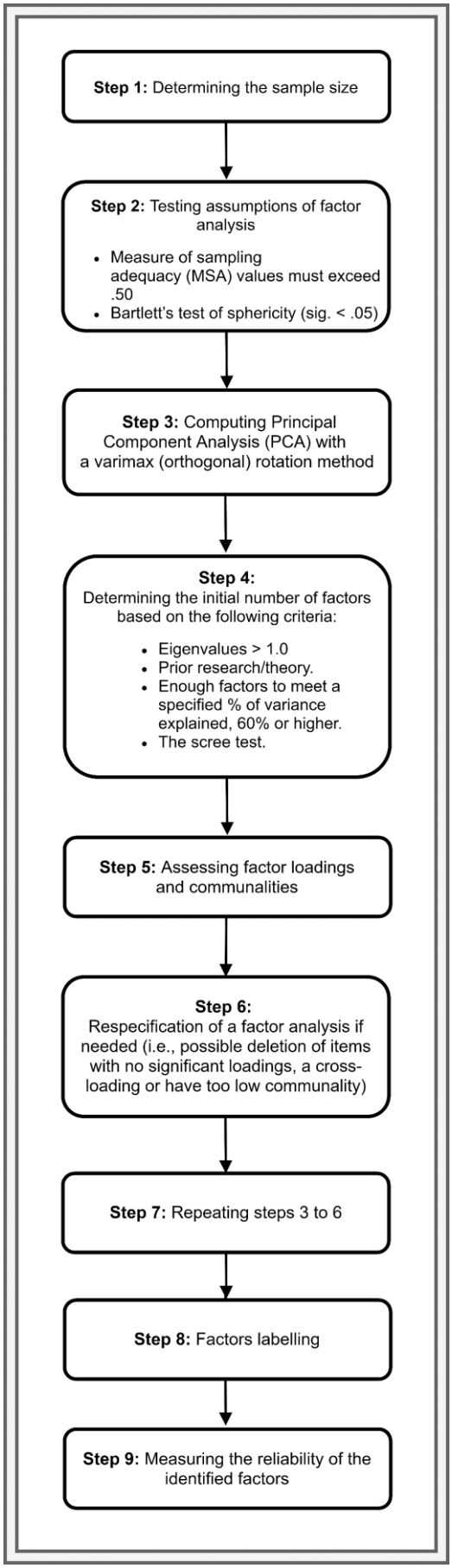


Figure 3. 3 The steps of exploratory factor analysis (EFA)

#### 3.6.6.3 Reliability analysis

The Cronbach's alpha (α) coefficient was used to measure the reliability of the derived perceived risk factor. Cronbach's (α) determines the intercorrelations of the items in the individual factor and the correlations of the items with the questionnaire as a whole. It assesses how all items of the factor fit together and whether they evaluate the same factor (DeVellis, 2017). Although there is no consensus in the literature about the (α) level to be accepted, Cronbach's (α) of > 0.7 is usually preferable, and 0.6 in exploratory research was satisfactory (see Hair et al., 2014, p. 123) (The results of the reliability analysis are presented in Chapter Five).

#### 3.6.6.4 DSM perceived risk factor scores

To quantify how strongly respondents agree with the derived DSM perceived risk factors, the mean factor scores for each respondent were calculated by averaging item scores of the items with the highest loading on a specific factor. Then, factor scores were averaged across all respondents to calculate total mean scores for each derived factor. In Study 2, the factor scores range from 0 to 5, with scores closest to 5 indicating the strongest agreement (salience) of the factor (the results of the salient DSM risk factors are presented in Chapter Six).

### Comparisons between factor scores based on participants' education level

To compare the differences in agreement between undergraduate, postgraduate dental students and dental professionals' groups, factor scores were expressed as means (± standard deviation) and medians (interquartile range) for each compared group. The normality of data was checked using visual inspection (a histogram, Q-Q plot, and box plot) and normality tests (Shapiro-Wilk's test and Kolmogorov Smirnov's test). Normality was assumed if any two of the above were showed to be normal. If data were normally distributed, and independent samples *t*-test and one-way ANOVA were used to compare

the mean outcome measures between groups. If data were not normally distributed, a non-parametric Kruskal Wallis test and Mann Whitney test were used. Statistical significance was assumed at the 5% level. All the analyses were carried out using SPSS version 27.0.

## 3.7 Chapter Summary

This chapter has described the methodological approach and the procedures utilised in this research, as follows:

- A mixed-methods procedure was used, adopting an exploratory sequential approach, starting with a qualitative study (interviews), followed by a quantitative study (questionnaire).
- In Study 1 (the qualitative study), face-to-face semi-structured interviews were the chosen data collection method, in order to reveal preliminary perceived risk themes and inform the following questionnaire study.
- In addition to obtaining a comprehensive understanding of the risks of using DSM in the general and professional contexts, the qualitative study helped to inform the questionnaire items and created a more accurate measure for the next study.
- In Study 2 (the quantitative study), the questionnaire as a data collection instrument was utilised to establish dental students' and professionals' underlying perceived risk factors of using DSM. It was also employed to examine the validity and reliability of the explored factors, as well as to determine the importance of and differences in perceived risk factors between dental students and professionals.
- This chapter also illustrated how the sample was chosen and the data were collected and analysed, along with the essential ethical concerns.

# 4 Chapter Four: Identification of Perceived Risks Affecting the Usage of DSM in the General and Professional Contexts: A Qualitative Study

## 4.1 Introduction

The purpose of this chapter is to present the analysis of the interview data collected as discussed in section 3.3.1 for Study 1 (the qualitative study), and the respective results obtained using procedures discussed in section 3.5.

This qualitative study was conducted to address the first and second research questions, "What are the perceived risks of DSM use that can be identified by dental students and dental professionals?" and "Are the identified risks associated specifically with their use in the professional context and/or general context?". The data were collected using face-to-face semi-structured interviews to gain deeper insight into how dental students and professionals perceived DSM risks.

The chapter begins by outlining the preliminary working coding scheme. It then presents the perceived risk themes identified in the interviews with dental students and dental professionals. Furthermore, it sheds light on the differences of perceived risk themes associated with using DSM in the general and dental professional contexts. The chapter then presents a discussion to compare and contrast the identified perceived risk themes with those factors found in the existing literature (e.g., Featherman & Pavlou, 2003; Khan et al., 2014). It also discusses the perceived risk themes that are specific to dental students and professionals. The last section of the chapter highlights the limitations of the results, and how these will be addressed in the following quantitative study.

## 4.2 Study Participants

A total of 21 participants volunteered to participate. The participants' demographics are presented in Table 4. 1; the median age of the dental students was 22 years (range 18–35), and the dental professionals' median was 33 years (range 31–51).

Table 4. 1 Participants' demographics (Number of participants in semi-structured interviews = 21).

| Education level | Gender | | Age range |
|---|---|---|---|
| | Male | Female | |
| **Dental Students** | 6 | 5 | (18-35) |
| **Dental professionals** | 6 | 4 | (31-51) |

## 4.3 The Identified Codes from the Interviews

From the 21 semi-structured interviews, responses were transcribed and analysed using thematic framework analysis as explained in section 3.5.3. As a result, a total of 302 codes were identified (140 risk codes and 162 non-risk codes), as shown in the examples below (Table 4. 2). The perceived non-risk codes identified during the analysis of the interviews are not the scope of this research and will deal with it in future works (Appendix E, Table 9. 11).

Table 4. 2 Examples of risk coded transcripts.

| Interviewee no. (Date, time) | Transcription codes | Codes labelling |
|---|---|---|
| DS.11 (27/11/2019, 17:00) | *"I would have to look to the information that I have been given from professors, lecturers and books because that is evidence-based, but on YouTube and Google, you have to be careful in terms of what you are taking as evidence-based or not".* | Non-evidence-based information |
| DP.6 (15/10/2019, 16:30) | *"Someone can easily photoshop and play with the quality of clinical work and enhance how the treatment looks like".* | Being deceptive in dental promotion |
| DS.9 (06/06/2019, 13:00) | *"I think I need to be careful. Because even I get patient consent to share a photo on the internet, it's not a green card".* | Obtaining explicit consent |
| DP.9 (27/11/19, 12:40) | *On social media, people will interfere and invade your personal life. They will try to know more about you, your patients and your works and everything*". | Intrusion into personal space |

## 4.4 The Coding Scheme

The coding scheme was written following the method suggested by DeCuir-Gunby et al. (2011), and included perceived risk code labels, definition or characterisation of the codes, and examples (see Table 4. 3)

Table 4. 3 The coding scheme developed based on the literature review and interview transcripts.

| Perceived risk codes | Definition | Example |
|---|---|---|
| **Scrutiny and negative comments concerns** | The possibility of receiving negative comments and criticism due to using DSM. | "*I will receive negative remarks from others if I use DSM*." |
| **Disclosure of personal data without the user's knowledge** | The potential loss of control over personal information leads to the information being used without the user's knowledge or permission. | "*Someone else can take the photo that I posted in my profile and use it without my consent*." |
| **Intrusion into personal space** | The state when one's personal/private life is observed or disturbed by others. | "*Using DSM would lead others to observe my private life*." |
| **Fear of hacking and identity fraud** | The potential loss of control over one's DSM profile and account, due to hacking and criminal attack. | "*Internet hackers (criminals) might take control of my checking account if I used a DSM*." |
| **Negative effect on self-esteem and self-image** | The possibility of an adverse effect on the users' peace of mind or self-esteem from using DSM. | "*I believe that DSM does affect self-esteem due to exposing users to a vast number of photos, such as ideal body image that would affect self-esteem or self-image*." |
| **Spending excessive time** | The possibility of losing time when using DSM by wasting time searching and browsing various activities on DSM. | "*There is a possible time loss due to engaging in different activities on DSM*." |
| **Being distracted from doing pertinent tasks** | The possibility of losing the time for doing important tasks (e.g., studying, exercising, etc.) | "*If you had begun to use DSM, there are chances that I will lose time for doing other essential tasks*." |
| **Issues with accepting friendship with patients** | The state of breaching the professional boundary when dental professionals accept friendship invitations from patients on DSM. | "*It might blur the professional boundary with patients, but if you have a professional account on an Instagram account and patients follow* |

| Perceived risk codes | Definition | Example |
|---|---|---|
| | | *that professional profile, it's not too much issue because it's not your personal account*." |
| **Abusing professional relationships with clinical teachers** | The possibility of blurring the professional line between dental faculty staff and their students when interacting on DSM. | "*People could cross the boundaries and professionalism, and at the end of the day, you have to have a strictly professional relationship with your lecturer, not too friendly one*." |
| **Social loss** | The potential loss of status in one's social group due to adopting DSM. | "*My signing up for and using DSM would lead to a social loss for me because my friends and relatives would think less highly of me*." |
| **Financial loss** | The potential loss of money due to adopting DSM. | "*There are the chances that you stand to lose money if you use the DSM*." |
| **Performance issues** | The possibility of the DSM not performing as it was designed and advertised. | "*DSM might not perform well and create problems*." |
| **Lack of validity and reliability of the information** | The possibility of using/sharing unreliable and invalid information on DSM. | "*The information posted on DSM is poorly referenced and unreliable*." |
| **Non-evidence-based information** | The possibility of using/sharing non-evidence-based information on DSM. | "*On YouTube and Google, you have to be careful in terms of what you are taking as evidence-based or not*." |
| **Information is lacking in quality assurance** | The possibility that the information shared on DSM is not critically appraised to ensure its quality. | "*The information posted on DSM is lacking in quality assurance*." |
| **Facing disciplinary action from regulatory bodies** | The possibility of facing disciplinary action due to using DSM. | "*You must be aware and do not make a mistake when using DSM, to avoid disciplinary action*." |
| **Legal and ethical issues** | The possibility of exposure to legal penalties due to using DSM. | "*There is a risk of legal and ethical issues associated with DSM usage*." |

| Perceived risk codes | Definition | Example |
|---|---|---|
| **Not following governing bodies' guidelines** | The possibility of violating guidelines when using DSM. | "*It is crucial to make sure that all the regulations are followed when using DSM*." |
| **Breaching patient confidentiality** | The possibility of violating and breaching patients' confidentiality when using DSM. | "*I believe that using DSM is good as long as they do not expose patient privacy*." |
| **Obtaining explicit consent** | The possibility of sharing patients' information on DSM without explicit consent. | "*There is a risk of sharing patients' photos on DSM without explicit consent*." |
| **False and misleading information** | The state of sharing misleading information when using DSM. | "*There are lots of misleading and false information shared on DSM*." |
| **Damage the professional image and reputation** | The state of damage to one's professional image when using DSM inappropriately. | "*I think using DSM is risky because anything you put could stay forever and consequently affect your professional image*." |
| **Being deceptive in dental promotion** | The state of sharing deceptive dental promotion on DSM. | "*Someone can easily photoshop and play with the quality of clinical work and enhance how the treatment looks like*." |

## 4.5 The Identified DSM Perceived Risk Themes

The risk codes were assigned to 21 sub-themes, then clustered to identify nine main risk themes (Figure 4. 1). Further scrutiny of the characterisations of the 21 subthemes was completed. This revealed three themes that were more associated with using DSM in the general context, and six that were more related to DSM use in the dental professional context (Figure 4. 2). Table 4. 4 presents the distribution of themes by the number of participants and the frequency of occurrences.

In the following sections 4.5.1 and 4.5.2, each perceived risk theme is defined and presented with illustrated exemplar quotes from participants, to explain the grouping of the general and the dental professional context themes.

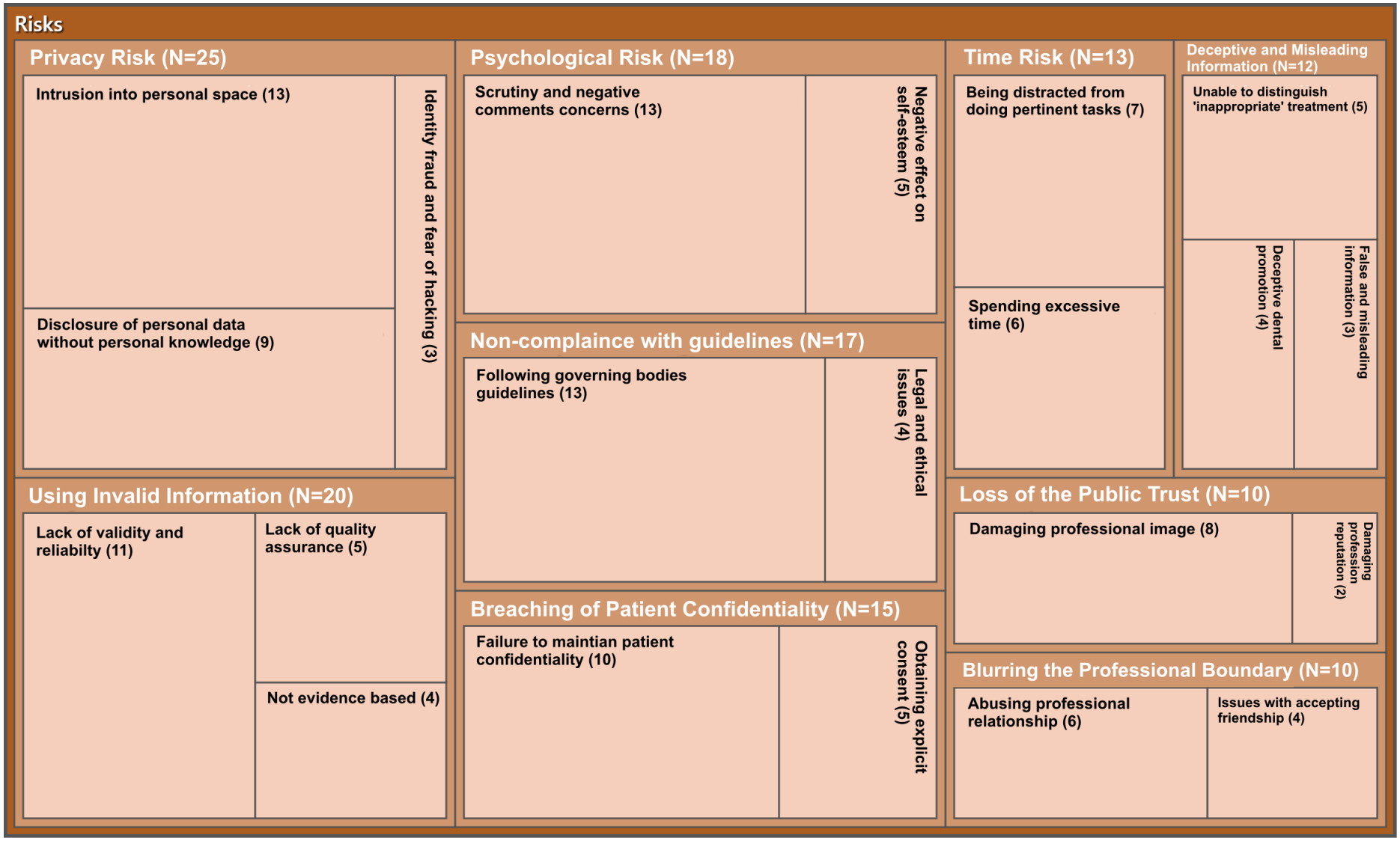


Figure 4. 1 A tree map shows the relative proportions (occurrences) of each code within the nine perceived risk themes.

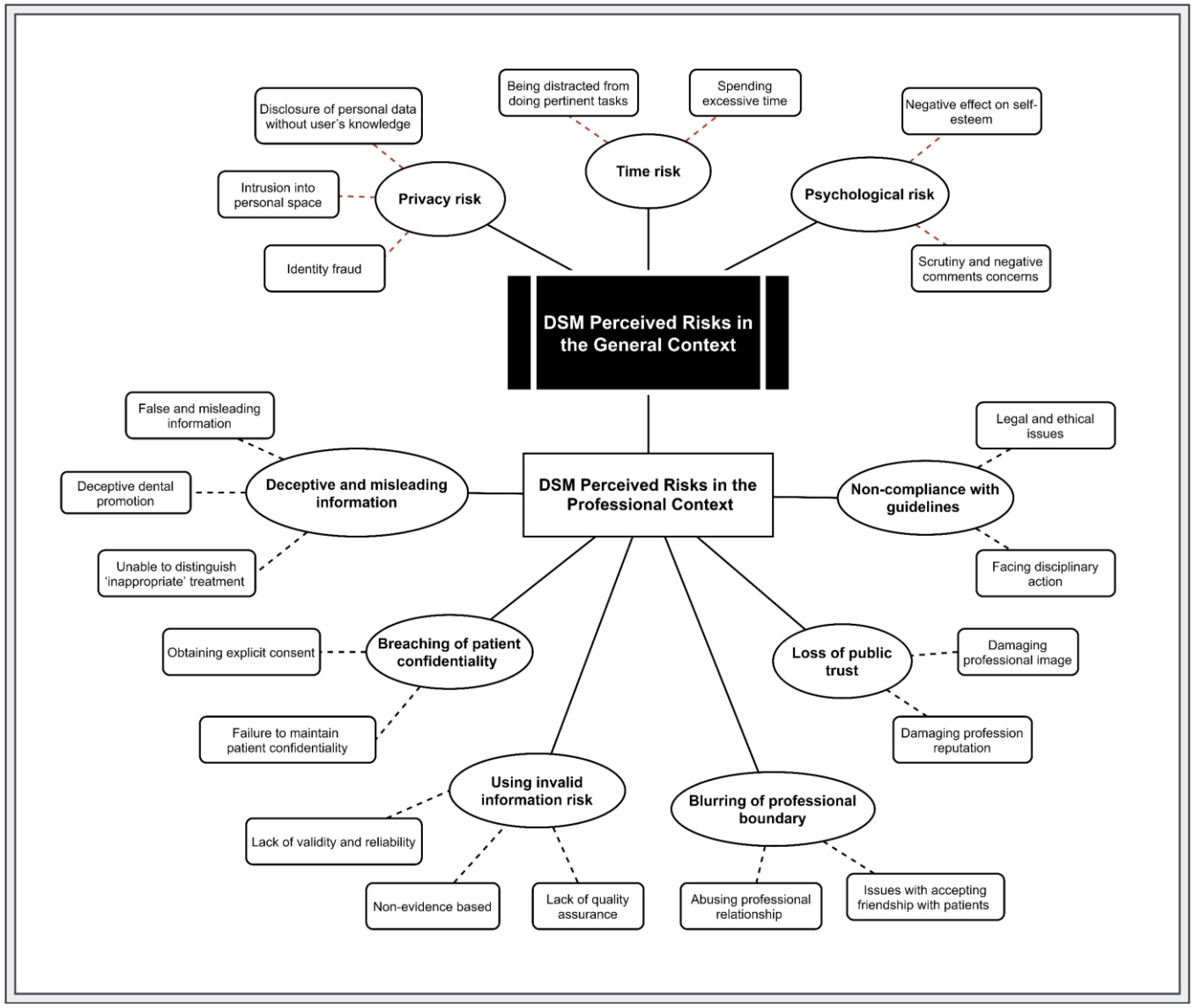


Figure 4. 2 Thematic map showing the 21 sub-themes (rounded rectangular shape) and nine main themes (oval shape).

Table 4. 4 Distribution of perceived risk themes, by total number of participants interviewed (N=21) and total number of occurrences (N=140).

| **(A) Perceived risk themes associated with the use of DSM in general context** | | |
|---|---|---|
| **Themes** | **Number of participants** | **Number of occurrences** |
| ❶ **Privacy risks** | 14 | 25 |
| ❷ **Psychological risks** | 14 | 18 |
| ❸ **Time risks** | 11 | 13 |
| **(B) Perceived risk themes associated with the use of DSM in the dental professional context** | | |
| ❹ **Using Invalid information** | 14 | 20 |
| ❺ **Non-compliance with guidelines** | 10 | 17 |
| ❻ **Breaches of patients' confidentiality** | 10 | 15 |
| ❼ **Deceptive and misleading information** | 9 | 12 |
| ❽ **Blurring of professional boundaries** | 8 | 10 |
| ❾ **Loss of public trust** | 7 | 10 |

### 4.5.1 Results of Perceived Risk Themes Associated with the Use of DSM in the General Context

**Theme ❶ Privacy Risks**

Privacy concerns have appeared as one of the main perceived risks associated with using DSM. There were three key privacy concerns that dental students and dental professionals mentioned:

a) The risk of intrusion into their personal space when revealing personal information, such as posting and publicly sharing private photos and specific personal life areas on DSM. They preferred to use DSM within a narrow circle of people, such as family and friends, without invasion from stranger users. For example, one dental student mentioned that "*My personal accounts are private, and only my friends and family members follow me*" (DS.9). Similarly, one dental professional supported this view by explaining: "*My social and private life on DSM I'd rather only share it with my friends and colleagues but not to be exposed to the public users*" (DP.7).

b) The challenges of protecting and managing personal information on DSM also emerged from interviews. "*All photos are on the internet technically forever so any people can download and share it*," (DS.9) one dental student explained. Another dental professional explained, "*I do post a picture of myself in personal life, but I have a very small circle of people who can visualise and access that because it's a private account, but these posts are still recorded and stored somewhere within the networks*" (DP.8).

c) Other aspects of privacy risks were identified, such as identity fraud. It is clear that the wide availability and easy accessibility of personal information on DSM could lead to identity fraud and ID theft. For example, one dental professional described how the information on DSM allows scammers to steal users' identity and sensitive information. He

explained, "*Someone can create a fake account and posting stuff as yourself*" (DP.6). Another dental student said, "*I am trying to decrease DSM usage due to the fact that everyone knows so much about you*" (DS.6).

**Theme ❷ Psychological Risks**

The discussion about psychological issues associated with using DSM emerged among dental students and professionals. They pointed out two main concerns in this theme:

a) The difficulty of protecting their posts on DSM from scrutiny, and receiving negative comments, which adversely affected feelings and moods. For example, one dental student described this situation by saying that "*Some people posting their work […] they think it is good but everyone else just like making fun of their work saying that your work is bad, it is too invasive […] there always risks like humiliation, and personally I do not like that*" (DS.9). Also, dental professionals mentioned that they decreased their interaction with people through DSM, as their posts could be exposed to negative comments. One dental professional commented, "*I do not like to use DSM, to avoid any unnecessary negative comments that are inconvenient for me*" (DP.5).

b) Another psychological issue was the negative effect on self-esteem. Using DSM is dominated by creating and posting visual contents, including sharing photos and videos of dental works and receiving comments and feedback. Looking at such information on DSM might affect one' self-esteem. For example, one dental student described, "*When I look at these sorts of fantastic aesthetic cases or reconstruction cases, should I do similar? Is this the normal dentistry that should I do? I get worried. Maybe I'm not good enough, and perhaps my clinical work is not good enough to be at that sort of level at the moment*" (DS.7).

**Theme ❸ Time Risks**

The issue of spending too much time on DSM emerged during interviews. DSM platforms use a variety of means that encourage users to engage and spend time. One dental student noted, "*If you are browsing, you can spend ages browsing and achieving nothing in your work, especially if you have a deadline*" (DS.11). Another dental professional supported this opinion and reported that using DSM in browsing and socialising with others wasted time and hindered him from doing pertinent tasks: "*With regard to personal use, it is very time-consuming, it keeps you away from daily physical activities just by staying on it and browsing*" (DP.8).

One dental professional discussed how DSM required devoting considerable time to communicating and interacting with others, which added an extra workload to her usual academic duties. She said, "*I do not have time. It really needs dedication, and some people are posting dental cases on a regular basis every single case, then they discuss it and respond to people*" (DP.1).

### 4.5.2 Results of Perceived Risk Themes Associated with the Use of DSM in the Dental Professional Context

**Theme ❹ Using Invalid Information**

The concerns about the questionable information published and disseminated through DSM were the primary issue associated with professional DSM use among dental students and professionals. They mentioned three main views:

a) Noticing poorly referenced and non-evidence-based information was common on DSM. One dental student noted, "*There is much information out there, you do not know what is evidence-based and what is not*" (DS.11). Another student supported this claim by giving a

more explicit example: "*Sometimes is questionable and sometimes the stuff we learn is different from what they are doing*" (DS.6).

b) There is a need for the cautious use for such information due to lack of quality assurance: "*There is no filtering feature that helps the user to distinguish between the right and wrong information*" (DP.9), explained one dental professional. Similarly, a dental student agreed with this view: "*It can be useful because it shows you how to do [E-max preparation], but I think the lack of quality assurance is an issue*" (DS.7).

c) The difficulty in ascertaining the validity of the information on DSM was also mentioned during the interviews. One dental professional noted, "*people just grab the information without knowing the source or the reference behind it. Literally, most of the people do not know if the information is valid and reliable unless you are a person from the medical field who can go and search and then know how reliable the information you got*" (DP.8).

**Theme ❺ Non-compliance with guidelines**

Dental students and professionals manifested their awareness of DSM guidelines issued by professional governing bodies, and subsequent disciplinary actions if they do not comply with these guidelines. They reported two central views:

a) The seriousness of the breaking governing bodies and university DSM guidelines. One dental student noted: "*If you are a dental student, you have to be aware of guidelines and do not make a mistake on DSM that leads to drop off your degree and get you in trouble*" (DS.11). Another student explained such concerns by stating that "*When you post something on DSM could be misinterpreting and breach the GDC guidelines even if it is not something majors like racism or something bad, it could be interpreted as a negative or something incorrect*" (DS.4).

b) The importance of complying with DSM guidelines to avoid legal and ethical complexities. One dental professional remarked: "*It is good to make sure that all the regulations are followed, no modifications made on the posted photos, and consent is achieved from the patient*" (DP.3).

**Theme ❻ Breaches of Patients' Confidentiality**

Dental students and professionals considered patient confidentiality to be a core element in healthcare consultations and treatment. There was a discussion about posting or sharing patients' information (e.g., dental procedures included patients' photos) on DSM, even with obtained consent. They gave reasons such as:

a) The difficulty of withdrawing information once it has been uploaded on DSM. One dental student explained, "*All photos are on the internet technically forever, so any people can download and share it. There is like a sticky situation to do that*" (DS.9).

b) The consent might not incorporate explicit agreement to post information on DSM. According to a dental student, "*I will go against [posting patients' photos] because when the patient gives you the consent is not for posting online, it is for learning uses*" (DS.8).

**Theme ❼ Deceptive and misleading information**

Dental students and professionals pointed out three issues associated with dental and oral health information that was posted for advertising or education.

a) The dental advertisements shared on DSM could deceive and harm the patients (such as through do it yourself (DIY) dental treatments and Hollywood smile advertisements). "*The public, unfortunately, gets a lot of wrong information from all DSM platforms, I think people are promoting information of people to get benefit from it like [Snap-On Smile] get so much publicity*" (DS.3), as one dental student explained.

Also, another student gave an example of such potential deceptive dental advertising on DSM. He stated, "*You see cases like up to three-to-three crowns or veneers and did the patients need that? I think that's where the danger is when you go out, and people think that this is the normal treatment, and that's the problem*" (DS.7).

b) Another crucial claim was that the public, including dental patients, lacked sufficient knowledge to differentiate between right and wrong information relevant to their oral and dental health. For example, one dental professional explained, "*As you know, each case scenario is different, and we are as a dentist, we can differentiate between the right and wrong treatment. Still, as a patient, when they see the outcome, they think that's correct, especially in aesthetic dentistry and veneers, which sometimes it looks magnificent for patients but not functional. Not all patients need this aggressive treatment. So, the public can get a false image from DSM promotion and think they have to do the same cases*" (DP.7).

c) The problem of receiving misinformation or false information disseminated on DSM, in relation to dental and oral health; especially those posts created and shared by non-specialised dental professionals. One professional explained, "*You can easily get fake information or untrue information because not all the posts are created or written by dental professionals*" (DP. 6).

**Theme ❽ Blurring of professional boundaries**

Respondents reported how DSM blurred the professional boundary. One view described the interaction between dental professionals and students as inappropriate and informal. One dental student said, "*If I tag him on the Facebook post and say hi mate, this would be less professional*" (DS.1). Similarly, dental professionals believed that their position as educators placed them in a conflict position when interacting with their dental students on

DSM. Therefore, they favoured maintaining a clear boundary between their professional and personal lives. One dental professional noted, "*I think it is good to have a barrier between professional life and personal life, and I think sometimes that barrier can be quietly abused*" (DP.3).

The other view in this theme was the risk of breaching the professional boundary with patients, specifically in friendships with patients on DSM. One dental professional commented: "*I would not accept [a friend request] because it is not professional, they are not my friends, I have to consider the professionalism and professional relationship*" (DS.8).

**Theme ❾ Loss of Public Trust**

The potential negative impact on dental professionals' reputation and their affiliated institutions, especially if they share unprofessional content, emerged during the interviews. "*I would not post anything which someone could question about me as a dental professional*" (DS.8), explained one student. Another student highlighted the issue of the negative digital footprint on DSM, as it will be impossible to delete it or change it. "*I think DSM is risky because anything you put could stay forever and affect your professional image, especially if you are a dental student*" (DS.4).

In addition, the importance of maintaining professionalism was noted. One dental professional explained: "*If you set up your professional profile, you cannot be like a normal user as a perception! You cannot be a guy who is having a party on Sunday or the weekend and posted on DSM. You have to be a professional person*" (DP.2).

(Additional example of quotes for each perceived risk themes provided in Appendix E Table 9. 10).

## 4.6 Discussion

The first research question in this study sought to identify the DSM risks as perceived by dental students and dental professionals. This question has been answered by identifying nine perceived risk themes that affect the use of DSM. These perceived risks were explicitly defined with supporting quotes in the previous section.

The second research question asked, "Are the identified risks associated specifically with their use in the professional context and/or general context?". Of the nine identified risks, three perceived risk themes were in line with those of previous studies in e-commerce (presented in Chapter Two, section 2.3) and could affect any DSM users (i.e., psychological risks, privacy risks, time risks) (Featherman & Pavlou, 2003; Khan et al., 2014; Munnukka & Järvi, 2014). Six perceived risk themes were in agreement with earlier studies (presented in Chapter Two, section 2.4) concerning DSM use in the professional context – such as non-compliance with guidelines, breaches of patient confidentiality, and using invalid information (Bhola & Hellyer, 2016; Kenny & Johnson, 2016; Greer et al., 2019).

This categorisation indicated that DSM impacted both the professional and personal life of dental students and dental professionals. When they used DSM in their personal life, they perceived similar risks to those noticed by any DSM users in a general context (Featherman & Pavlou, 2003; Khan et al., 2014). With regard to the DSM risks in the general context, one of the major risk themes cited by both dental students and professionals was privacy. This finding broadly supported the work of other studies in this area, which found that privacy concerns are a crucial factor explaining people's reluctance and dissatisfaction in using DSM (Aldás-Manzano et al., 2009; Khan et al., 2014). This may be explained by the fact that DSM encourages users to interact and socialise with friends, relatives and companions by revealing information, such as sharing personal

photos, thoughts, hobbies and interests with others. This sort of interaction is neither secured against outside parties nor able to be protected. This concern was clearly expressed during the interviews. For example, one dental professional reported, "*On DSM, people will interfere and invade your personal life. They will try to know more about you, your patients and your works and everything*" (DP.9). A comparable finding was reached previously among a sample of dental students and dental educators, where 60% stated that privacy concerns were the most important reason for not using DSM (Arnett et al., 2013, 2014). In both previous primary studies, the main concern was with the general privacy settings of DSM, for limiting others' access to users' information. In contrast to earlier results, however, this study extended the DSM privacy issue to involve broader aspects of this particular risk, such as identity hijacking and personal data invasions.

Moreover, one of the main themes identified in the general context was the psychological risk. Dental students and professionals highlighted two key aspects within this theme: scrutiny and receiving negative comments, and the negative effect on self-esteem. Emerging from this theme was an unexpected finding, suggesting that dental students and professionals perceive that others' decisions related to the use of DSM might have negative psychological consequences for them. It is somewhat surprising that no previous empirical studies among dental students and professionals have demonstrated this particular aspect of risk. However, psychological risk as a distinct factor affecting DSM use was extensively supported by several studies in e-commerce (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Khan et al., 2014; Kircaburun et al., 2019).

Furthermore, much of the current literature on DSM pays particular attention to the feasible link between using DSM and the adverse repercussions in terms of depression, self-esteem and emotion (Iwamoto & Chun, 2020; Keles et al., 2020). In this study, the probable explanation is that most interactions on DSM are unprotected from negative comments,

which may affect dental students' and dental professionals' self-esteem, causing feelings of emotional distress. This interpretation is consistent with data obtained in an earlier study by Davila et al. (2012). They found an association between the quality of online interactions and communications users experienced while using DSM, and depressive symptoms, including sadness and feelings of worthlessness. Another interpretation could be related to the prolonged time that dental students and professionals spend on DSM. According to Iwamoto and Chun (2020), in a sample of undergraduate students, significant positive correlations were observed between the hours spent using DSM, and depression, anxiety and stress. This claim was also suggested by a systematic review that analysed the data for a presumed relationship between DSM use and psychological and mental dilemmas among adolescents. The salient risk factors for psychological and anxiety suffering rising from this review involved time spent using DSM, and online behaviours such as continuous checking for messages (Keles et al., 2020). Another possible reason for emerging psychological issues could be social comparison, especially among the younger age group. In this study, one undergraduate student stated that this issue of DSM lowered his self-esteem: "*When I look at these sorts of amazing aesthetic or sort of full mouth reconstruction, I asked myself should I do similar? Is this the normal dentistry that should I do? And that is where I get worried maybe I'm not good enough, and maybe my clinical work is not good enough to be at that level at the moment, and what I should I do to get to that level*" (DS.7). This finding is in line with a study that found a link between social comparison due to DSM usage, and psychological problems (Latif et al., 2021).

The present study found that risks specifically pertaining to the dental professional context appeared profoundly during interviews, with six identified perceived risk themes. This result of the analyses show that perceived risk themes attributed to using DSM in the

professional context could significantly influence dental students' and professionals' use of DSM.

The most important risk recognised by dental students and professionals was their concern about the information disseminated and circulated on DSM for learning and education purposes. In the interviews, they used phrases such as "*invalid*", "*incorrect*", "*unreliable*" and "*not evidence-based*" to describe this type of information. This critical perceived risk theme also accords with previous reviews, which explained the serious implications of using invalid information for dental students' education and dental professionals' evidence-based practice. For example, in their review paper, Bhola and Hellyer (2016) claimed that it is compelling for dental students before graduation to gain the necessary skills to appraise the quality information they access on DSM. Similarly, Ventola (2014) reported that DSM became an open-learning resource and provided educational content through a user-generated content feature. However, much information dispensed is neither reviewed for its validity nor based on trustworthy sources.

Another perceived risk theme concerned the importance of compliance with governing bodies' DSM guidelines. During the interviews, dental students and professionals discussed how to properly use DSM in line with existing guidance, and to avoid committing any potential unprofessional behaviour that could lead to disciplinary action or penalty. It can be noticed that this group of interviewees were conscious of their professional conduct. Quotes such as "*If you are a dental student, you have to be aware of guidelines and do not make a mistake on DSM*" (DS.11) appeared during interviews. This theme seems to be consistent with previous empirical studies which highlighted that dental professionals and students struggled to adhere to governing bodies' DSM guidance, or to understand professional behaviour related to their presence on DSM (Neville & Waylen, 2015; Kenny & Johnson, 2016; Knott & Wassif, 2018). This situation also corresponds

with individual universities and dental schools that have drafted and implemented social media guidelines for their faculty members and students. It is expected that dental professionals and students will comply with these guidelines, as any breach could lead to disciplinary action (Neville, 2017a).

Moreover, nearly half of dental students and professionals highlighted the issues regarding a potential breach of patient confidentiality if they share their clinical work, including treatment cases, on DSM. Some reported that posting patients' photos is entirely unacceptable even with obtained consent: for instance, one dental professional commented, "*I see it as a breach of patient confidentiality even with obtained consent form*" (DP.1). The possible explanation is that the essential aspect of most DSM consent forms is to protect patients' autonomy to withdraw their consent if they decide later. However, the internet and DSM in fact nullify this right. The dental regulatory body in the UK, the General Dental Council (GDC), clearly declared that posting unidentifiable patients' photos on social media is prohibited without explicit consent from patients (GDC, 2016). Furthermore, the GDC standards for oral healthcare teams highlighted some principles related to using DSM in the professional context, such as GDC standard 4.2.3: "You must not post any information or comments about patients on social networking or blogging sites". Patients should manifest an understanding of this reality before consenting.

Another perceived risk theme identified was deceptive and misleading information. This finding supports the previous finding by Shuttleworth and Smith (2016), that misleading information affects the delivery of treatment, care, or management of patients' expectations in clinical practice, as well as the rising incidence of cases influenced by the misinformation posted on DSM. This could open up new challenges for stakeholders in the oral and dental health system, with the increased sharing of commercially directed advertisements on such uncontrolled platforms. Similarly, Rana and Kelleher (2018)

supported this view and warned that such deceptive information could influence aesthetic dentistry, especially among young groups of patients exposed to this deceptive content, who would become sensitive about the perception of their facial and body appearance. In this study, a possible explanation for this theme may be the lack of control of content that appears on DSM. Anyone can post and share misinformation and inaccurate dental/oral information, which will be easily absorbed by the public, including patients. As one dental professional noted, "*It is an open space, and anyone can post anything and supported it as they want without any scientific basis*" (DP.1).

Blurring the professional boundary was a minor theme discussed in the interviews. Dental professionals found that they felt their position as an oral healthcare provider created a conflict of interests when networking online with patients; thus, they desired to maintain a distinct line between professional and personal relationships. Consensus existed among dental students and professionals regarding the inappropriateness of initiating or accepting friend requests with patients; they viewed it as a violation of professional boundaries: "*I would not accept [a friend request] because it is not professional, they are not my friends, I have to consider the professionalism and professional relationship*" (DS.8). Such perceptions could be explained by respondents' awareness of the GDC guidance and the ethical dilemmas surrounding such interactions.

The theme of protecting professional image and reputation on DSM was one of the issues about which dental students and professionals were genuinely concerned. With the recent increase in using DSM for professional and personal purposes, the call for careful use of DSM and maintaining one's professional reputation appeared during interviews. For instance: "*If I start publishing something on DSM, I have to think because maybe this should include my patient, as a dental professional*." (DS.2).

The reason for this emerging theme could relate to the type of education that dental students and dental professionals received during their undergraduate studies, with regard to keeping the public's trust and confidence in the profession. Therefore, unprofessional behaviour on DSM could, in some cases, ruin their professional reputation irrevocably and give a negative impression. For instance, if photographs or comments that appear on dental professionals' and students' personal pages are unprofessional or somehow compromising, this poses a risk to their professional reputation (Holden, 2017).

Furthermore, analysing the interviews illustrated the issue of concerns about the time spent on DSM. The participants believed that engaging in DSM requires being an active member of these digital and virtual communities, which will demand plenty of time. They stated several phrases to describe this issue, such as "*it needs dedication*" (DP.1), "*it is very time-consuming*" (DP.8), and "*I do not have enough time*" (DP.9). This perception could be interpreted in the light of previous studies (Arnett et al., 2013; Dobson et al., 2019) which showed that dental students and professionals engage in an enormous amount of activity that DSM offers, ranging from connecting with friends to browsing recent news and others' posts – this makes it time-consuming. These results are in accord with a prior multi-institutional study conducted among undergraduate dental students by Rajeh et al. (2020). They reported that approximately one-third of participants believed that DSM is time-consuming and diverts them from studies. Also, the same problem was identified previously among dental professionals, as half of them were concerned about the time they spent on DSM during the day (Arnett et al., 2013).

The following limitations can be reported from this qualitative study:

- This qualitative study provides a preliminary understanding of the perceived risks of DSM in the dental context, but it may not be generalisable to all dental students and professionals in other dental schools. Dental students and professionals were

recruited purposively from different academic and experience levels in a single dental school. The sample of this study contained a mix of males and females of different ages and education levels, some of whom considered themselves as heavy DSM users, while others had been hindered for various reasons, which were clearly discussed during interviews. Further work employing a quantitative methodology (i.e., a questionnaire method with a larger number of participants) could further confirm and explore how these perceived risk themes differ across those multiple groups.

- The interviews were conducted with dental students and professionals from a dental school whose curriculum places much emphasis on professionalism as applied to DSM, thereby perhaps limiting the perceived risk themes that could emerge. A further qualitative study in another dental school with less focus on this type of education is worth considering in the future.
- The qualitative results may have been influenced by the perspectives of the researcher and his personal biases. In this study, the interviewer's gender, age and experience could potentially have affected the interview process and analysis. To reduce this limitation, data were analysed by a multidisciplinary team and as an iterative analysis process, in order to enhance the rigorous, reflexive approach to generating the study results.

## 4.7 Chapter Summary

- This chapter has presented nine perceived risk themes that influence dental students' and professionals' use of DSM. The identified risk themes indicated that DSM impacted dental students' and professionals' professional and personal life. When they used DSM in their personal life, unsurprisingly, they perceived similar

risks to those that any DSM users perceived in a general context, including psychological, privacy and time risks.

- They also shed light on fundamental perceived risk themes when DSM is used in a dental professional context, such as non-compliance with guidelines, breaching patients' confidentiality, and using invalid information.
- A new DSM risk theme has emerged from the interviews: "Deceptive and misleading information", which pertains to the risk of consuming misleading and deceptive information related to oral health. This affects public users, including patients, and negatively impacts the delivery of evidence-based treatment or management of patients' expectations in clinical dental practice.
- Although this study has contributed to a better understanding and explanation of the perceived risks of DSM among dental students and professionals, it is necessary to utilise a quantitative methodology, such as a questionnaire instrument, with a larger number of participants. This would enable the identified risks to be generalised and validated, as well as to assess and prioritise those risks, in order to reduce their negative impact on the dental education system and profession.

# 5 Chapter Five: Analysis of Perceived Risk Factors of Using DSM Among Dental Students and Professionals: Exploratory Factor Analysis (Study 2 Results, Part 1)

## 5.1 Introduction

Chapter 4 presented the results of the qualitative study, which provided a unique insight into DSM risks perceived by dental students and dental professionals. Building on previous empirical perceived risk studies presented in Chapter 2 (e.g., Featherman and Pavlou, 2003; Khan et al., 2014, Arnett et al., 2014; Dobson et al., 2019), the interview data presented in Chapter 4 were analysed using a thematic framework. Nine perceived risk themes were identified, three of which applied generally, and six more specifically when DSM is used in the dental professional context.

However, further evidence is needed to support these findings. The combination of qualitative and quantitative data can build more substantial evidence and further check the validity of the results. This chapter presents Part 1 of the data analysis for the DSM perceived risks questionnaire, outlined in section 3.6, for Study 2 (the quantitative study). Study 2 employs quantitative methods and uses a larger sample and a different analytic strategy, aiming to complement the previous qualitative study by further confirming and providing both empirical and conceptual support. This chapter addresses the research question, “What are the underlying factors of perceived risks related to DSM usage by dental students and dental professionals?”.

As explained in Chapter 3, the exploratory factor analysis (EFA) method provided evidence of factor validity and unidimensionality by establishing a simplified structure and a parsimonious solution of factors. This chapter presents and discusses the results of the EFA. It begins by presenting the results from the data extraction methods, then provides

the factor loadings, the number of factors, and finally describes the labelling for the pattern of factor loadings, along with the assessment of the reliability of the factors. This chapter also discusses the derived factors' interpretation in terms of their statistical and theoretical quality.

## 5.2 Study Participants

The sample size is required to be above N=190 to satisfy analysis power for conducting EFA, as explained in section 3.6.1. A total of 987 questionnaires were sent out, and 301 valid responses were received and included in the data analysis; this represents an overall response rate of 30.5%. Two thirds of respondents were female (65.4%). Just over half of the respondents (51.2%) were at the age (16 to 24 yrs.), and the highest number of respondents were received from undergraduate students (62.5%) (Table 5. 1).

Table 5. 1 Participants' demographics by frequency and percentage (N=301).

| Variables | N (%) |
|---|---|
| **Gender** | |
| Male | 104 (34.6) |
| Female | 197 (65.4) |
| **Age** | |
| 16 to 24 | 154 (51.2) |
| 25 to 34 | 110 (36.5) |
| 35 and above | 37 (12.3) |
| **Education level / qualification level** | |
| Undergraduate dental students | 188 (62.5) |
| Postgraduate dental students | 51 (16.9) |
| Dental professionals | 62 (20.6) |

## 5.3 Patterns of DSM use

The most frequently used DSM was WhatsApp, which was used by 92% of total respondents. The followed DSM platforms used were Instagram, YouTube and Facebook (79%, 70% and 60%, respectively) (Figure 5. 1). Of total respondents, 35% were spent more than three hours per day on DSM, and 27% were using DSM more than an hour per day (Figure 5. 2).

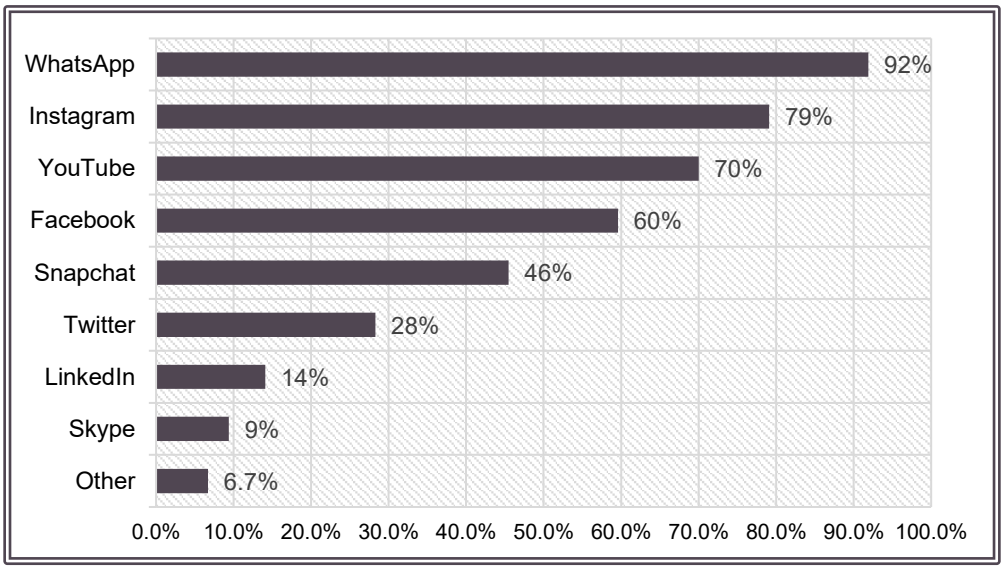


Figure 5. 1 Percentages of types of DSM platforms used by dental students and professionals.

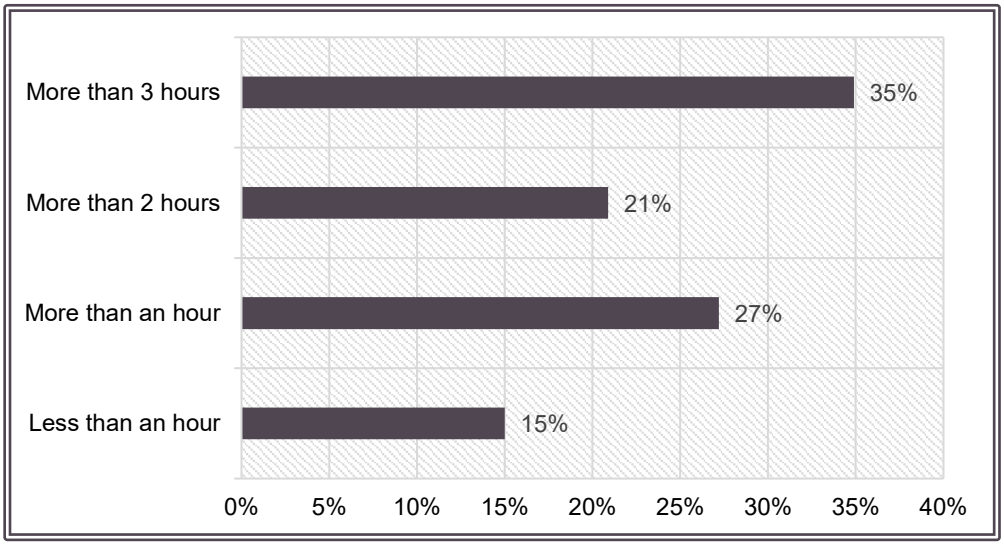


Figure 5. 2 Percentages of DSM uses in hours.

## 5.4 Exploratory Factor Analysis (EFA)

This section presents the results in terms of satisfying the EFA assumptions. It also explains the EFA procedure to identify the DSM perceived risks, and finally the labelling of recognised factors.

### 5.4.1 Satisfying the EFA assumptions

- As presented in section 3.6.6, before proceeding to EFA, two statistical tests were conducted to determine the suitability of collected data, as follows: the Measure of Sampling Adequacy (MSA), which has to be above the recommended value of .6; and Bartlett's test of sphericity should be statistically significant. The MSA overall index was 0.860, which is within the recommended value of > 0.8, indicating that this study's sample size is adequate for EFA.
- A statistically significant result of Bartlett's test for sphericity revealed a factorable intercorrelation matrix ($X2\ (703) = 4246.793$, $P < 0.001$), which indicates that sufficient correlations exist among the items, in order to proceed to EFA.

The above values of the MSA of sampling adequacy and Bartlett's test of sphericity indicate that the data were deemed to be suitable for EFA.

After satisfying the assumptions of factor analysis, the EFA was carried out using principal component analysis with a varimax (orthogonal) rotation method, in order to explore and validate the DSM perceived risk factors of the 38-item questionnaire.

### 5.4.2 Results of Exploratory Factor Analysis (EFA)

The initial four EFA iterations for the 38 items showed that ten items (Q6, Q8, Q16, Q28, Q30, Q32, Q35, Q36, Q37, and Q38) failed to meet a minimum criterion of having a factor loading of > .35 on a single factor, as explained in section 3.6.6, and were omitted from the questionnaire.

The next paragraphs present the number of factors and how these factors are clustered based on shared variance, following the final EFA iteration for the 28 remaining items.

To determine the number of factors, the eigenvalue has to be > 1. Then the extracted factors have to be supported by the scree test criterion and prior theories. Also, it is recommended that the extracted factors explain a large amount of variance, with the average percentage of variance accounted for being > 50%, as explained in 3.6.6.

Table 5. 2 shows that the EFA identifies eight stable factors from the remaining 28 items of the DSM perceived risks questionnaire. These eight factors demonstrated an eigenvalue > 1 and accounted for 63.55% of the variance explained.

Table 5. 2 The eigenvalues and percentage of the variance explained for each identified factor.

| Perceived risk items | Eigenvalues |
|---|---|
| **Factor I** | 6.26 |
| **Factor II** | 3.65 |
| **Factor III** | 1.85 |
| **Factor IV** | 1.40 |
| **Factor V** | 1.31 |
| **Factor VI** | 1.22 |
| **Factor VII** | 1.05 |
| **Factor VIII** | 1.01 |
| **Total variance explained** | 63.55% |

Figure 5. 3 shows the scree plot of the EFA of the 28 perceived risk items, representing the items with eigenvalues plotted. The inspection of the scree plot shows that eight extracted factors are acceptable, as the curve begins to straighten out after eight factors.

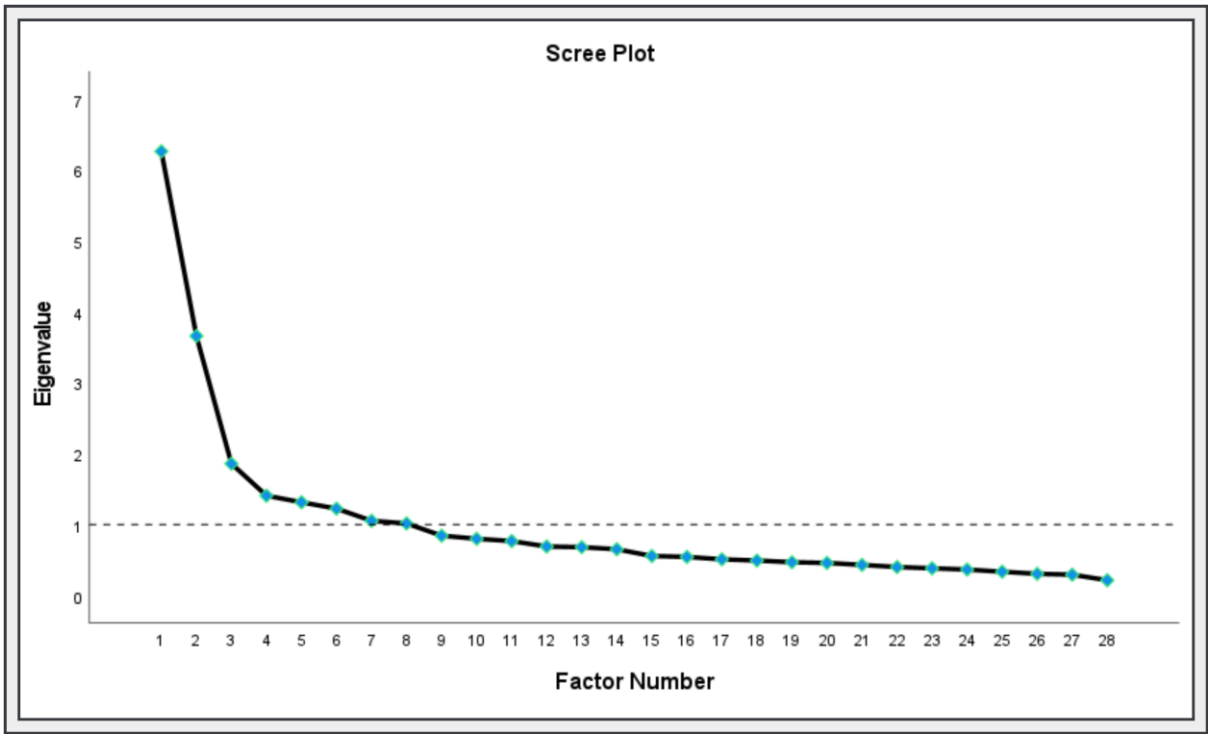


Figure 5. 3 Scree plot of the EFA of the 28-perceived risk items.

To further confirm the number of derived factors, as mentioned in section 3.6.6, the eight factors extracted are supported by prior theory from previous research (e.g., Featherman & Pavlou, 2003; Khan et al., 2014), and the previous *nine themes* identified in Study 1 (Chapter 4).

The next paragraphs explain what each of the factors represent, with the items that are loaded on them.

Table 5. 3 presents the results of the EFA displayed in the rotated (orthogonal) component matrix. Significant loadings and communality (*h*2) for each item are presented on the final eight factors extracted.

A loading factor of 0.35 was determined as the minimum salient factor loading. The first factor consisted of five items (Q22, Q14, Q7, Q24 and Q3), with factor loadings ranging from 0.644 to 0.783, and these accounted for 11.33% of the variance. The second factor of five items (Q9, Q13, Q31, Q11 and Q15) had a factor coefficient of > 0.35, ranging from 0.579 to 0.674, accounting for 9.81% of the variance. The third factor included four items (Q1, Q4, Q23, and Q18), with factor loadings ranging from 0.593 to 0.785, accounting for 8.59% of the variance. The fourth factor accounted for 7.95% of the variance, with four items (Q33, Q34, Q17, and Q2) had factor coefficients of > 0.35, ranging from 0.546 to 0.747. The fifth factor consisted of three items (Q25, Q27, and Q26), with factor loadings ranging from 0.688 to 0.772, accounting for 7.66% of the variance. The sixth factor included three items (Q20, Q19, and Q21) with factor loadings ranging from 0.661 to 0.680, accounting for 6.33% of the variance. The seventh factor included two items (Q12 and Q10) had a factor coefficient of > 0.35, with factor coefficients of 0.749 and 0.801 respectively, accounting for 5.94% of the variance. The eighth factor contained two items

(Q5 and Q29) that had factor coefficients of 0.579 and 0.674 respectively and accounted for 5.90% of the variance (Table 5. 3).

Moreover, once all the significant loadings were identified, the communality values for each questionnaire item were examined to evaluate whether the items fulfilled satisfactory levels of explanation. Table 5. 3 showed that the communality values varied from 0.499 to 0.766 and met acceptable levels of variance explanation.

Table 5. 3 Exploratory factor analysis (EFA) displayed in the rotated (orthogonal) component matrix for the final 28-items.

| Perceived risk Items | Factors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | $h^2$ |
| 22) Using DSM would negatively affect the way others think of me. | .783 | | | | | | | | .700 |
| 14) Using DSM will not fit well with my self-image or self-concept. | .774 | | | | | | | | .669 |
| 7) Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept. | .751 | | | | | | | | .652 |
| 24) Using DSM worsens the image my friends and colleagues have of me. | .724 | | | | | | | | .691 |
| 3) Using DSM would lead to personal social detriment because my friends and colleagues would think less highly of me. | .644 | | | | | | | | .579 |
| 9) There is a risk of the public getting misleading information related to their oral/dental health on DSM. | | .674 | | | | | | | .575 |
| 13) There is a risk of the public not being able to recognise the 'inappropriate' dental treatment shared on DSM. | | .658 | | | | | | | .504 |
| 31) There is a risk of damaging the profession reputation if I share unprofessional content on DSM. | | .647 | | | | | | | .517 |
| 11) There is a risk of the public deception from the dental promotion shared on DSM. | | .633 | | | | | | | .549 |
| 15) There is a risk of damaging the profession reputation when my professional image is negatively affected by using DSM. | | .579 | | | | | | | .499 |

| Perceived risk Items | Factors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | $h^2$ |
| 1) I find it risky to use information shared on DSM because it is not evidence-based. | | | .785 | | | | | | .684 |
| 4) I find it risky to use information shared on DSM because it is not subjected to quality control. | | | .781 | | | | | | .699 |
| 23) I find it risky to use information shared on DSM because of a lack of reliability. | | | .628 | | | | | | .634 |
| 18) I find it risky to use information shared on DSM because of a lack of quality. | | | .593 | | | | | | .629 |
| 33) There is a risk of significant time wasted in having to learn how to use DSM. | | | | .747 | | | | | .658 |
| 34) There is a risk of losing money if I use DSM for advertisement of services. | | | | .726 | | | | | .570 |
| 17) There is a risk of using DSM inappropriately because of my lacking in technical know-how. | | | | .693 | | | | | .589 |
| 2) There is a risk of significant time wasted from having to cope with the technical aspects of using DSM. | | | | .546 | | | | | .621 |
| 25) There is a risk of using DSM for sharing dental procedures with identified patient information. | | | | | .772 | | | | .667 |
| 27) There is a risk of using DSM to discuss anonymised patients cases/material without explicit consent. | | | | | .771 | | | | .670 |

| Perceived risk Items | Factors | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | $h^2$ |
| 26) There is a risk of using DSM for sharing sensitive personal information that can be accessed by others due to system security breaches. | | | | | .688 | | | | .667 |
| 20) Using DSM might not technically perform well to achieve the desired advantages. | | | | | | .680 | | | .611 |
| 21) I find it risky to use DSM as posting unprofessional content on DSM could lead to disciplinary action by the governing bodies. | | | | | | .663 | | | .632 |
| 19) I find it risky to use DSM without complying with the guidelines set by governing bodies. | | | | | | .661 | | | .546 |
| 12) Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals). | | | | | | | .801 | | .766 |
| 10) There is a risk of invasion of my personal space without my permission when using DSM which makes me feel uncomfortable. | | | | | | | .794 | | .752 |
| 5) There is a risk of DSM being too time-consuming. | | | | | | | | .811 | .764 |
| 29) There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks. | | | | | | | | .772 | .701 |
| **% Of Variance** | 11.33 | 9.81 | 8.59 | 7.95 | 7.66 | 6.33 | 5.94 | 5.90 | |

Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 7 iterations; $h^2$: Communality; Items with significant loadings > 0.35 are highlighted in grey; blank cell: Items with loadings < 0.35.

### 5.4.3 Results of Factors Labelling

Table 5. 4 explains how the perceived risk items were grouped, to produce eight DSM perceived risk factors. As presented in section 3.6.6, once an acceptable factor solution is achieved in which all items have a significant loading on a factor, a label is assigned to this pattern of factor loadings. Items with higher loadings are considered more significant, and influence the label appointed to represent a factor. By scrutinising the items, a description of each factor was given, and labelling was provided to facilitate the interpretation, as follows:

- **Factor 1** is labelled as the "negative impact on self-image when using DSM". This factor includes items concerning the negative effect of using DSM on self-image and self-concept, e.g., *Using DSM will not fit well with my self-image or self-concept*. Also, it comprises items related to the impact of DSM use on social image, e.g., *Using DSM would negatively affect how others think of me*.
- **Factor 2** is labelled as "public deception and reputational damage". It comprises three items concerning the risk of deceiving the public by means of the misleading information or dental promotion distributed on DSM, e.g., *There is a risk of the public getting misleading information related to their oral/dental health on DSM*. Furthermore, it includes two items concerning damage to one's professional reputation due to sharing unprofessional content on DSM, e.g., *There is a risk of damaging the profession reputation if I share unprofessional content on DSM*.
- **Factor 3** is labelled as "using invalid information". This factor emerges as a distinct factor, containing items that refer to a lack of evidence-based, quality-controlled, reliable and high-quality information published on DSM, e.g., *I find it risky to use information shared on DSM because it is not evidence-based*.

- **Factor 4** is labelled as "time and resources spent on learning/training how to use DSM". This factor includes four items describing the potential loss of time, money, and inappropriate usage due to lack of expertise and technical knowledge in using DSM, e.g., *There is a risk of significant time wasted in having to learn how to use DSM*.
- **Factor 5** is labelled as "breaching patient confidentiality". This factor describes concerns about disclosing patients' information without their consent, or unauthorised parties accessing personal information due to security breaches, e.g., *There is a risk of using DSM for sharing dental procedures with identified patient information*.
- **Factor 6** is labelled as "technical failure and non-compliance issues". It consists of three items, including: *I find it risky to use DSM without complying with the guidelines set by governing bodies.*
- **Factor 7** is labelled as "personal privacy risk", and combines items that mainly concern privacy breaches. This factor was represented by two items with high loading scores, including potential attacks from cybercriminals, i.e., *Using DSM may subject my online accounts to privacy breaches from internet hackers*; and personal space invasion, such as: *There is a risk of invasion of my personal space without my permission when using DSM, which makes me feel uncomfortable*.
- **Factor 8** is labelled as "time spent on DSM". It examines the concerns of wasting time due to devoting considerable time to browsing instead of doing other pertinent tasks, e.g., *There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks.*

All these factors described above are summarised and presented in Table 5. 4, with the list of items corresponding to each factor.

Table 5. 4 The derived factors with corresponding items ordered from highest to lowest loadings with description and labelling.

| Factors | Perceived risk items | Description | Labelling |
|---|---|---|---|
| **Factor I** | (22) Using DSM would negatively affect the way others think of me.<br>(14) Using DSM will not fit well with my self-image or self-concept.<br>(7) Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept.<br>(24) Using DSM worsens the image my friends and colleagues have of me.<br>(3) Using DSM would lead to personal social detriment because my friends and colleagues would think less highly of me. | These items describe dental students' and professionals' perceived risks of how others think about them when using DSM. Also, how using DSM impacts on their self-image concept, as perceived by friends and colleagues. | Negative impact on self-image when using DSM |
| **Factor II** | (9) There is a risk of the public getting misleading information related to their oral/dental health on DSM.<br>(13) There is a risk of the public not being able to recognise the 'inappropriate' dental treatment shared on DSM.<br>(31) There is a risk of damaging the profession reputation if I share unprofessional content on DSM.<br>(11) There is a risk of the public deception from the dental promotion shared on DSM.<br>(15) There is a risk of damaging the profession reputation when my professional image is negatively affected by using DSM. | These items refer to dental students' and professionals' perceived risks of disseminating information through DSM that would mislead and deceive the public. They also concern the risk of damage to their profession reputation and professional image due to sharing unprofessional content on DSM. | Public deception and reputational damage |

| Factors | Perceived risk items | Description | Labelling |
|---|---|---|---|
| **Factor III** | (1) I find it risky to use information shared on DSM because it is not evidence-based.<br>(4) I find it risky to use information shared on DSM because it is not subjected to quality control.<br>(23) I find it risky to use information shared on DSM because of a lack of reliability.<br>(18) I find it risky to use information shared on DSM because of a lack of quality. | These items refer to the risk of potentially using invalid information shared on DSM, as it may be poor quality, lack reliability, and be non-evidence based. | Using invalid information |
| **Factor IV** | (33) There is a risk of significant time wasted in having to learn how to use DSM.<br>(34) There is a risk of losing money if I use DSM for advertisement of services.<br>(17) There is a risk of using DSM inappropriately because of my lacking in technical know-how.<br>(2) There is a risk of significant time wasted from having to cope with the technical aspects of using DSM. | These items address the risk of potentially losing time and money, and lacking skills, due to users feeling hindered in gaining the know-how to use DSM. | Time and resources spent on learning/training how to use DSM |
| **Factor V** | (25) There is a risk of using DSM for sharing dental procedures with identified patient information.<br>(27) There is a risk of using DSM to discuss anonymised patients' cases/material without explicit consent.<br>26) There is a risk of using DSM for sharing sensitive personal information that can be accessed by others due to system security breaches. | These items indicate the risk of breaching/disclosing patients' confidential information, as well as concerns about the ability of DSM platforms to protect such sensitive data. | Breaches of patient confidentiality |

| Factors | Perceived risk items | Description | Labelling |
|---|---|---|---|
| **Factor VI** | (20) Using DSM might not technically perform well to achieve the desired advantages.<br>(19) I find it risky to use DSM without complying with the guidelines set by governing bodies.<br>(21) I find it risky to use DSM as posting unprofessional content on DSM could lead to disciplinary action by the governing bodies. | These items concern the technical issues and risks of using DSM that might lead to breaching the guidelines/policy set by the governing bodies. | Technical failure and non-compliance issue |
| **Factor VII** | (12) Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals).<br>(10) There is a risk of invasion of my personal space without my permission when using DSM which makes me feel uncomfortable. | These items involve the risk of privacy breaches leading to potential cybercrime attack and personal space invasion. | Personal privacy risk |
| **Factor VIII** | (5) There is a risk of DSM being too time-consuming.<br>(29) There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks. | These items describe the risk of potentially wasting time due to devoting considerable time to browsing and engaging in DSM. | Time spent on DSM |

## 5.5 Reliability Test Results

After labelling the factors derived from EFA, the Cronbach's (α) coefficient was computed to measure the reliability of the extracted factors, which is preferably > 0.6, as explained in 3.6.6.

Table 5. 5 shows that the Cronbach's (α) for the eight DSM perceived risk factors were within the acceptable range (0.6 to 0.8). The overall reliability of the perceived risks questionnaire was 0.9. This value indicates that the total questionnaire items had excellent internal consistency.

Table 5. 5 Reliability statistics of each extracted factors.

| Factors | Number of items | Cronbach's alpha (α) |
|---|---|---|
| Factor I: Negative impact on self-image when using DSM | 5 | 0.8 |
| Factor II: Public deception and reputational damage risk | 5 | 0.7 |
| Factor III: Sharing invalid information | 4 | 0.8 |
| Factor IV: Time and resources spent on learning/training how to use DSM | 4 | 0.7 |
| Factor V: Breaches of patient confidentiality | 3 | 0.8 |
| Factor VI: Technical failure and non-compliance risk | 3 | 0.6 |
| Factor VII: Personal privacy risk | 2 | 0.7 |
| Factor VIII: Time spent on DSM | 2 | 0.6 |
| **Total questionnaire items** | **28** | **0.9** |

## 5.6 Discussion

This study was designed to provide more substantial evidence of the DSM perceived risks identified in Study 1, and to further confirm the validity of the results. This section discusses how this chapter has addressed the research question, "What are the underlying factors of perceived risks related to DSM use by dental students and dental professionals?". The eight derived factors are interpreted in the order of their explained variance, and they are compared to the findings of previous studies, presented in Chapter 2. Results from this study suggest that DSM perceived risks consist of eight factors that are composed of 28 items in total; these findings were tested empirically and validated amongst dental students and professionals.

The first DSM perceived risk factor derived was labelled as "Negative impact on self-image when using DSM", because of the high loadings of items referring to DSM's adverse influence on one's self-image. This factor can imply that dental students and professionals are using DSM for several purposes – as a means for self-disclosure, self-promotion, and sharing information – as previous studies have shown (Arnett et al., 2013; Kenny & Johnson, 2016; Parmar et al., 2018; Dobson et al., 2019). Some people in society may not encourage this kind of DSM use because they have different perspectives and opinions towards adopting DSM and its related technologies; perhaps they do not like or recommend using DSM (Khan et al., 2014). A number of previous studies confirmed this factor, and proposed that DSM use might negatively influence the self-image and social image of DSM users (Hassan et al., 2006; Aldás-Manzano et al., 2009). Interestingly, this factor combines items from two distinct perceived risk factors: social and psychological risks, as theorised by several previous studies in the e-commerce context (Hassan et al., 2006; Littler & Melanthiou, 2006; Hong & Cha, 2013). This result might indicate that

dental students and professionals in this study thought that items related to psychological issues affecting self-image, and what others in the society think of them when using DSM, were similar and closely related. This view has been supported by Featherman and Pavlou, (2003), as they combined and examined psychological and social risk items under one factor.

The second factor derived in this study was “public deception and reputational damage”. The three items relating to public deception have been discussed in the previous literature, especially in the dental professional context (Shuttleworth & Smith, 2016; Rana & Kelleher, 2018). For instance, Rana and Kelleher (2018) discussed that DSM has become the main source of deceptive information that attracts significant interest and is consumed by public users on a large scale, young individuals in particular. Such deceptive information could jeopardise their oral health safety and result in disappointing outcomes. They argued that when dentists promote their dental treatment results on DSM, this could mislead and be erroneous to the public. Moreover, this result is consistent with previous opinions that raised concerns about the inaccuracy of information on DSM. Shuttleworth and Smith (2016) believed that DSM has a strong influence and arguably affects a patient’s autonomy in their dental decision-making; this highlights the importance of providing patients with accurate and sufficient information related to their oral/dental health. For instance, misinformation could cause serious complications for the continuous delivery of optimal dental care and break down the patient/dentist trust relationship. Moreover, two items that described the reputational damage due to sharing unprofessional content on DSM were loaded in this factor. What is curious regarding this factor is the correlation between public deception items and reputational damage items. This result is supported by previous studies which stated that sharing unprofessional content on DSM could damage the profession’s reputation and the public’s trust in it (Henry & Molnar, 2013; Spallek et

al., 2015a; Kenny & Johnson, 2016; Knott & Wassif, 2018; Nason et al., 2018; Karveleas et al., 2020). However, this factor might suggest that one's professional reputation could also be impacted by sharing deceptive dental information, especially if such content is created and disseminated by dental students and professionals.

The third factor was labelled as "using invalid information". This included four items referring to a lack of evidence-based, quality-controlled, reliable and high-quality information published on DSM. Not surprisingly, these items were grouped together with high loadings, because they described the most alarming critique of dental knowledge dissemination through DSM, which lacked validity and formal peer review. This result is in line with several current studies that scrutinised and assessed the quality of the dental and oral information shared on DSM. Taking an example from one common DSM, such as YouTube, Abukaraky et al. (2018) evaluated the quality and quantity of the information related to dental implants. Of 117 videos identified and analysed, 80% did not mention the reference and source of information. The scientific accuracy of the uploaded videos was considered poor, as they gained low usefulness scores. Likewise, Fortuna et al. (2019) assessed the quality of videos about oral health problems such as Burning Mouth Syndrome. They found that more than two-thirds of identified videos were of poor quality, and most frequently were scientifically incorrect. Hence, the dental professionals' and students' concerns about lack of evidence-based information appear to be valid.

The fourth factor was labelled as "time and resources spent on learning/training how to use DSM". It comprised four items describing the potential loss of time, money, and inappropriate use due to lack of expertise and technical knowledge in using DSM. Several previous studies have supported these items (Munnukka & Järvi, 2014; Khedmatgozar & Shahnazi, 2018). For instance, in the context of using social media in business, Munnukka

and Järvi (2014) found that the risk of losing time due to designing, communicating and controlling such interactions significantly concerned people when using DSM in the business context. Similarly, in the dental context, a previous study by Arnett et al. (2013) explored some of these items pertaining to time loss and the resources required to adopt DSM for teaching purposes. For example, one of the crucial barriers cited was a lack of time and expertise in utilising DSM in dental education. It can be inferred from this factor that some dental professionals and students might hesitate to use DSM because they are hampered by the time required to learn how to use it (e.g., setting up an account, site navigation, and sharing content) and coping with technical issues associated with the usage.

The fifth factor derived was "breaching patient confidentiality". Items with high loadings on this factor described concerns about sharing dental procedures that included information identifying the patient, or were shown without their consent. Prior studies have raised concerns about discussing patients' cases and sharing their images on DSM, as it poses potential risks to patients' rights and confidentiality if proper protection procedures are not undertaken (Stieber et al., 2015; Kenny & Johnson, 2016; Greer et al., 2019; Costa et al., 2020). Additionally, the regulatory bodies forbid dental professionals from sharing information or comments about patients on DSM platforms, except when reporting anonymised cases with valid consent in order to discuss best practice (GDC, 2016). Furthermore, the current move to utilise digital records (e.g. digital patients' photographs, digital medical records and digital radiographs) expands the number of medical providers who have inherent access to patient records, and increases the possibility of subjecting such sensitive data to possible security breaches from system providers (Shenoy & Appel, 2017). Another noteworthy point is that some scholars have argued that the power of DSM is hard for patients to comprehend. Numerous patients may not recognise that when they

give consent to share their cases on DSM – to be used as an example of successful treatment, or as promotional content for the dental practice page – this information may be continually reused by different people on various DSM platforms, and will stay on the internet forever (Ventola, 2014; Shenoy & Appel, 2017; P. S. Santos et al., 2021).

The sixth perceived risk factor identified included items mainly concerning the risk of technical issues and non-compliance with DSM guidelines. This perceived risk factor is in line with previous empirical studies that attempted to investigate dental students' and dental professionals' compliance with current DSM guidelines. In the UK, the dental regulatory body, GDC, provides strict guidelines regarding the use of internet-based platforms, including social media, by concentrating on its impact on the conduct of dental professionals. The primary goals of such guidelines are to safeguard the profession's trustworthiness and reputation when using DSM. However, Dobson et al. (2019) showed that dental students underrated the accessibility of what they post on DSM and its impact on their professional reputation. Additionally, many previous studies have highlighted that dental professionals and students struggled to adhere to governing bodies' policy, or to understand professional behaviour in relation to their presence on DSM (Neville & Waylen, 2015; Kenny & Johnson, 2016; Knott & Wassif, 2018). This situation is also relevant to individual universities and dental schools that have drafted and implemented social media guidelines for their faculty and students. It is expected that dental professionals and students will comply with these guidelines, as any breach could lead to disciplinary action (Neville, 2017). The item concerning possible technical issues of DSM was loaded in this factor, i.e., "*Using DSM might not technically perform well to achieve the desired advantages*", which was adopted from Featherman and Pavlou (2003). This item is supported by previous studies which highlighted that technical factors are crucial issues and create an obstacle in adopting DSM (Almaiah et al., 2020; Rajeh, Aboalshamat,

et al., 2020). Technical problems could relate to availability, accessibility and usability. The governing bodies, university administration and technical support need to provide the necessary regulations and technical resources for DSM to be used professionally, and to conduct constant technical maintenance for the DSM use. Thus, sufficient access to and use of DSM platforms, without any technical difficulties or delay, will be significantly associated with successfully increasing DSM adoption.

The seventh factor combined items concerning personal privacy breaches. This factor has been widely discussed in the existing literature in the dental professional context (Arnett et al., 2013, 2014; Rajeh, Sembawa, et al., 2020), which suggests that dental students' and professionals' concerns regarding the privacy breach of their personal or professional DSM account were valid. Furthermore, this specific factor was observed to be the most dominant concern in several empirical studies in the e-commerce context: for instance, regarding online shopping (Hong & Cha, 2013; Nepomuceno et al., 2014), online banking (Aldás-Manzano et al., 2009; Khedmatgozar & Shahnazi, 2018), and social network sites (Khan et al., 2014). According to the cybercrime and DSM study by McGuire (2018), DSM platforms have enabled criminals to add at least $3.25 billion to cybercrime earnings annually; also, between 45% and 50% of all unlawful trading of personal information entails the theft of, for example, payment information, profiles, usernames and passwords. Moreover, Zhang and Gupta (2018) indicated that the most apparent intention for a criminal attack on DSM is to obtain sensitive information regarding payment services.

The final perceived risk factor was related to the time spent on DSM, and is supported by existing literature (Khan et al., 2014; Rajeh, Aboalshamat, et al., 2020; Rajeh, Sembawa, et al., 2020). DSM deliver a broad assortment of activities which users engage in and devote significant time to, as was revealed in this study: for example, approximately 35% of

respondents reported using DSM for more than three hours daily. This figure was comparable with the global statistics, which showed that overall, the average time each person spent on DSM peaked at more than two hours per day (Global Overview Report, 2021). This result was also in line with previous studies among undergraduate dental students, such as by Dobson et al. (2019), who found similar usage figures among dental students in one dental school in the UK.

The questionnaire has gathered information about the type of DSM platforms used. The top platforms used across respondents were WhatsApp, Instagram, YouTube and Facebook (92%, 79%, 70% and 60% of total respondents, respectively). This result is consistent with previous empirical studies among dental students and professionals which have suggested that WhatsApp, Facebook, and Instagram are the most popular DSM platform used amongst dental students and professionals (Arnett et al., 2013; Kenny & Johnson, 2016; Dobson et al., 2019; Karveleas et al., 2020; Meira et al., 2021). It also reflects the global popularity of WhatsApp as instant multimedia messaging and Instagram and Facebook as social media platform in modern society and confirms its numerous utilities within the educational and clinical setting in dentistry (Khatoon et al., 2015; Santos et al., 2017; Poblete & Nieto, 2020; Tsai et al., 2020).

With regard to the validity and reliability of the extracted factors, each factor was represented by items loading ≥ 0.5, which confirmed their validity (Hair et al., 2014). As illustrated in Table 5. 5, the overall Cronbach's alpha of the derived factors was .9. Cronbach's alpha values ranged from 0.6 to 0.8 for the identified perceived risks. Two factors (VI: Technical failure and non-compliance risk, and VIII: Time spent on DSM) demonstrated a Cronbach's alpha estimate of 0.6. Although there is no consensus in the literature about the (α) level to be accepted, Cronbach's (α) of > 0.7 is usually preferable,

but 0.6 in exploratory research is also satisfactory (Hair et al., 2014). A possible explanation for this lower value is that these two factors included only three and two items respectively, and Cronbach's alpha is very sensitive to the number of items within the factor, as it increases accordingly (Tavakol & Dennick, 2011). Thus, future research should strive to find additional items that measure these two factors.

The EFA analysis yielded eight perceived risk factors. Although the identified model somewhat differed from published studies that investigated perceived risks in e-commerce (e.g., Featherman & Pavlou, 2003; Khan et al., 2014; Bashir et al., 2021), the identified factors provided significant intuition into DSM risks that dental students and professionals perceived in the dental context (Figure 5. 4).

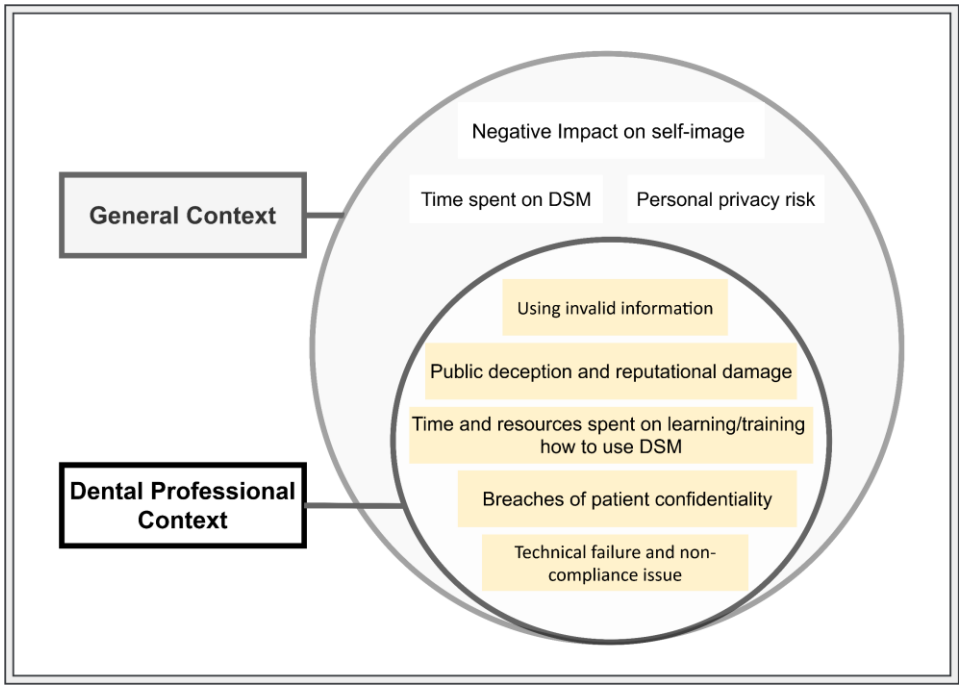


Figure 5. 4 Conceptual model to explain DSM perceived risks identified and discussed in Study 2.

Finally, a number of limitations and threats to validity need to be considered, as follows:

- The eight derived factors could be strengthened in future studies through revising (restating) items with lower primary loadings and cross-loadings. For instance, the deleted item, "*Using DSM payment service subjects my checking account to potential fraud*", could be restated, because this study's results suggest that the DSM financial risk is related to whether spending money on particular services on DSM (e.g., advertising and promotion) increases dentists' presence and the profits of their practices, rather than whether they will lose money due to technical issues or potential fraud.
- For factor seven "Personal privacy risk" and factor eight "Time spent on DSM", adding more items specifically concerning these crucial DSM risks may be required, in order to proceed to confirmatory factor analysis (CFA) in future studies. Researchers have suggested varying the numbers of items per factor – preferably at least three measured items, for statistical identification of a factor in factor analysis; although more items are advisable (Watkins, 2018). However, there are scales in the literature that include only two items per factor since it has strong theoretical and practical reasons (Ameh et al., 2019; Sun et al., 2020).
- The total respondents' number was 301, with a response rate of 30.5%, which is comparable with the average online survey response rate in previous studies (Nulty, 2008; Arnett et al., 2013). Furthermore, it achieved more than the calculated sample size required for EFA power to provide valid analysis (Yong & Pearce, 2013; Hair et al., 2014). However, caution must be applied due to the convenience sampling used in this study, which does not represent the target population as a whole. Therefore, the results should be considered carefully in terms of generalisability.

## 5.7 Chapter Summary

- This chapter presented the first part of Study 2's results, which involved details of the EFA analysis of the DSM perceived risks questionnaire. The EFA suggested that the 28 items could be grouped into eight factors.
- The validity and reliability evidence presented suggests that the questionnaire is reliable and valid in reflecting dental students' and professionals' perceptions of their DSM uses in general and dental professional contexts.
- A key distinction of the DSM perceived risk factors developed in this study, compared to other factors reviewed earlier in Chapter 2, is that it incorporated five new factors which related to dental professionals' context, including "Breaches of patient confidentiality" and "Public deception and reputational damage risk".
- The possible interpretation of the identified DSM perceived risk factors was provided, in light of the critical literature review in Chapter 2.

The next chapter presents the rank of these identified DSM risk factors and compares the strength of agreement between groups towards each perceived risk factor that was identified using EFA analysis.

# 6 Chapter Six: Analysis of the Salient DSM Risk Factors and Differences in Agreement Between Groups (Study 2 Results, Part 2)

## 6.1 Introduction

Chapter 5 presented the results of the first part of Study 2, which identified the underlying DSM perceived risk factors by deriving an eight-factor structure of DSM perceived risks. Also, each factor identified was assigned a label to represent it, and an explicit description.

This chapter further addresses the last two research questions presented in Chapter 1: "Which types of DSM perceived risks are salient to dental students and dental professionals?" and "To what extent do dental students and dental professionals differ in their agreement regarding the identified DSM perceived risk factors?"

The purpose of this chapter is to present the second part of Study 2's data analysis, which includes the strength of agreement regarding the identified DSM perceived risks, as discussed in 3.3.2, as well as the differences in agreement on DSM perceived risks between the dental students' and dental professionals' groups. Then, this chapter discusses and interprets the significance of the results, in light of the literature reviewed in Chapter 2.

## 6.2 The Salient DSM Perceived Risk Factors

Figure 6. 1 shows the factor scores, averaged across the complete sample of dental students and professionals. These factor scores quantify how strongly dental students and professionals agreed with the derived DSM perceived risk factors.

The range of mean scores was between 2.63 and 4.09. The factor with the highest mean rating was Factor II: "Public deception and reputational damage", followed by Factor V: "Breaches of patient confidentiality". On the other hand, the following two factors – I:

"Negative impact on self-image", and IV: "Time and resources spent on learning/training how to use DSM", received the lowest mean scores.

Figures 6. 2 to 6. 9 present the percentage of the participants' agreement for each DSM perceived risk item within factors.

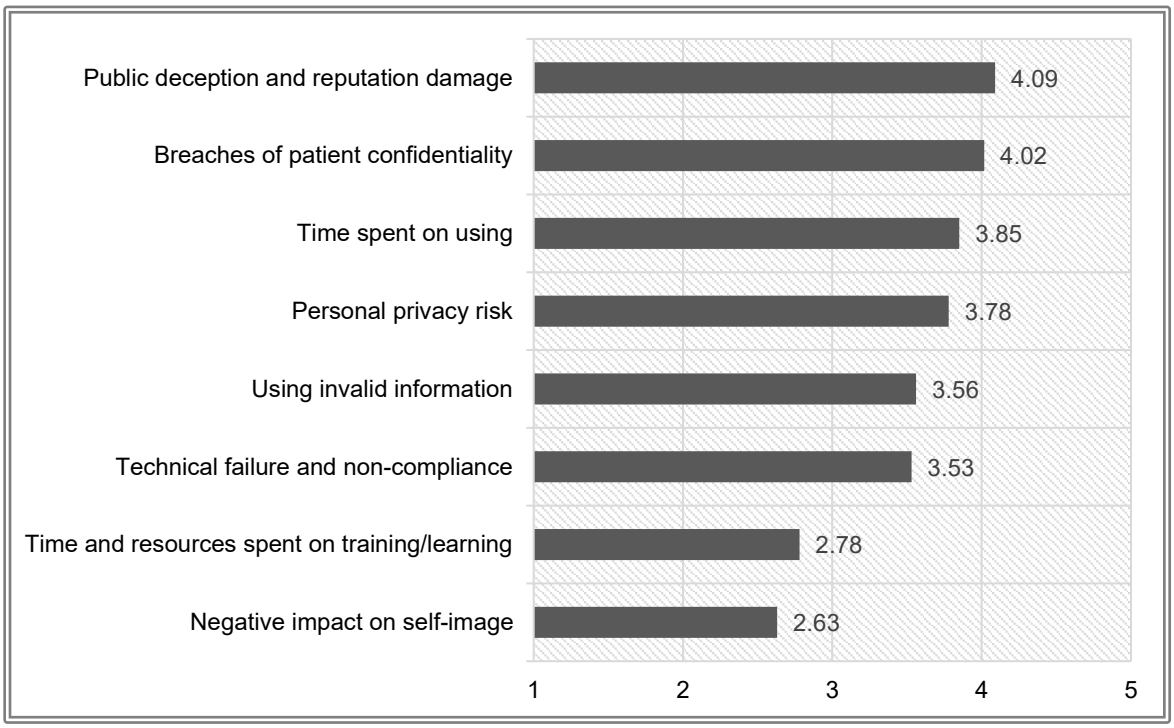


Figure 6. 1 The factor scores showing respondents' mean rating across the eight perceived risk factors in descending order.

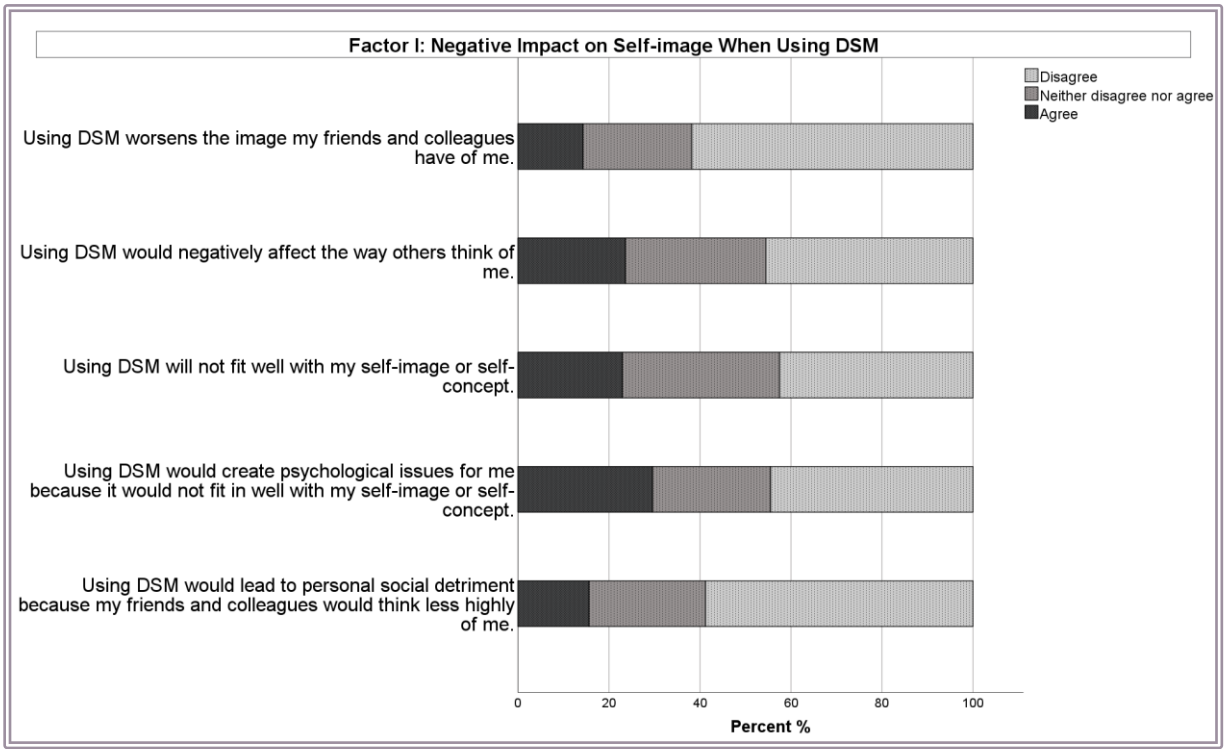


Figure 6. 2 The proportion of respondents' agreeing and disagreeing with (factor I) items.

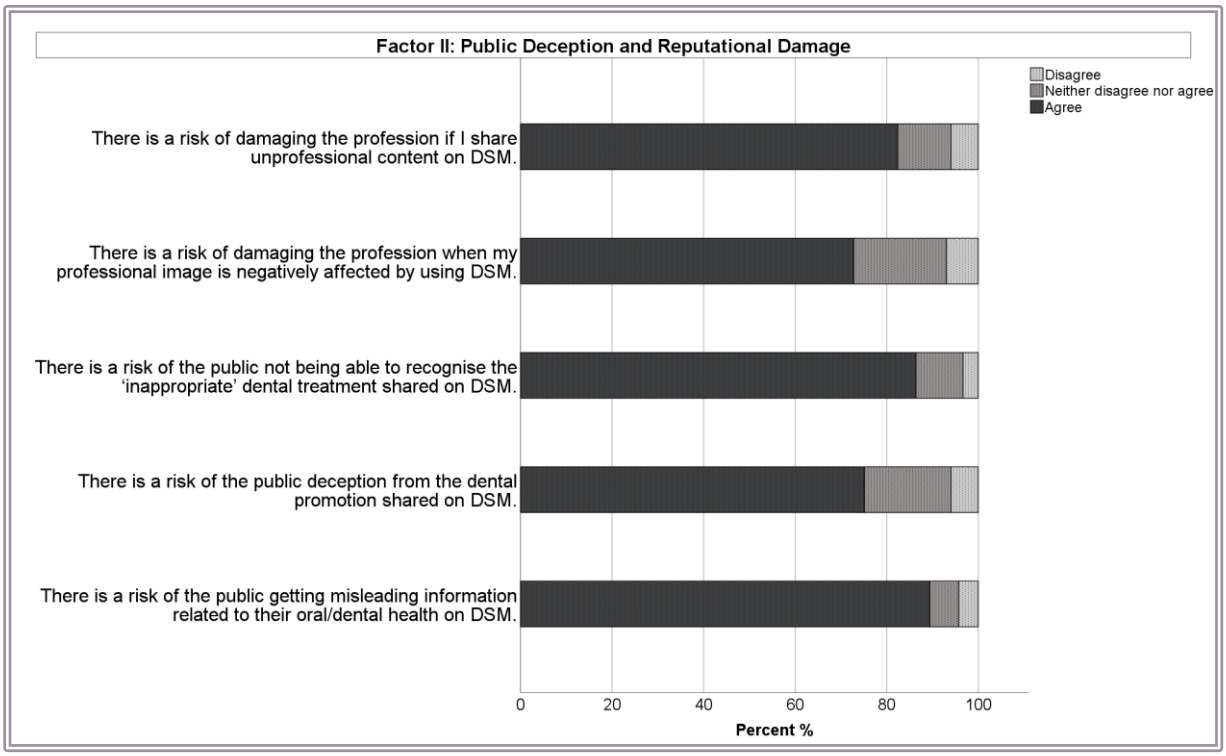


Figure 6. 3 The proportion of respondents' agreeing and disagreeing with (factor II) items.

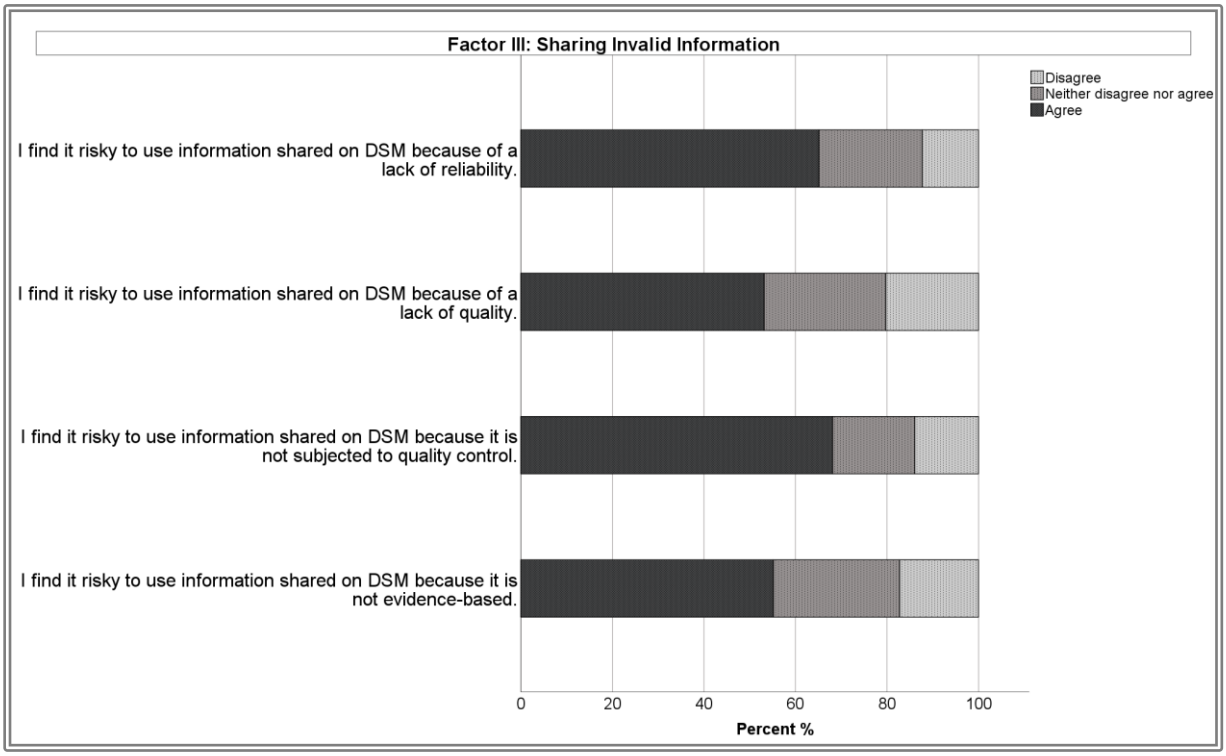


Figure 6. 4 The proportion of respondents' agreeing and disagreeing with (factor III) items.

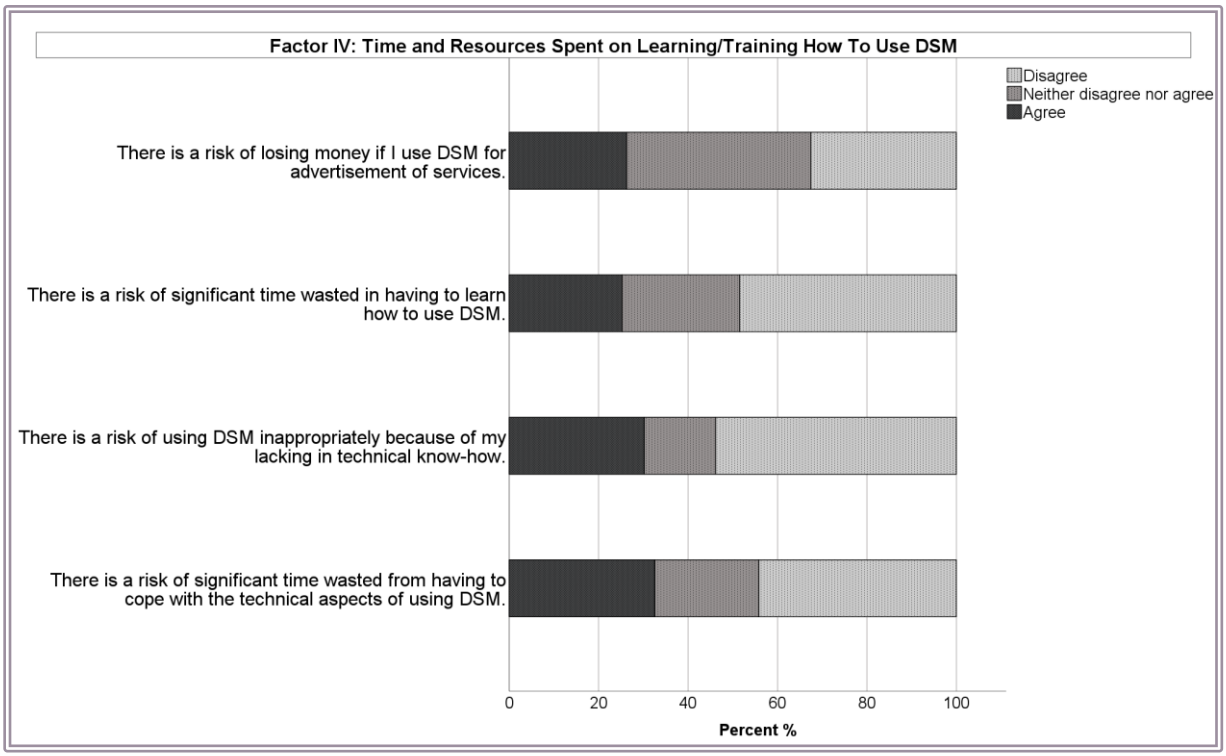


Figure 6. 5 The proportion of respondents' agreeing and disagreeing with (factor IV) items.

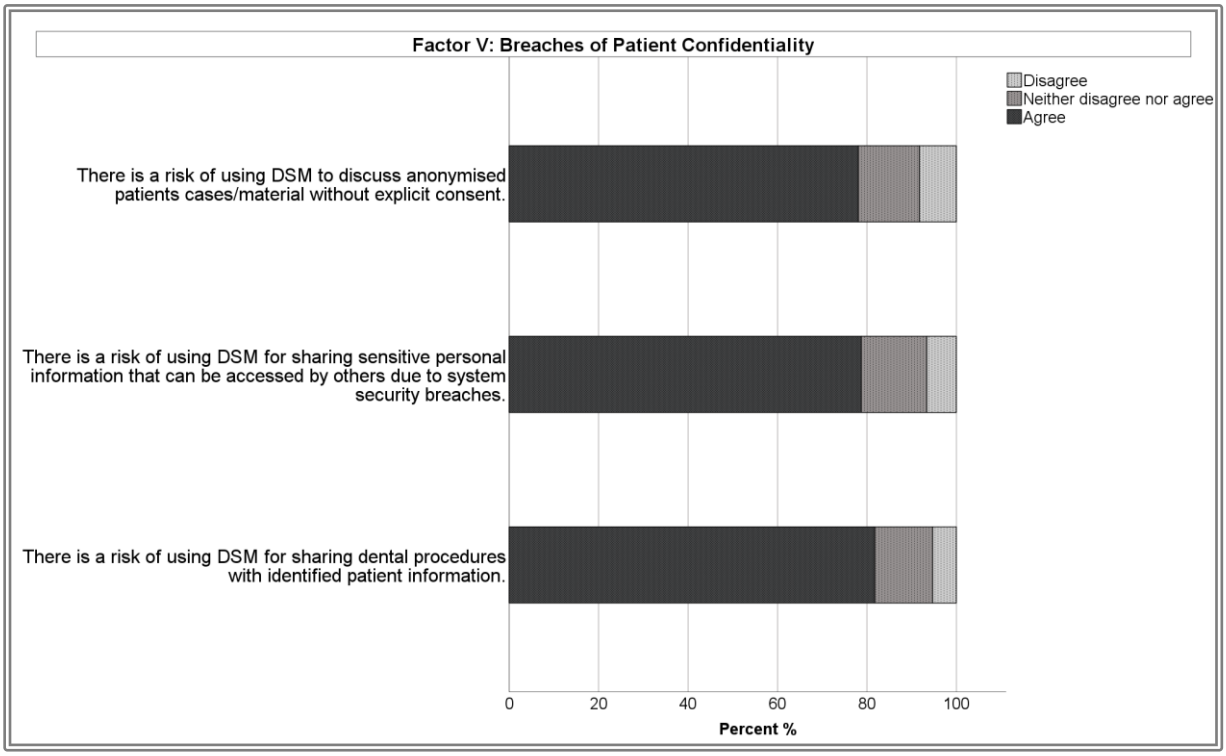


Figure 6. 6 The proportion of respondents' agreeing and disagreeing with (factor V) items.

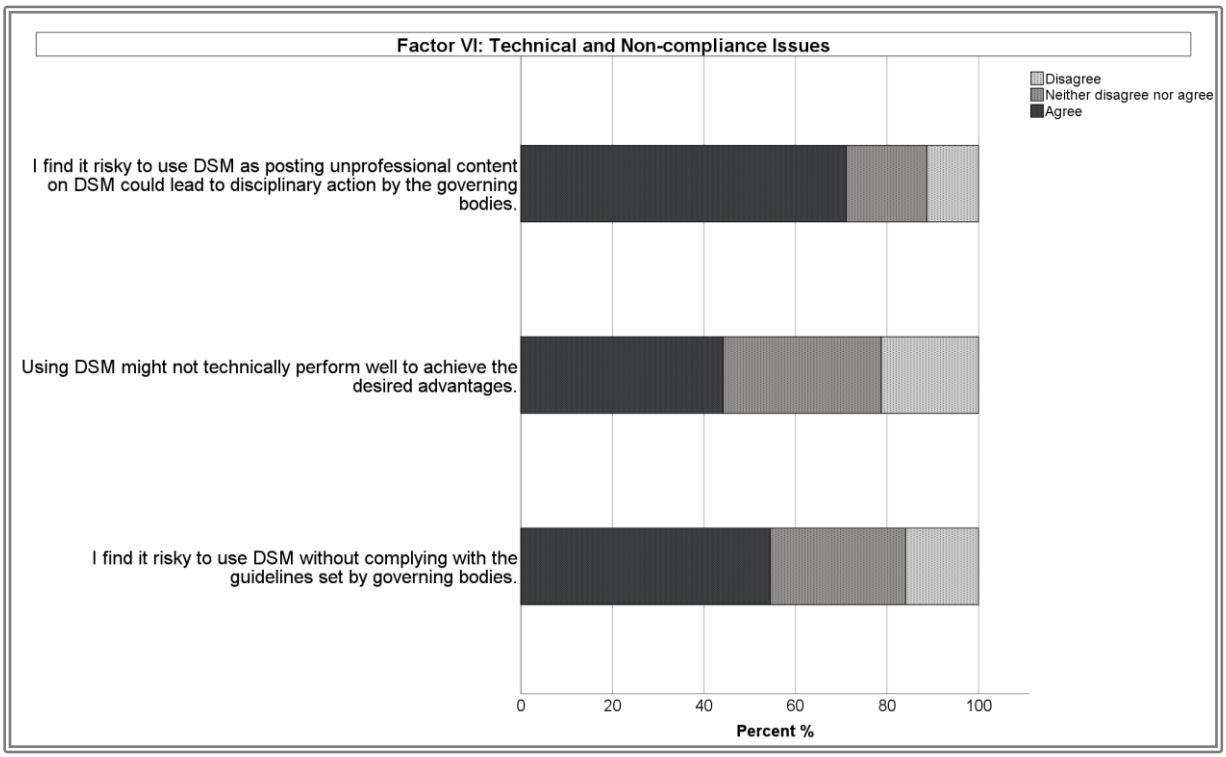


Figure 6. 7 The proportion of respondents' agreeing and disagreeing with (factor VI) items.

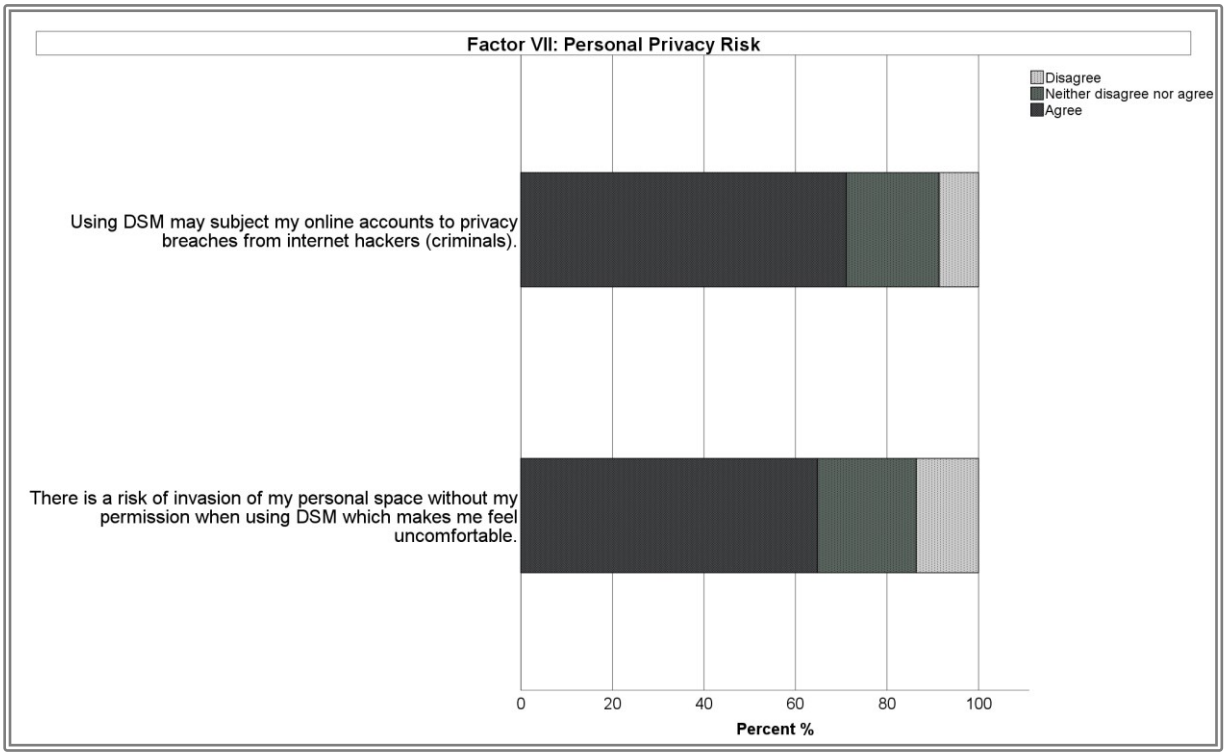


Figure 6. 8 The proportion of respondents' agreeing and disagreeing with (factor VII) items.

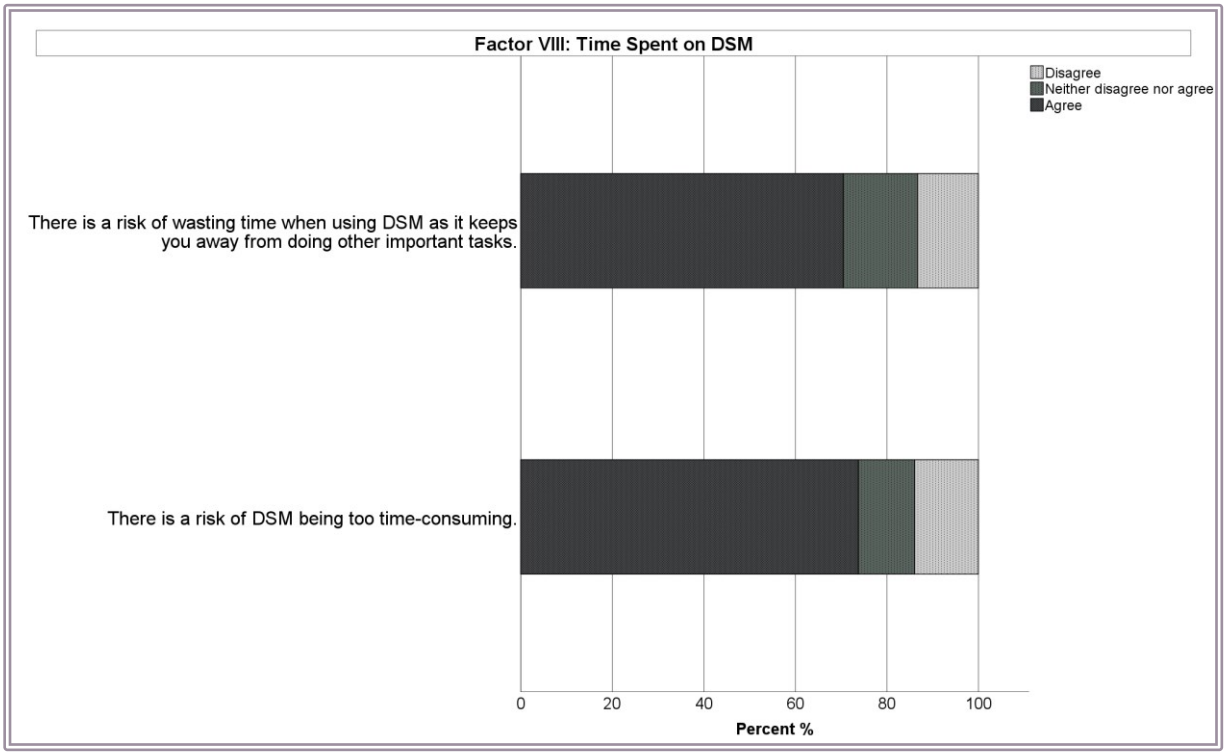


Figure 6. 9 The proportion of respondents' agreeing and disagreeing with (factor VIII) items.

## 6.3 The Difference Between Groups in Perceived Risk Factors Based on Qualification Level

After the factor scores of the complete sample were presented in section 6.2, Table 6.1 shows factor scores expressed as means (± standard deviation) and medians (interquartile range) for each compared group.

For all factors in each DSM perceived risk, the data were assumed to be non-normally distributed. The Kruskal- Wallis test was used to examine the differences in mean rank scores amongst the three groups: (A) Undergraduate group, (B) Postgraduate group, and (C) Dental professionals' group. There were statistically significant differences in mean rank scores between groups in the following DSM perceived risk factors:

- Factor I: "Negative impact on self-image when using DSM" [H(2) = 10.679, *P* = .005]. The *Post hoc* Dunn's pairwise tests test indicated that undergraduate group scores were significantly lower than postgraduate group scores (*P* = .007).
- Factor IV: "Time and resources spent on learning/training how to use DSM" [H(2) = 13.4482, *P* = .001]. The *Post hoc* Dunn's pairwise tests showed that undergraduate group scores were significantly lower than postgraduate group and dental professional groups scores (*P* = .018) and (*P* = .008), respectively (Table 6. 1, Figure 6. 10).

Table 6. 1 Comparison of the different types of participants with respect to their level of education: (A) Undergraduate students (N = 188), (B) Postgraduate students (N = 51), and (C) Dental professionals (N = 62).

| Factors | Undergraduate students① | | Postgraduate students② | | Dental professionals③ | | *P* value | Post hoc |
|---|---|---|---|---|---|---|---|---|
| | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | | |
| **F I: Negative impact on self-image when using DSM** | 2.512 (.681) | 2.4 (1) | 2.929 (.915) | 2.8 (1.40) | 2.712 (.885) | 2.7 (1.20) | .005* | ② > ① |
| **F II: Public deception and reputation damage** | 4.126 (.552) | 4.2 (.80) | 3.972 (.707) | 4 (1.20) | 4.067 (.559) | 4 (.85) | .373 | - |
| **F III: Sharing invalid information** | 3.517 (.704) | 3.5 (1) | 3.666 (.764) | 3.75 (.75) | 3.584 (.851) | 3.75 (.81) | .228 | - |
| **F IV: Time and resources spent on learning/training about how to use DSM** | 2.633 (.742) | 2.625 (1) | 3.039 (.862) | 3 (1.5) | 3.020 (.921) | 3 (1.5) | .001* | ② > ①, ③ > ① |
| **F V: Breaches of patient confidentiality** | 4.028 (.722) | 4 (1) | 4.111 (.675) | 4 (1) | 3.908 (.732) | 4 (.75) | .541 | - |
| **F VI: Technical failure and non-compliance issue** | 3.524 (.697) | 3.333 (1) | 3.555 (.738) | 3.666 (1) | 3.521 (.720) | 3.666 (1) | .849 | - |
| **F VII: Personal privacy risk** | 3.736 (.847) | 4 (1.5) | 3.803 (.806) | 4 (1.5) | 3.846 (.861) | 4 (1) | .617 | - |
| **F VIII: Time spent on DSM** | 3.851(0.873) | 4 (1.5) | 3.862 (.873) | 4 (1.5) | 3.846 (.861) | 4 (1.5) | .974 | - |

Note: ①, Undergraduate students; ②, Postgraduate students; ③, Dental professionals; SD, Standard Deviation, IQR, Interquartile Range
*Significant *P*-values < 0.05.

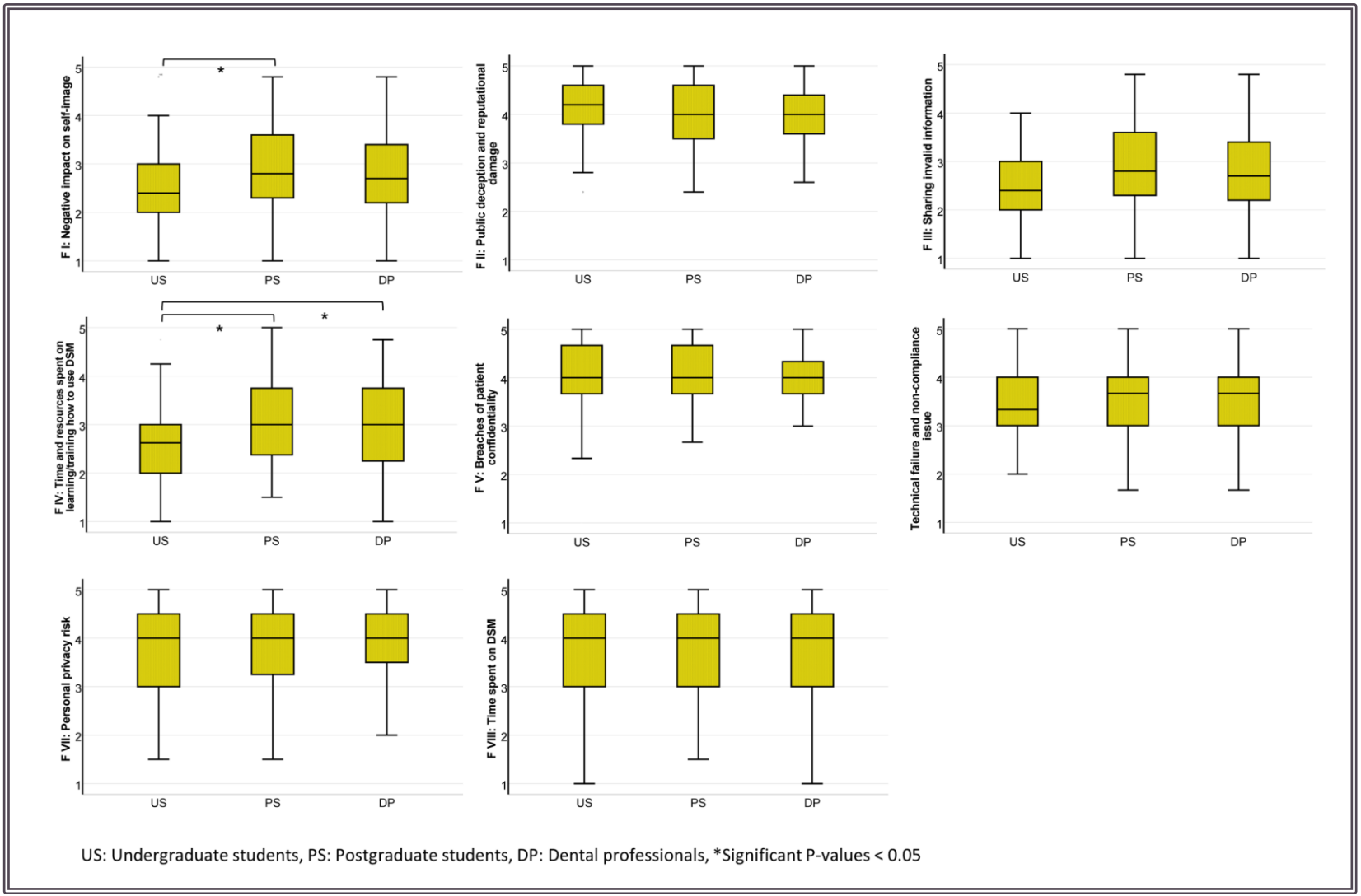


Figure 6. 10 Box-whisker-plot showing the differences between three groups: US: Undergraduate Students (N = 188), PS: Postgraduate Students (N = 51), DP: Dental professionals (N = 62).

## 6.4 Discussion

The results presented in Figure 6. 1 addressed the research question, "Which types of perceived risks of DSM usage are salient to dental students and dental professionals?". The results presented an interesting insight into the strength of dental students' and dental professionals' agreement regarding DSM risks. It is somewhat surprising that this sample seemed to have stronger agreement on risks affecting other DSM users, i.e., the public and patients, compared with the risks affecting themselves. In particular, the factors of "Public deception and reputational damage" and "Breaching patient confidentiality" obtained higher mean scores than other risks.

These findings reflect those current studies affirming that deceptive dental information is shared on DSM more extensively (Chou et al., 2018; Suarez-Lledo & Alvarez-Galvez, 2021). The factors with high agreement scores may explain how DSM have become an imperative source of information for the public: such overexposure to deceptive information could influence people's views and beliefs, making misleading and deceptive information seem more credible than accurate and scientific material (Shuttleworth & Smith, 2016; Rana & Kelleher, 2018). The two items under this factor – "*There is a risk of the public getting misleading information related to their oral/dental health on DSM"* and "*There is a risk of the public not being able to recognise the 'inappropriate' dental treatment shared on DSM*" – received the highest percentage of agreement (see Figure 6. 2). The possible explanation is that DSM are powerful tools that can educate potential patients, but they can also be deceptive by falsely advertising and promoting treatments. In their reviews describing how the internet is a favourite place for patients to explore and read more about their oral issues, Dias da Silva and Walmsley (2020) analysed Google trends to determine what dental information people seek on the internet. Between

September 2018 to August 2019, terms such as “tooth whitening”, “root canal” and “dental implants” attracted a substantial volume of web traffic.

Furthermore, this result was supported by evidence from several studies analysing dental content that is available to the public, and identified that such material includes incorrect information, scientifically false, and sometimes misleading health-related articles that could harm patients’ health (Abukaraky et al., 2018; Simsek et al., 2020). For example, Simsek et al. (2020) evaluated the content and quality of 100 videos about teeth whitening on YouTube. Unfortunately, the information quality for most videos was low, with only 12% classified as good, 53% as moderate and 35% as poor. Moreover, 60% of YouTube videos on teeth whitening were uploaded by non-professionals, and videos with misinformation content had significantly higher viewing rates than the other groups. Patients see dentists as a trusted source of oral health information; yet professional sources of information from dental professionals and dental schools have been underrepresented in DSM.

Regarding the breaches of patient confidentiality, this was the second-highest ranked risk factor in terms of the agreement score. The possible explanation is that the fact that as DSM have become rooted in their everyday lives, dental professionals’ standards have been acquired in their response. Figure 6. 6 showed that 80% of responses strongly agreed with items concerning patient confidentiality. As discussed in Chapter 5, many regulators now include specific guidance regarding DSM and the confidentiality of patients. For instance, the GDC guidance states: “You must maintain and protect patients’ information by not publishing any information which could identify them on social media without their explicit consent” (GDC, 2016). Posting detailed information of patient care situations that contain aspects of the treatment and patients’ characteristics, without explicit consent or thoroughly considering who might view this information, will breach patient

confidentiality. Another possible reason is that violating confidentiality is among the most critical risks. Not only does it betray the patient's trust in the dental professionals, but it also destroys public confidence in the dental profession and defames the reputation of dentists and the wider healthcare system. It can also have serious judicial consequences, including dismissal, suspension, and revocation of the licence to practise dentistry (Neville, 2017). Furthermore, it can be understood from the findings that dental students and professionals understand the DSM usage risks affecting not only themselves, but also the image of the profession. When patient confidentiality is breached on DSM, the integrity of the profession is called into question, which in turn reduces patients' confidence in the dental care system.

On the other hand, the factor that received the lowest agreement scores was the negative impact on self-image. Several researchers argue that using DSM might damage self-image and create a negative social impression (Khan et al., 2014; Khedmatgozar & Shahnazi, 2018). However, it seems that this factor is not highly important among the current study sample. The possible interpretation is that DSM is already ubiquitous, and most respondents have colleagues or relatives who perceive it favourably. These findings are in agreement with Featherman and Pavlou's (2003) study, which found that questionnaire items representing psychological and social risks were neither critical nor salient to using DSM in an e-commerce context. This implies that DSM users do not care about their self-image and social pressure from others, such as colleagues, family or workgroup, regarding their DSM usage.

Another factor receiving a comparatively low mean score was "Time and resources spent on learning/training how to use DSM". The possible reason is that the majority of responses in this study (87.7%) were from the younger age group (16 to 34 years old) who

grew up in the era of smartphones, social media and the internet. They are digital natives and very comfortable with using digital platforms in their daily life; thus, they have essential digital skills, and did not perceive any difficulties in using DSM.

With respect to the research question, "To what extent do dental students and dental professionals differ in their agreement regarding the identified DSM perceived risk factors?", the differences in agreement between the groups' perceptions of risks were also examined.

Table 6. 1 showed that there were significant differences identified between the undergraduate group and postgraduate group regarding factor I: "Negative impact on self-image when using DSM". This result was somewhat surprising, given the fact that the postgraduate group was more concerned about their self-image on DSM than the undergraduate group. There are some possible explanations for this result. Firstly, some authors have speculated that most students in the undergraduate programme are in the developmental period of establishing their professional image on DSM. This view was supported by Spallek et al. (2015), who explained that undergraduate students go through different stages of developing their professional identity. As they are exposed to professional education resources and dedicate considerable time to clinical training, their new-found identity as dental professionals, accompanied by a growing knowledge of dedication to the profession and its standards, might influence their perception of their DSM social image and how others perceive them on DSM. Another feasible explanation is that the undergraduate group's earlier experience in using DSM may change after graduation, and when they start practising dentistry outside their dental schools – especially when using it in dental professional settings (i.e., self-promotion and marketing dental services). Therefore, they might become more aware of their self-image and social

image. This point has been previously discussed and supported by the Study 1 results. For example, one dental professional stated: "*If you set up your professional profile on DSM, you cannot be like a normal user as a perception. You cannot be a guy who has a party on Sunday or weekend and posted on DSM. You have to be a professional person*" (DP.2). Similarly, one dental student said, "*I think DSM is risky because anything you put could stay forever and consequently affect your professional image*" (DS.4). These results match those observed in earlier UK studies conducted among undergraduate students, which found that they mostly use DSM to talk to friends and colleagues, post photos for self-exposure purposes, and show their everyday life events (Kenny & Johnson, 2016). As a result, they are not interested in paying attention to being concerned about others. However, it can be understood from this result that as undergraduate students progress in their studies and become qualified dentists, they gain a greater sense of caution, awareness and responsibility towards their social image on DSM.

With regard to Factor IV: "Time and resources spent on learning/training how to use DSM", dental professional and postgraduate groups were in strong agreement, with a significant difference from the undergraduate group. There are two possible explanations: firstly, it appears plausible that these findings are due to the age difference between groups. The majority of the undergraduates in this study (82%) were from a younger cohort (16–24 years); they have used digital platforms and the internet from an early age, and are considered to be more comfortable and digitally literate than the older population (Shatto & Erwin, 2017). This interpretation was supported by a previous empirical study, which found age to be a significant factor affecting the digital and internet skills of a sample from the general population (van Deursen & van Dijk, 2011). The differences could also be attributed to the fact that the dental professional and postgraduate groups seem to use DSM for professional reasons such as advertisement, self-promotion and knowledge

dissemination (Snyman & Visser, 2014; Parmar et al., 2018). For this purpose, it might be the area where they require more time, resources and knowledge, in terms of the technical and operational experience to implement DSM properly. A previous empirical study by Parmar et al. (2018) investigated dentists' attitudes towards using DSM as a marketing tool in the UK. More than 80% of them believed that DSM are effective tools for dental marketing and approaching patients. Similarly, more than 50% of dental professionals in Saudi Arabia were using DSM to find new patients and improve the marketing value of their dental practices (Aboalshamat et al., 2019).

## 6.5 Chapter Summary

In this chapter, the identified perceived risks were ranked based on dental students' and dental professionals' agreement ratings. Overall, risk factors associated with DSM usage in the dental professional context seemed to be more salient (i.e., public deception and reputational damage, and breaches of patient confidentiality). The undergraduate group appeared to be less concerned about their self-image in the society, compared with the postgraduate group. The possible explanations have been provided and discussed. Furthermore, the dental professional and postgraduate groups showed higher agreement scores than the undergraduate group, for items concerning time, money and resources spent on learning/training how to use DSM.

The findings of this chapter might provide a better understanding of what issues are most important to dental students and professionals, by prioritising DSM perceived risks from highest to lowest. This result could benefit their training and teaching by including new approaches in their educational plans, which could enhance the learning process and render it more attractive. Further discussion and research implications are provided in the next chapter.

# 7 Chapter Seven: Discussion

## 7.1 Introduction

This research aimed to identify and analyse how dental students and dental professionals perceived the risks of using DSM in the dental profession context. A mixed-methods approach was applied to sequentially collect data using different methods (i.e., interviews and questionnaires); this provided empirical evidence and drew a holistic picture of the perceived risks that influence dental students' and dental professionals' DSM use, as discussed in Chapter Three. Study 1 used a thematic framework analysis to identify the DSM perceived risks and reveal explicit descriptions of risks, in order to guide the development of a questionnaire. Study 2 employed the questionnaire to validate the perceived risks, analyse the salient DSM perceived risks, and examine the differences in perceptions between dental students and dental professionals.

This final chapter discusses the overall research findings by interpreting the complementary Study 1 (qualitative study) and Study 2 (quantitative study) results and drawing conclusions. This chapter concludes with presenting the limitations of the research.

## 7.2 Discussion

### 7.2.1 Outline of The Main Findings from Both Studies:

This discussion section aims to collate the evidence from Study 1 and Study 2. Particularly, it describes how DSM perceived risks were first explored qualitatively with interview data and thematic framework analysis, which provided a rich characterisation of prominent DSM risk themes, as presented and discussed in Chapter Four. Key risk codes from the interview data were operationalised as questionnaire items for inclusion in Study 2. The

combination of the qualitative and quantitative components produced a thorough, multifaceted explanation; it also led to some modifications in the definition of DSM risk factors that influence dental students' and dental professionals' use of DSM in general and professional contexts.

It was noticed that four modifications occurred as follows:

A. The labelling of the "psychological risk" theme in Study 1 was changed to "negative impact on self-image when using DSM" in Study 2.
B. The "time risk" theme in Study 1 was split into two factors in Study 2: "time spent on DSM" and "time and resources spent on learning/training how to use DSM".
C. The "blurring the professional boundary" theme was not identified in the Study 2 factor analysis results.
D. The "loss of the public trust" theme and "deceptive and misleading information" theme were combined in Study 2 to become "public deception and reputational damage".

Study 1 suggested that both dental students and dental professionals recognised the difficulty in protecting their posts on DSM from scrutiny, and that they received negative comments which led to psychological issues and influenced their self-image and self-concept. This adversely affected feelings and self-esteem, which is congruent with previous research by Iwamoto & Chun (2020) and Keles et al. (2020). This finding was particularly evident amongst dental students and professionals, who expressed their worries about comparing their current clinical level with other qualified dentists on DSM. However, in Study 1, the social risk was neither identified nor discussed directly by the participants. In contrast, when the social risk items were added to the questionnaire items in Study 2, they were significantly loaded with items of psychological risk, which clearly

concerned the negative impact on self-image and self-concept. The possible interpretation of this result, as briefly discussed in Chapter Five, is that dental students' and dental professionals' perceived risks of what others in society (i.e., friends, colleagues, and family members) think of them when using DSM also affects their self-image and self-concept. Another interpretation is that in the dental context, DSM could act as a social lubricant for building a professional image and social communications with others. The knowledge or advertisements shared via DSM are open to the public, exposing users to potential attacks through other users' refusal or negative comments. In accordance with the present results, Forest and Wood (2012) argued that although people with low self-esteem believe DSM platforms to be a secure place for self-disclosure, they commonly experience contrary and adverse comments, and less consideration than they anticipate. Such hostile statements, as Khan et al. (2014) claimed, might exacerbate low esteem and have a further negative impact on perceptions and peace of mind. Therefore, the use of DSM can cause dental professionals and students to be discouraged, or feel incompetent (Bola, 2021).

Study 1 and Study 2 of this research identified time-related concerns, which diverged from previous studies' findings (Featherman & Pavlou, 2003; Hassan et al., 2006; Littler & Melanthiou, 2006); the items representing this factor differed in Study 2. The items concerning time risk were loaded into two factors: "time spent on DSM" and "time and resources spent on learning/training how to use DSM". This division makes sense because dental students and dental professionals in Study 1 were concerned about the time aspect; they believed that using DSM required being an active member of digital and virtual communities, which would demand much time. They made several remarks to describe this issue, such as "*it needs dedication*" (DP.1), "*it is very time-consuming*" (DP.8), and "*I do not have enough time*" (DP.9). These findings reflect those empirical studies among dental students and dental professionals which reported that DSM offers multitudinous activities,

ranging from connecting with friends to browsing recent news and others' posts, which make it time-consuming (Arnett et al., 2013; Dobson et al., 2019; Rajeh et al., 2020). The "time spent on DSM" risk factor was also supported by Study 2's results, which showed significant usage time: 35% used DSM for more than three hours daily and 22% for at least two hours per day; the majority of them were undergraduates (Table 9. 15). This result is comparable with a previous study, in which 41% of undergraduates used DSM for two hours daily (Dobson et al., 2019). Study 2 illustrated an interesting risk: "time and resources spent on learning/training how to use DSM" – and especially for using DSM efficiently in the dental professional context. Dental students and professionals valued using DSM platforms as an essential medium for delivering or accessing learning, and advertising professional services (Rung et al., 2014; Alshiekhly et al., 2015; Gonzalez & Gadbury-Amyot, 2016; Naguib et al., 2018; Rajeh, Aboalshamat, et al., 2020; Abrar et al., 2020). This particular use of DSM could be challenging for dental students and dental professionals, as they need time, money and resources to optimise DSM in marketing dental treatments, promoting oral health products, and creating an online presence, in order to build a brand for themselves and their dental practice. As the use of DSM for dental marketing is growing, the current and new generation of dental students and professionals demand to know how to plan their DSM marketing strategy, so as to benefit from these innovative digital forms when there is a risk of losing time and resources. As one dental student reported in Study 1, "*I think we should have training on how to use DSM for marketing because so many of us will use it for such a purpose. I should know how to utilise it better, maybe like calling influencer dentists who are very successful on the Instagram and have a lot of followers, and ask them how they did it?*" (DS.6). Thus, digital marketing skills – such as managing a DSM business profile, attracting new patients, and

creating marketing content – require time, money and resources, which seem important concerns to current dental students and professionals (Snyman & Visser, 2014).

It was an unexpected result to find that the "blurring the professional boundary" theme, which emerged during the thematic analysis of interviews in Study 1, was not identified as a risk factor in the EFA model in Study 2. The possible explanation is that infringing this boundary was not important to this study's respondents. This assumption was supported by Study 1's results, which revealed this to be a minor theme that was not discussed extensively by dental students and professionals. Perhaps the current research participants believed that they could enjoy the interactions with each other on DSM despite having a professional identity. This view has been supported by Neville (2016), whose commentaries mentioned that dental students had a sense of freedom online, without paying attention to how such interactions on DSM might impact their professional image and conflict-of-interest situations. However, this result contradicts the previous study by Wyatt et al. (2016), which found that 69% thought it was improper for dental professionals to communicate or interact on Facebook with their students. Also, 68% stated that the line between faculty members and students became blurred because of Facebook interactions. The majority (78%) believed that they should keep their personal lives separate from their professional lives.

The risk of deceiving the public and damage to their reputation were considered as two separate themes in Study 1. However, the items referring to these two themes were loaded on the same factor in Study 2. As discussed previously in Chapter Five, a possible explanation is that sharing unprofessional behaviours and contents on DSM carries a risk of reputational damage, leading to mistrust by the public – not of a particular dental practice or dental professional, but the entire profession (Sykes et al., 2017). Furthermore,

this result has been supported by the findings in Chapter Six, which showed that this study's respondents perceived this factor as the most important risk.

In Chapter Six, the ranking of the identified risks showed that "public deception and reputational damage" and "breaches of patient confidentiality" were the most salient risks. This result underlined the difficulty of upholding ethical principles when using DSM. As discussed earlier, the information disseminated or communicated on DSM may include identified patient information, such as discussing complex cases or sharing sensitive data with others when seeking consultations and opinions for patient care-related services. However, this type of communication contravenes Principle Four of GDC standards, "Maintain and protect patients' information", including the repository and right of shared information, which further adds to the risk of loss of confidentiality (GDC, 2013). The use of uncontrolled, unencrypted and open-access DSM to share patient information may expose dental professionals to violations of ethical standards and the law. Although the guidance confirms that explicit consent should be sought before posting photos or videos of patients on DSM, dentists should be given additional advice about informing patients of the consequences of allowing their case to be used as an example for promotion, as such information may be repeatedly reused by other platforms. The GDC Standards 3.2.1 clearly states, "You must provide patients with sufficient information and give them a reasonable amount of time to consider that information in order to make a decision" (GDC, 2013). Thus, it is essential that the DSM consent form includes all information that the patient requires, such as regarding the type of content shared, the purpose of the content, and where these contents will be posted.

Moreover, the ramifications of advertising dental treatments have become evident, bringing some significant dento-legal risks for dental professionals (Kaney, 2019). In the

contemporary era, DSM has extended the normalised view of the perfect body image, including 'ideal' dental or facial appearance, particularly in aesthetic dentistry procedures (Holden, 2018). This leads patients to be inundated with messages of promotional and educational materials through DSM. The GDC makes explicit reference to dental advertisements in its Standards; Standard 1.3.3 advises: "You must make sure that any advertising, promotional material or other information that you produce is accurate and not misleading and complies with the GDC's guidance on ethical advertising" (GDC, 2013). Furthermore, the GDC has an advertising checklist document that is a helpful guide for all dental advertisements (GDC, 2013). However, dental professionals' compliance with such guidance is still lacking (Raimundo & Robinson, 2014; Budd et al., 2016; Donnell et al., 2021). For instance, a recent study conducted among 450 dental practices' websites, and their Facebook and Instagram accounts in the UK, found that only six websites and three Facebook pages were fully compliant with the GDC guidance on advertising, and with the Advertising Standards Agency Committee of Advertising Practice (ASA-CAP) regulation on aesthetic treatments (Donnell et al., 2021). This result indicated that dental students and dental professionals require essential professionalism education and training on using DSM within the governing bodies' ethical and legal framework; this will be highlighted in the recommendations section.

### 7.2.2 The Impact of COVID-19 on the Validity of DSM Risks

A further point worthy of discussion is the possible impact of COVID-19 on the validity of DSM risks identified in this research. This research was conducted pre- and mid-pandemic. Following the UK national lockdown and its associated interruptions to dental education, dental students' and dental professionals' perceptions towards this sudden adoption of DSM have not yet been thoroughly examined, and there is little information on the actual

impact of DSM use during the COVID-19 lockdown. Undoubtedly, the pandemic lockdown has posed significant challenges to delivering dental education, by hampering the global health system, economy and international society at large. Due to strict government guidelines, face-to-face and on-site preclinical/clinical and theoretical teaching with undergraduate and postgraduate dental students was interrupted and restricted (Iyer et al., 2020; Quinn et al., 2020). Dental schools instantly adopted various forms of DSM and digital technologies as an alternative approach to cope with the exceptional situation, in order to provide a safe environment and uphold social distancing for their students, staff and patients (Chang et al., 2020; Haridy et al., 2021). Popular DSM platforms, and new forms of virtual classroom teaching and lectures using video conferencing programs (e.g. MS Teams, Google Meet and Zoom), were implemented to maintain theoretical and practical dental education at various dental institutions (Chang et al., 2021; Das et al., 2020; Docimo et al., 2020; Poblete & Nieto, 2020; Yüce et al., 2020).

Given the limited on-site dental education and the social distancing rules imposed during COVID-19, an increase in DSM use was anticipated. Silva et al. (2021) examined undergraduate dental students' DSM use and quality of life during COVID-19. Among 230 respondents, they found that more than 80% mentioned an increased use of mobile phones and the internet during the pandemic, which was a significant rise compared with watching TV and streaming media. Also, the computer was the most used digital device to access online courses and college learning content, followed by the cell phone.

Similarly, Al-Amad and Hussein (2021) conducted a multinational study among dental professionals. They reported that the frequency of DSM use was higher among younger dental professionals who had more limited clinical experience. However, the above empirical studies did not measure the use in hours, making a comparison with the current

research findings impossible. In this research, the use of DSM in hours per day was similar to pre-COVID-19 empirical studies, as presented in Figure 5. 2. This may indicate that the findings regarding DSM usage time during COVID-19 are more subjective and thus inconclusive. Therefore, further objective studies are required to investigate the impact of DSM use during and pre/post the pandemic, to provide a better understanding of this topic.

Furthermore, the analysis of empirical studies conducted during COVID-19 reported a number of concerns and challenges that could be linked to dental students and professionals' perceptions identified and discussed in this PhD research. For instance, DSM's functional characteristics allow for establishing complete or partial online delivery of clinical education and knowledge in interactive visual forms (Moore et al., 2021; Nasseripour et al., 2021). To replace on-site patient treatments and simulate such clinical cases, dental schools developed an alternative approach using a combination of asynchronous sessions and teacher-facilitated synchronous online forums (Iyer et al., 2020; Quinn et al., 2020). However, allowing technology to drive e-learning without any scaffolding or guidelines is frequently detrimental to student education. This view was supported by some empirical studies. In their research exploring dental students' and faculty members' perceptions of using digital technologies in learning during COVID-19, Chen et al. (2020) found that both groups highlighted technical issues and time loss as the main challenges. Similarly, Trowbridge et al. (2021) investigated using MS Teams to teach modules for dental students. The main pitfalls were the difficulty in portraying some technical and poor resources, such as the internet connection. Another qualitative study amongst students and faculty staff showed that the primary obstacles to successfully implementing DSM during COVID-19 were providing the technical skills and guidance to perform tasks efficiently, and assisting users when they encountered technical difficulties with DSM (Almaiah et al., 2020). These findings were consistent with this PhD results,

where “time and resources spent on learning/training how to use DSM” was concerned students and professionals when using DSM in the dental context. Also, in Study 2, more than 30% of respondents believed that significant time was wasted in coping with DSM technical aspects, or in DSM use difficulties due to a lack of technological know-how (Figure 6. 5). However, the lack of DSM resources and skills, and technical failure, may have been magnified during the pandemic, due to the rapid transformation in adopting DSM. Further investigation could be conducted to examine the potential types of technical issues, to provide an insight into specific technical problems of using DSM.

Another risk factor that emerged extensively in the literature was the surge in sharing misleading information during COVID-19. The rapid emergence of this novel “disease” has driven the fast and broad dissemination of misinformation about the virus and efficient prevention and treatment approaches, especially on DSM, since it delivers free and instantaneous access to enormous volumes of data (Frenkel et al., 2020).

In the dental context, Yüce et al. (2020) analysed the quality of YouTube videos as a source of information for dentists, regarding the required clinical preventive precautions during COVID-19. Of the 55 videos included in the final analysis, only 2 (3.6%) were regarded as good quality. Although approximately 60% of the videos were uploaded by dental professionals, more than 40% of those related to COVID-19 infection control in dental practice were found to be of poor quality. This concern about using invalid information has emerged as an important factor influencing DSM usage among dental students and professionals. In Study 1, dental students and dental professionals revealed three main issues: poorly referenced and non-evidence-based information, lack of quality assurance, and difficulty in ascertaining the validity of the information shared on DSM. Thus, future research should investigate perceptions of using DSM to deliver virtual dental

education during the COVID-19 pandemic, and its effect on the learning or teaching experience, in order to provide a complete picture of how lockdown has changed users' perceptions and engagement in the future adoption of DSM.

### 7.2.3 Digital Professionalism Teaching at KCL

As mentioned earlier in Chapter 3, there is a course called Digital Professionalism in Dentistry within dental curricula for both undergraduate and postgraduate programmes, where dental students at FoDOCS are educated in ethics and professionalism as applied to DSM. Moreover, dental students and dental professionals must adhere to specific guidelines when using DSM in these settings, i.e. the guidance on using social media published by GDC (GDC, 2016) and KCL's social media communications policy (King's College London, 2016). This contextual factor could bias the responses in interviews and questionnaires. Dental students and professionals might show more awareness of DSM risks and present higher risk scores in responses to the perceived risk items questionnaire. However, the researcher clearly reflects this potential bias in the research limitations in Section 7.2.4 as a result of the context of the present research, in addition to highlighting the necessity of conducting this research in other dental schools.

### 7.2.4 Research Limitations

Some limitations of this research need to be acknowledged. First, the sample included dental students and dental professionals, from a single dental school in the UK, who had received courses and training on professionalism pertaining to DSM use in the curriculum. Therefore, their responses may be biased by this further education, so that the results have limited generalisability and cannot be extrapolated to all UK dental students and dental professionals. Second, DSM is and will keep on changing and developing for the foreseeable future. Therefore, these results need to be interpreted with caution, as a

snapshot in time. As a cross-sectional study, it determined the risk perceptions among multiple groups at a single point of time; thus, it would be challenging to infer whether the perceptions of respondents had changed over time. To obtain more reliable data, rigorous longitudinal studies of single or multiple groups of dental students and dental professionals are required, to investigate perceived risk scores longitudinally and post-COVID-19. Third, despite attempts to invite a diverse and random sample of dental students and dental professionals, this research had a primary limitation regarding the recruited participants, as the sample consisted of mostly females. Consequently, the generalisability of the explored factors across genders needs to be studied in the future. Moreover, the questionnaire did not gather information about racial and ethnic backgrounds, which could also have an influence on DSM use. Furthermore, although this study formed a theoretical foundation of DSM perceived risks, the work does not go further to measure the impact of those perceived risks on the acceptance and uptake of DSM.

# 8 Chapter Eight: Research Contributions, Recommendations and Conclusions

## 8.1 Introduction

The previous chapter thoroughly discussed the research findings whilst simultaneously making reference to the previous literature review and theoretical perspectives. Moreover, the findings were analysed through the lens of the perceived risks identified in Study 1 and compared with factors yielded by analysis in Study 2. Furthermore, the discussion concerning the impact of COVID-19 on the interpretation of DSM perceived risks was presented. The chapter concludes by highlighting the limitations of the research.

This final chapter presents the research's contributions to the body of knowledge, theory, and method. Additionally, it summarises the conclusions and recommendations for future research. Research Contributions

This research makes three meaningful contributions, categorised below under contributions to knowledge, theory, and method..

### 8.1.1 Contribution to Knowledge

The first contribution of this research is the fact that it was able to address a knowledge gap by identifying how dental students and dental professionals perceived risks of using DSM in general and in dental professional contexts in particular. Whilst the literature on dentistry has looked at DSM risks using a narrow lens, it does not identify and provide a complete picture of DSM risks (Kenny & Johnson, 2016; Knott & Wassif, 2018; Dobson et al., 2019). Moreover, the scholars highlighted a broad range of specific risks of DSM use in the dental profession based on commentaries and opinions which did not offer empirical

evidence to support their claims (Spallek et al., 2015; Bhola & Hellyer, 2016; de Peralta et al., 2019).

Given the increased use and the high DSM penetration rate in dentistry, this research has identified significant perceived risks that may affect DSM use in the dental field. It was uncovered that dental students and dental professionals were concerned with eight DSM perceived risks. When they used DSM in their personal life, unsurprisingly, they perceived similar risks to those perceived by any DSM users in a general context, such as personal privacy breaches and time loss. The findings also shed light on fundamental perceived risk factors when DSM is used in a dental professional context, such as breaches of patient confidentiality, using invalid information, public deception, and reputation damage. Moreover, this research has provided further understanding by analysing the importance and the differences of DSM perceived risks between groups based on education level. Interestingly, these comparison findings were inconsistent between groups, as presented and discussed in Chapter 6.

### 8.1.2 Contribution to Theory

The second contribution of this research was developing a DSM perceived risks conceptual model, which illustrates risks that are specific to the dental professional context. As mentioned in Chapter 1, the e-commerce perceived risks theorised by Featherman and Pavlou (2003) were extensively adopted and redefined to fit into several research contexts e.g. in online banking (Lee, 2009), internet government services (Bélanger & Carter, 2008), and public social media services (Khan et al., 2014), although they did not seem to entirely reflect the risk perceptions of DSM use in dentistry amongst dental students and dental professionals. Featherman and Pavlou, (2003) typified perceived risk as comprising six factors: (1) psychological, (2) financial, (3) social, (4) privacy, (5) performance and (6) time loss. As an outcome of analysing the results through the lens of perceived risks, this

research developed a new conceptual model that reflects the risk perceptions of DSM use in dentistry amongst dental students and dental professionals.

The proposed conceptual model is entitled Eight DSM Perceived Risks (as presented in Chapter 5). This model also explains the possible differences in the uptake of DSM in the dental context. Furthermore, it will open up valuable future research opportunities to analyse whether the recognised DSM perceived risks in this research impact the adoption of DSM by integrating and testing DSM within well-established technology acceptance models (Featherman & Pavlou, 2003; Escobar-Rodrguez et al., 2014).

### 8.1.3 Contribution to Method

The third contribution of this research was the development of a scale to measure DSM perceived risk that can be employed in the dental context and other healthcare research fields. The current work has reported the construction and validation of a measure of dental students, and dental professionals' DSM perceived risks. The existing perceived risk scales, such as the online-services 25-item perceived risk scale (Featherman & Pavlou, 2003) and the public social media 12-item perceived risk scale (Khan et al., 2014) do not fully include items that fit the dental context.

In the current project, exploratory factor analysis based on the sample collected for this research yielded an eight-factor solution, which was subsequently supported by reliability and validity evidence; the final version of the measure consisted of eight scales made up of 28 items in total (see Chapter 5). This instrument can not only be used for benchmarking across dental schools but can also be utilised to enable dental students and dental professionals' self-reflection and improve their self-understanding of risks related to DSM. As mentioned, this work provides an instrument with standard scales which can be used by dental educators and other academic assessors to evaluate the adoption of DSM in

education. Moreover, it can aid in informing teaching by allowing dental educators to acquire a general understanding of their students' perceived risks regarding their DSM technologies and which risk factors they need support with.

## 8.2 Research Recommendations

Based on the results of this research, a number of implications and recommendations are presented in this section which are relevant to dental educators, policymakers and future research development, in order to manage DSM risks and cultivate practical and education strategies.

### 8.2.1 Recommendations for Dental Education/Curriculum Design

The evidence from this research complements that of earlier studies which called for training on DSM use for dental students and dental professionals; this should provide competent skills and self-assessment of risks regarding ethical issues, and thus advance the adoption of DSM in the dental professional context (Spallek et al., 2015; Kenny & Johnson, 2016; Khatoon et al., 2019). Teaching relating to GDC standards, DSM risks and appropriate online behaviour can be delivered via lectures, interactive workshops, and seminars. Especially when considering the current dramatic trend of adopting digital technologies in education and disseminating information through DSM, such training has become crucial. FODOCs curriculum incorporated courses on professionalism as applied to DSM. The findings of this research have revealed broad opportunities and highlighted critical risk factors to inform the curriculum and cover subjects/topics that address the salient DSM risks perpetuated in this research (i.e., public deception and damage to reputation, patient confidentiality, privacy and time concerns, and the issues surrounding the validity of the information on DSM). Also, this training can be incorporated into continuing professional development (CPD) courses for qualified dental professionals.

Such self-assessment of DSM risks will help to better navigate the use of DSM in dental practice and education. In addition to the suggested topics and curricular considerations provided by Spallek et al. (2015), some further topics can be recommended for dental students' education. These include, but are not limited to, the critical appraisal of the information related to oral and dental health posted on DSM, and marketing dental services to a wide array of consumers from the general public and patients, in compliance with governing bodies' guidance and regulations (Table 8. 1).

Table 8. 1 The suggested topics to be included in DSM education for dental students in a professional programme.

| Education stage | Examples of suggested topics based on this study's results: |
|---|---|
| **Stage 1**<br>**Transition to a dental student** | Topics focusing on critical appraisal of the information related to oral and dental health posted on DSM:<br>• How to recognise and distinguish non-evidence-based, poorly referenced, and poor-quality information on DSM, from credible sources.<br>• Guiding dental students to access reliable peer-reviewed journals and website accounts on DSM, where the information is subjected to quality assessment.<br>Additional topics focusing on risks related to DSM use in the general and professional contexts:<br>• Technical training courses to ensure DSM are used with efficient knowledge of technical and privacy settings.<br>• Manage the time of using DSM (i.e., stop receiving notifications). |
| **Stage 2**<br>**Transition to the clinical setting** | Topics focusing on how to use DSM as powerful supplemental tools for education, and marketing to a large array of consumers from the general public and patients.<br>• How to implement DSM for dental practices' digital presence and self-promotion.<br>• How to market dental products and services in accordance with available GDC guidelines.<br>• How to utilise DSM for the benefit of patients (e.g., building a channel for patient education and customer service). |
| **Stage 3**<br>**Transition from education to practice.** | Topics focusing on how to use DSM professionally in dental practice, such as:<br>• How to endorse products based on accurate information proved by evidence.<br>• How to create DSM profiles and websites for marketing purposes and manage the posted content.<br>• Conflict of interest topics (e.g., business interest conflicts and product and services conflicts). |

### 8.2.2 Recommendations for Policymakers

The results of this study underlined that the risks involved in DSM use are not only limited to the reputation of the profession and patients' confidentiality, as mentioned in previous studies (Kenny & Johnson, 2016; Nason et al., 2018; Santos et al., 2021). They also include other risks, such as time, personal privacy, using invalid information, and technical issues. Therefore, the findings of this study offer valuable suggestions for policymakers, to become better informed about the critical aspects of DSM.

The policymakers in universities and dental faculties require sound policies and regulations to facilitate the adoption of DSM among dental students and professionals. These changes can occur via adequate administration infrastructure and investment, as well as training programmes on risk mitigation and compliance with the university regulations.

Moreover, GDC guidance provides useful information to enable dental students and professionals to navigate the complexities of their obligations (GDC, 2016). However, there are still some grey areas in the GDC guidance domains, which need further explanation. For example, the unnecessary disclosure of patients' images on DSM by dental students and professionals is a worrying reality and needs clearer guidance, especially regarding consent issues. Publishing cases where the patients' anonymity and confidentiality were not appreciated had been constantly observed and appeared as a salient risk in this study.

### 8.2.3 Recommendations for Future Research

Further works can be conducted to scrutinise and analyse the Study 1 perceived non-risk codes that emerged from Study 1, which could provide a basis for future research.

The following are recommendations and directions for future research opportunities to pursue:

- The DSM perceived risk factors were identified and validated based on data collected in a dental school in the UK, in one academic year. It would be interesting to readminister the questionnaire in forthcoming academic years and in other dental schools, to determine the test-retest reliability of the factor structure and compare experiences of DSM use pre and post the COVID-19 pandemic.
- Further research is needed to investigate the varying policies, guidelines, prevalence and purposes of DSM use, in different countries. Therefore, validation through cross-cultural studies, utilising a similar mixed-methods design, might be another exciting area of research: interviews and questionnaires could be conducted in other countries, to develop a comparison model and examine the factor structure's replicability across languages and cultures.
- The findings from this study focused primarily on identifying and analysing DSM risk factors as perceived by dental students and professionals. Exploring the DSM risk factors of stakeholders (i.e., policymakers and patients) might be the next imperative action for acquiring a holistic view; this would also confirm some factors identified in the current study (i.e., the deceptive information risk and patient confidentiality risk).
- This study explored the risks of using a wide range of DSM. Further research is required to examine specific DSM platforms, services or applications, and how their associated risks may be perceived differently. It would be more useful to focus on popular DSM applications, to identify specific results relevant to each platform.
- It is suggested that future studies examine whether the identified DSM perceived risks in this research affect the adoption of DSM, by integrating and testing the DSM perceived risks framework within technology acceptance models (e.g., Technology Acceptance Model (TAM), or the Unified Theory of Acceptance and

Use of Technology (UTAUT)). This will help to determine which specific DSM risk factors affect the adoption of DSM.

## 8.3 Conclusions

In conclusion, this research has taken a primary step in deepening the understanding of perceived risks that influence DSM use in the dental professional context. Some identified perceived risks were associated with all DSM users in the general context (i.e., privacy, time spent on DSM, and negative impact on self-image), but others were specific to the dental professional context (e.g., breaches of patients' confidentiality, public deception, and reputational damage). Such a thorough description and explanation of those risks using a mixed methods approach have not been previously reported. Therefore, the results represent a novel contribution and produce a new framework; this will help to develop education, training and guidance, in order to mitigate and manage the risks associated with DSM use in the dental professional context.

Also, this research has shed light on the most salient risks that dental students and professionals perceive. The results indicate higher agreement ratings for risks pertaining to ethical and professionalism issues, such as disclosure of patients' confidential information, and sharing deceptive information related to dental and oral health. These risks magnify the risks related to DSM content, because once posted, information on DSM cannot simply be removed again, and is more rapidly distributed to many people. Moreover, the findings indicate the complexity of upholding ethical and professionalism standards on DSM.

Dental professionals and postgraduate students had a significantly higher perception of "time and resources spent on learning/training to use DSM" than undergraduate students. This highlighted the importance of considering the technical skills and resources support that are required to enrich the use of DSM within the dental professional context, including

dental practices and delivering education. Moreover, undergraduate students seem to care less about their self-image, compared with dental professionals and postgraduate students. This suggests the need to appropriately instruct and educate them about the potential adverse consequences for their professional image, due to the unprofessional use of DSM.

Finally, although this research has some limitations, it is believed that the findings will enable dental educators and policymakers to recognise and address DSM risks in the dental professional context.

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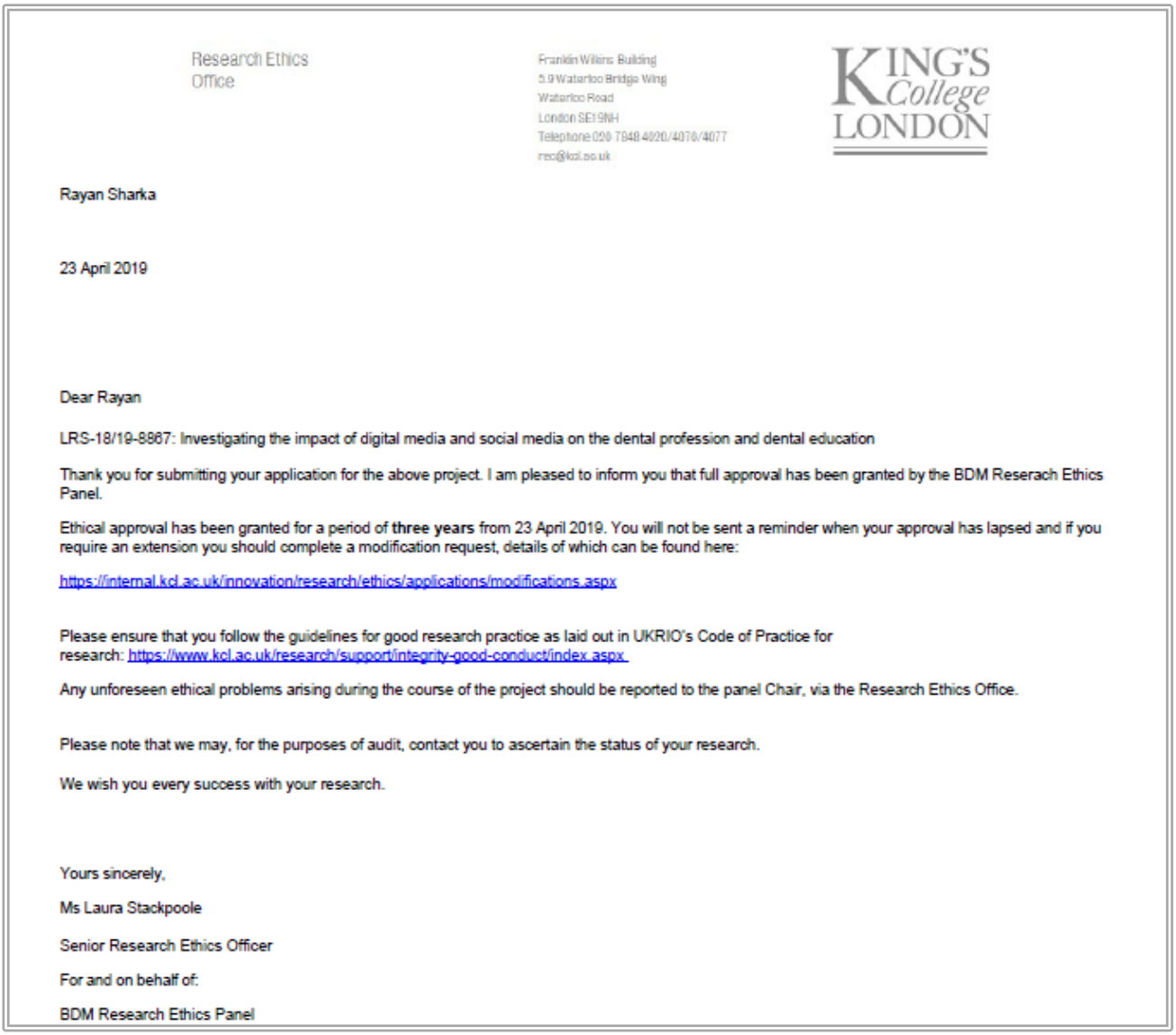
# 10 Appendices

## 10.1 Appendix A: Ethical Approvals of Research



Research Ethics
Office

Franklin Wilkins Building
5.9 Waterloo Bridge Wing
Waterloo Road
London SE1 9NH
Telephone 020 7848 4920/4078/4077
reo@kcl.ac.uk

KING'S College LONDON

Rayan Sharka

23 April 2019

Dear Rayan

LRS-18/19-8867: Investigating the impact of digital media and social media on the dental profession and dental education

Thank you for submitting your application for the above project. I am pleased to inform you that full approval has been granted by the BDM Reserach Ethics Panel.

Ethical approval has been granted for a period of **three years** from 23 April 2019. You will not be sent a reminder when your approval has lapsed and if you require an extension you should complete a modification request, details of which can be found here:

https://internal.kcl.ac.uk/innovation/research/ethics/applications/modifications.aspx

Please ensure that you follow the guidelines for good research practice as laid out in UKRIO's Code of Practice for research: https://www.kcl.ac.uk/research/support/integrity-good-conduct/index.aspx

Any unforeseen ethical problems arising during the course of the project should be reported to the panel Chair, via the Research Ethics Office.

Please note that we may, for the purposes of audit, contact you to ascertain the status of your research.

We wish you every success with your research.

Yours sincerely,

Ms Laura Stackpoole

Senior Research Ethics Officer

For and on behalf of:

BDM Research Ethics Panel

Figure 9. 1 Study 1 (qualitative study) ethical approval.

Research Ethics
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KING'S College LONDON

13/03/2020

Dear Rayan,

**Reference Number:** MOD-19/20-8867

**Study Title:** Investigating the impact of digital media and social media on the dental profession and dental education

**Modification Review Outcome: Full Approval**

Thank you for submitting a modification request for the above study. This is a letter to confirm that your request has now been granted Full Approval.

If you have any questions regarding your application please contact the Research Ethics Office at rec@kcl.ac.uk.

Kind regards

Mr James Patterson

Senior Research Ethics Officer

**on behalf of**

BDM Research Ethics Panel

Figure 9. 2 Study 2 (quantitative study) ethical approval.

## 10.2 Appendix B: Participant Information Sheet and Consent Forms

Study 1 Participant Information Sheet

**INFORMATION SHEET FOR PARTICIPANTS**

Version 1 (17/04/2019)

*Ethical Clearance Reference Number: LRS-18/19-8867*

# Investigating the impact of digital media and social media on the dental profession and dental education

**Invitation Paragraph**

We are pleased to invite you to participate in this research study. It is important for you to understand the reasons why we are undertaking for this research and what your participation will involve before you to decide to participate or not. Please take your time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information, we will be more than happy to assist you.

**What is the purpose of the study?**

The primary purpose of the study is to explore perceptions of using digital media and social media risks as perceived by dental students and dental educators as a (dental professional) and what are the barriers challenges that affecting their intention and adoption to using these technologies.

Also, the study is interested to investigate the differences between dental students and faculties' perceptions of social media risks and whether age and clinical experience had an influence on their usage of digital and social media awareness, perception and behaviours.

**Why have I been invited to take part?**

We are asking you to take part because we are interested in exploring a range of different perceptions of using digital and social media as pertained by dental students and dental

professionals and affecting their intention to use social media. Also, the literature review showed a paucity of dental studies that address this phenomenon.

The exclusion and inclusion criteria of the study:

a) Inclusion criteria

• Participants of Study (1) are (Ds) Dental students: undergraduate/postgraduate students who are studying at FoDOCS at King's College London and at Portsmouth Dental Academy; and (Dp) Dental professionals: faculty members who are providing dental care and working at FoDOCS, King's College London, and its education partners including Guy's and St Thomas NHS foundation trust, West Norwood, King's College Hospital, Portsmouth Dental Academy.

• Male and female participants will be invited.

• The age range of dental students will be 16 years and above.

• The age range of dental educators 20 years and above.

b) Exclusion criteria

• Since this study aimed to identify risks that pertain to dental students and dental professionals, any participant outside dental field will be excluded. In more specific, students and faculty in medicine and other health allied specialisations will be excluded.

**What will happen if I take part?**

If you agree to participate, we will invite you to attend the location of the interview. Then, we will go through the following stages:

a) We will introduce the research topic and describes the aims and objectives of the research, its design and what we are planning to cover throughout the interview.
b) We ask you to read and sign the consent form.
c) We will ask you questions about your general social media activity, usage, and preferred social media platform. An example of questions of this part are "Tell us about the main

ways that you use social media? In your personal/daily life? As a part of studying and learning?"

d) We will ask you questions about challenges of using digital and social media as dental professionals. An example of questions of this part are "What are the risks of using such tools as dental students? What do you do to mitigate these risks and maximise the benefits?.
e) After that we will show you a series of social media activities conducted by dental professionals such as (photographs and comments captured from social media networks and a short video from Twitter) and will ask you about your opinion and risks of that behaviour.

We think that the whole interview should last 30-60 mins at most.

**Do I have to take part? How can I withdraw?**

Participation is completely voluntary. If you choose to take part, you will be asked to sign a consent form. You are free to withdraw at any point during the interview, without having to give a reason and by any means such as (email, phone, and letter to researchers). Withdrawing from the study will not affect you in any way.

Once the recorded interview transcribed and analysed, it will no longer be possible to withdraw from the study after the following date **31 December 2020** because the data will be fully anonymous. Please do not include any personal identifiable information in your responses.

**Incentives**

It is expected that the interview will take up to 30-60 mins. So, the researchers will compensate research participants for their time by awarding them £15 Amazon voucher/hour at the end of the interview as our way of saying "Thank you".

**What are the possible risks of taking part?**

We believe that there are no risks or disadvantages to taking part in this study; the only inconvenience is the time taken for the interview discussions and answer the questions. If you

suffer any harm as a direct result of taking part in this study, you can apply for compensation under the King's College London's 'No Fault Compensation Schemes'.

**Data handling and confidentiality**

This research is anonymous. All information which is collected about you during the interview will kept strictly confidential. All the materials you provide will be coded with an anonymous code known only to the research team. The information you give us will be kept on a password protected computer and data will be destroyed at the end of the study.

Also, the information you provide will not allow you to be identified in any research outputs, thesis or publications.

The data controller for this project will be King's College London (KCL). Your data will be processed in accordance with the standards set by the General Data Protection Regulation 2016 (GDPR).

**How is the project being funded?**

This project is part of Dr. Rayan Sharka's PhD studies at King's College London.

**What will happen to the results of the study?**

The results will be used as a part of an educational qualification for Dr. Sharka as a part of his PhD thesis. We also hope to publish the research results in academic journals. It will not be possible for any individual participant to be identified in any publication we produce. If you would like a summary of the findings of the study let us know and we will send you a summary at the end of our data analysis.

**Who should I contact for further information?**

If you have any questions or require more information about this study, please contact Dr. Sharka using the following contact details: **rayan.sharka@kcl.ac.uk**

**What if I have further questions, or if something goes wrong?**

For further advice and information:

If you wish to make a complaint about the conduct of the study, you can contact the project supervisory team in King's College London using the details below:

| **Dr. Jonathan San Diego**<br>+44 (0) 207 188 1831<br>**jonathan.p.san_diego@kcl.ac.uk** | **Prof. Avijit Banerjee**<br>+44 (0) 207 188 1577<br>**avijit.banerjee@kcl.ac.uk** | **Dr. Melanie Nasseripour**<br>+44 (0) 207 188 1594<br>**melanie.nasseripour@kcl.ac.uk** |
|---|---|---|
| Senior Lecturer in Educational Technology and Healthcare Informatics<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>iTEL Hub<br>Floor 18, Tower Wing<br>Guy's Hospital<br>London SE1 9RW | Professor, Conservative and MI dentistry<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>Room 302<br>Floor 26, Tower Wing<br>Guy's Hospital<br>London SE1 9RW | Clinical Senior Lecturer in Ethics and Dental Education<br>Conservative and MI dentistry<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>Room 302<br>Floor 26, Tower Wing<br>Guy's Hospital<br>London SE1 9RW |

**If something goes wrong?**

If this study has harmed you in any way or something goes wrong, or you have complaints relating to the conduct of the research that has not been addressed satisfactorily by the research team, please contact the research ethics chair (**rec@kcl.ac.uk**).

**Thank you for reading this information sheet and for considering taking part in this research.**

Study 1 consent form

Version Number 1 05/03/19

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

## Title of Study: Investigating the impact of using social media on dental education and dental profession.

King's College Research Ethics Committee Ref: LRS-18/19-8867

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

1. I confirm that I understand that by ticking/initialling each box I am consenting to this element of the study. I understand that it will be assumed that unticked/initialled boxes mean that I DO NOT consent to that part of the study. I understand that by not giving consent for any one element I may be deemed ineligible for the study. ☐

2. I confirm that I have read and understood the information sheet dated [INSERT DATE AND VERSION NUMBER] for the above study. I have had the opportunity to consider the information and asked questions which have been answered to my satisfaction. ☐

3. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason, up until [INSERT DATE SPECIFIED ON INFORMATION SHEET] ☐
4. I consent to the processing of my personal information for the purposes explained to me in the Information Sheet. I understand that such information will be handled in accordance with the terms of the General Data Protection Regulation. ☐
5. I understand that my information may be subject to review by responsible individuals from the College for monitoring and audit purposes. ☐
6. I understand that confidentiality and anonymity will be maintained, and it will not be possible to identify me in any research outputs. ☐
7. I agree to be contacted in the future by King's College London researchers who would like to invite me to participate in follow up studies to this project, or in future studies of a similar nature. ☐
8. I agree that the research team may use my data for future research and understand that any such use of identifiable data would be reviewed and approved by a research ethics committee. (In such cases, as with this project, data would not be identifiable in any report). ☐
9. I understand that the information I have submitted will be published as a report and I wish to receive a copy of it. ☐
10. I consent to my interview being audio/video recorded. ☐
11. I understand that I must not take part if I fall under the exclusion criteria as detailed in the information sheet and explained to me by the researcher. ☐

12. You are free to withdraw at any point during interview, without having to give a reason and by any means (email, contact phone letter person). Withdrawing from the study will not affect you in any way. Once the recorded interview transcribed and analysed, it will no longer be possible to withdraw from the study after the following date 31 December 2020 because the data will be fully anonymous. ☐
13. Once the recorded interview transcribed, it will no longer be possible to withdraw from the study because the data will be fully anonymous. ☐
14. I have informed the researcher of any other research in which I am currently involved or have been involved in during the past 12 months. ☐
15. I agree to maintain the confidentiality of focus group discussion. ☐
16. I understand that confidentiality cannot be guaranteed during the [focus group/teamwork/intervention]. ☐

| _____ | _____ | _____ |
|---|---|---|
| **Name of Participant** | **Date** | **Signature** |
| _____ | _____ | _____ |
| **Name of Researcher** | **Date** | **Signature** |

Study two participant information sheet 1

**INFORMATION SHEET FOR PARTICIPANTS**

Version 2 (07/03/2020)

*Ethical Clearance Reference Number: MOD-19/20-8867*

# Investigating the impact of digital media and social media on the dental profession and dental education

## Invitation Paragraph

I would like to invite you to participate in this research project, which forms part of my PhD research. Before you decide whether you want to take part, it is important for you to understand the reasons why the research is being done and what your participation will involve. Please take your time to read the following information carefully. Ask me if there is anything that is not clear or if you.

## What is the purpose of the study?

The purpose of the study is to explore and understand the perceived risks of using digital and social media (DSM) as pertained by dental students and dental professionals.

Also, the study is interested in investigating empirically the differences between dental students and dental professionals' perceived risks of DSM and whether age, academic level and clinical experience had an influence on their usage of DSM risk perceptions and behaviours.

## Why have I been invited to take part?

You are being invited to participate in this study because you are a dental student and dental professional. We are interested in exploring a range of different perceptions of using DSM as pertained by dental students and dental professionals and affecting their intention to use DSM in dental education and profession.

The exclusion and inclusion criteria of the study:

a) Inclusion criteria

• Participants of Study (1) are (Ds) Dental students: undergraduate/postgraduate students who are studying at dental schools in the UK and (Dp) Dental professionals: faculty members who are providing dental care and teaching at dental schools in the UK.

• Male and female participants will be invited.

• The age range of dental students will be 16 years and above.

• The age range of dental educators 20 years and above.

b) Exclusion criteria

• Since this study aimed to identify risks that pertain to dental students and dental professionals, any participant outside dental field will be excluded. In more specific, students and faculty in medicine and other health allied specialisations will be excluded.

**What will happen if I take part?**

If you agree to participate, will be asked to complete an anonymous online questionnaire. The questionnaire will ask you questions about yourself (i.e., age, gender, academic level, types of digital and social media platforms and time you spend on digital and social media). Also, you will be asked to rate statements with 5 points Likert scale [Strongly disagree (1) Strongly agree (5)] regarding your perceived level of risks of the DSM in dental education and profession.

**Do I have to take part? How I can withdraw?**

Participation is entirely voluntary. You should only take part if you want to and choosing not to take part will not disadvantage you in any way. If you decide to take part, you will be asked to provide your consent. To do this, you will be asked to indicate that you have read and understood the information provided within this online questionnaire and that you consent to your anonymous data being used for the purposes explained.

You are free to withdraw at any point during completion of the questionnaire, without having to give a reason. You can contact us at the email provided below. Withdrawing from the study will not affect you in any way. However, once you submit the questionnaire, it will no longer be possible to withdraw from the study as the data will be fully anonymous. Please do not include any personal identifiable information in your responses.

**Incentives**

It is expected that the questionnaire will take up to 5 mins to complete. The researchers will compensate participants for their time by awarding them £5 Amazon e-voucher for the completed questionnaire as our way of saying "Thank you".

**What are the possible risks of taking part?**

We believe that there are no risks or disadvantages to taking part in this study; the only inconvenience is the time taken to answer the questionnaire questions.

**Data handling and confidentiality**

This research is anonymous. All information which is collected about you will be kept strictly confidential. All the materials you provide will be coded with an anonymous code known only to the research team. The information you give us will be kept on a password-protected computer and data will be destroyed at the end of the study.

Also, the information you provide will not allow you to be identified in any research outputs, thesis or publications.

The data controller for this project will be King's College London (KCL). Your data will be processed in accordance with the standards set by the General Data Protection Regulation 2016 (GDPR).

**How is the project being funded?**

This project is part of Dr. Rayan Sharka's PhD studies at King's College London.

**What will happen to the results of the study?**

The results will be used as a part of an educational qualification for Dr. Sharka as a part of his PhD thesis. We also hope to publish the research results in academic journals. It will not be possible for any individual participant to be identified in any publication we produce. If you would like a summary of the findings of the study let us know and we will send you a summary at the end of our data analysis.

**Who should I contact for further information?**

If you have any questions or require more information about this study, please contact Dr. Sharka using the following contact details: **rayan.sharka@kcl.ac.uk**

**What if I have further questions, or if something goes wrong?**

a) For further advice and information:

If you wish to make a complaint about the conduct of the study, you can contact the project supervisory team in King's College London using the details below:

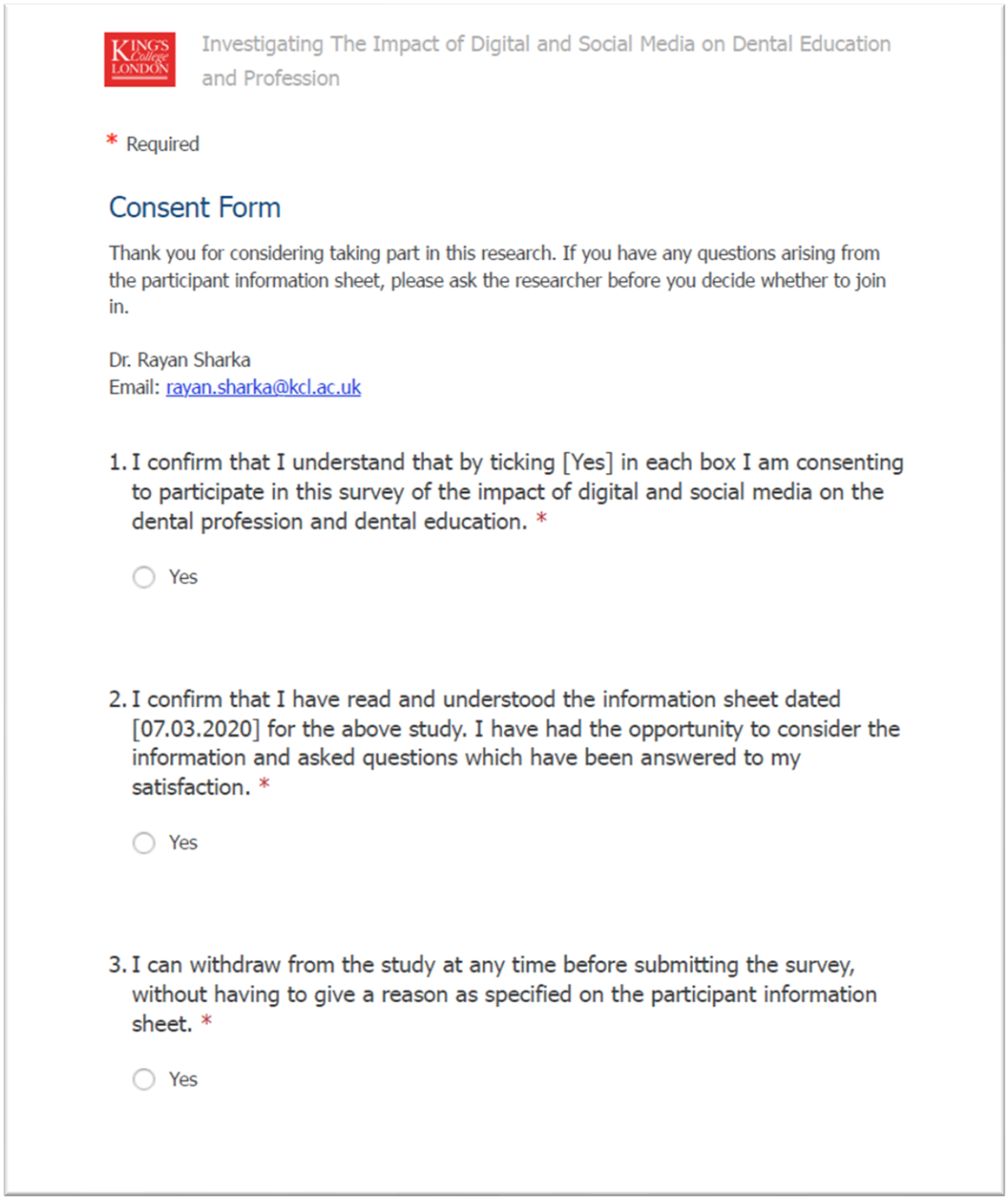
| **Dr. Jonathan San Diego**<br>+44 (0) 207 188 1831<br>**jonathan.p.san_diego@kcl.ac.uk** | **Prof. Avijit Banerjee**<br>+44 (0) 207 188 1577<br>**avijit.banerjee@kcl.ac.uk** | **Dr. Melanie Nasseripour**<br>+44 (0) 207 188 1594<br>**melanie.nasseripour@kcl.ac.uk** |
|---|---|---|
| Senior Lecturer in Educational Technology and Healthcare Informatics<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>iTEL Hub<br>Floor 18, Tower Wing<br>Guy's Hospital<br>London SE1 9RW | Professor, Conservative and MI dentistry<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>Room 302<br>Floor 26, Tower Wing<br>Guy's Hospital<br>London SE1 9RW | Clinical Senior Lecturer in Ethics<br>and Dental Education<br>Conservative and MI dentistry<br>Faculty of dentistry, oral and craniofacial sciences<br>King's College London<br>Room 302<br>Floor 26, Tower Wing<br>Guy's Hospital<br>London SE1 9RW |

## If something goes wrong?

If this study has harmed you in any way or something goes wrong, or you have complaints relating to the conduct of the research that has not been addressed satisfactorily by the research team, please contact the research ethics chair (**rec@kcl.ac.uk**).

**Thank you for reading this information sheet and for considering taking part in this research.**

Study two consent form 1



Investigating The Impact of Digital and Social Media on Dental Education and Profession

* Required

## Consent Form

Thank you for considering taking part in this research. If you have any questions arising from the participant information sheet, please ask the researcher before you decide whether to join in.

Dr. Rayan Sharka
Email: rayan.sharka@kcl.ac.uk

1. I confirm that I understand that by ticking [Yes] in each box I am consenting to participate in this survey of the impact of digital and social media on the dental profession and dental education. *

   ○ Yes

2. I confirm that I have read and understood the information sheet dated [07.03.2020] for the above study. I have had the opportunity to consider the information and asked questions which have been answered to my satisfaction. *

   ○ Yes

3. I can withdraw from the study at any time before submitting the survey, without having to give a reason as specified on the participant information sheet. *

   ○ Yes

4. I consent to the processing of my personal information for the purposes explained to me in the Information Sheet. I understand that such information will be handled in accordance with the terms of the General Data Protection Regulation. *

- ○ Yes

5. I understand that my information may be subject to review by responsible individuals from the College for monitoring and audit purposes. *

- ○ Yes

6. I understand that confidentiality and anonymity will be maintained, and it will not be possible to identify me in any research outputs. *

- ○ Yes

7. I agree that the research team may use the survey data for future research and understand that any such use the data would be reviewed and approved by a research ethics committee. (In such cases, as with this project, data would not be identifiable in any report). *

- ○ Yes

8. I understand that the results of the survey will be published as specified in the information sheet. *

- ○ Yes

Back Next

## 10.3 Appendix C: Study One Methods

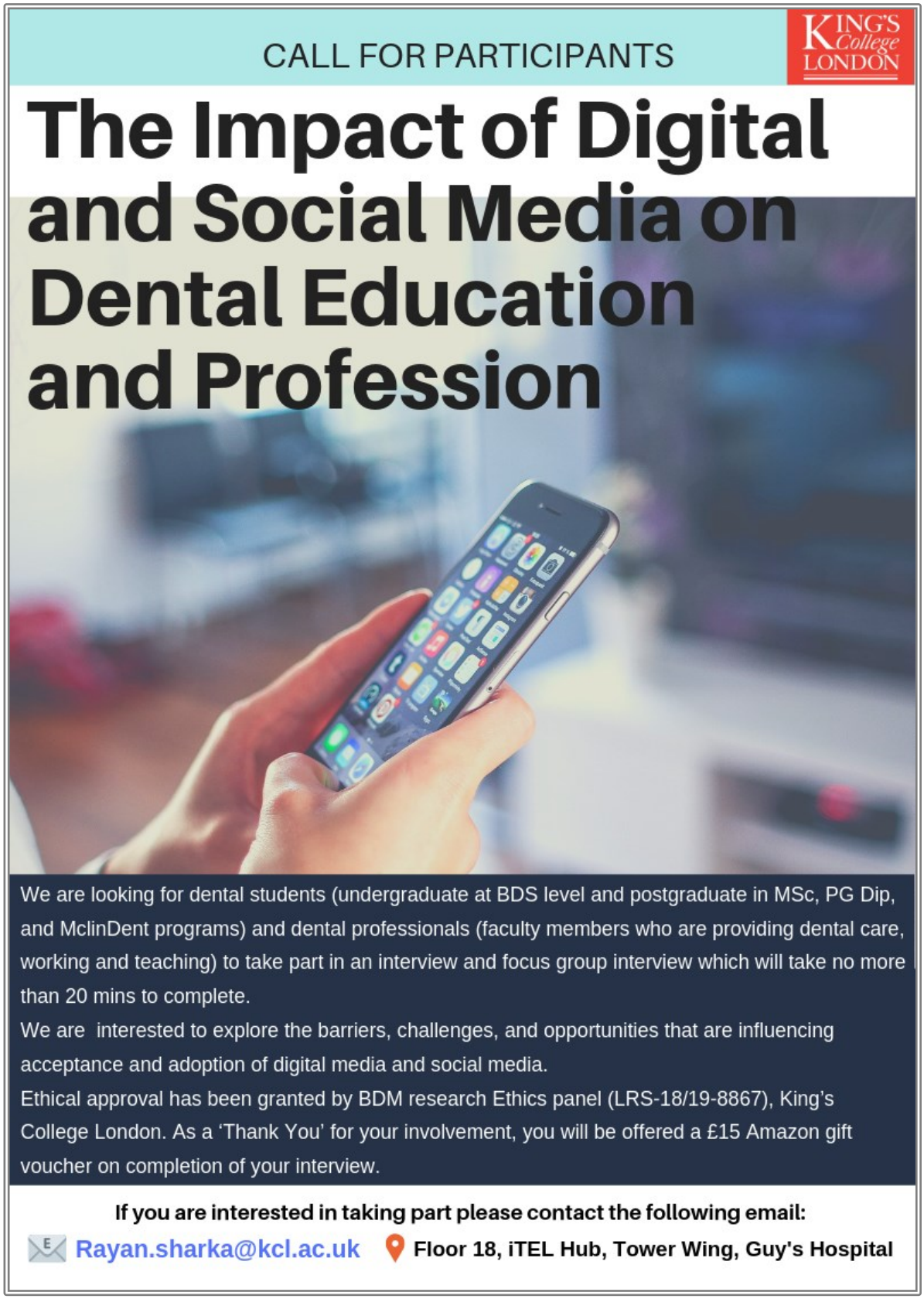



Figure 9. 3 The invitation poster for the interviews.

Table 9. 1 Interviews guide.

**Establishing a rapport with interviewees**

- Brief introduction of the researcher.
- Study topic.
- Explanation of the aims and objectives of the study.
- Why have we selected him/her?
- Why are we conducting this study?
- Ensure about confidentiality/anonymity.
- Explain recording, duration of the interview and nature of discussion.
- Check whether they have questions about participant information sheet.
- Signing consent form and go through consent form and explain that they can quit anytime from. interview, and do not have to answer questions that they would prefer not.

**Section one:** The current use and activities of DSM in daily life (general context) (to make participant talking and to find out contextual knowledge about his/her current use of DSM).

1. Can you tell me about how you use DSM in your personal and social life?

Prompts:

- Do you have any DSM daily activities i.e., posting photos, videos and stories?
- Why are DSM important for your social life?
- What are the favourite DSM applications/platforms use? And why?
- On average, how much time do you spend on DSM each day? How many times you check DSM daily?

**Section two:** Experience and perceptions about DSM in professional life (professional context) (to understand what led the participant to use digital and social media in their professional/academic life, what circumstances, factors influencing).

2. Can you tell me about how you use DSM in your professional life?

- With colleagues?
- With your patients?
- For academic (teaching purposes)?
- For marketing purposes?
- In dental practice?
- With your students?

3. Could you explain what sort of things/reasons you do not like or discourage you from using DSM?

Prompts:

- Can you tell me your opinion about using DSM for education and knowledge dissemination?
- Could you explain how you use DSM during dental training years?
- What benefits have you experienced for using DSM?
- Can you give a specific example of how they useful?
- What do you see as the main problems that are keeping you form using DSM?

- To what extent, do you think DSM could help you in your professional life?
- Overall, do you find your DSM use has a positive or negative impact on your education and the education of others? Can you explain your answer?

**Section three:** Discussing some example of DSM uses and behaviours raised from literature

4. Can you tell me your opinion about posting (photos/videos/CT scan, X-ray of dental procedures which include patient data in DSM?

Prompts:

- Do you see these DSM activities useful to you or others in the dental field and public?
- What about disclose your (personal data) in DSM? i.e., your photos, name, and interests on DSM?
- Do you use DSM to contact patients? Why?
- What about using DSM to interact with students/patients/professionals?
- Can you tell me about your opinion about the health and oral health information that is available online on DSM and websites?

**Section four:** To conclude the interview:

- Do you see these DSM tools will become more useful or risky to you as a dental professional/student and to the dental profession in the future?
- Is there anything else you would like to discuss about this topic?
- Thank participant for their time.
- Reassure about the interview confidentiality.
- They are welcome to contact the researchers anytime they wish.

Comments/notes taken during interviews

Table 9. 2 The identified preliminary list of coding based on previous relevant literature.

| Codes | Description | Example | Evidence from literature |
|---|---|---|---|
| **Fear of hacking and identity fraud** | The potential loss of control over one's DSM profile and account due to hacking and criminal attack. | Internet hackers (criminals) might take control of my checking account if I used a DSM. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Lifen Zhao et al., 2008; Aldás-Manzano et al., 2009; Lee, 2009; Hong & Cha, 2013; Nepomuceno et al., 2014; Khan et al., 2014; Orekondy et al., 2017; Baccarella et al., 2018) |
| **Spending excessive time** | The possibility of losing time when using DSM by wasting time searching and browsing various activities. | There is a possible time loss due to engaging in different activities on DSM. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Khan et al., 2014; Nepomuceno et al., 2014; Hrafnkelsdottir et al., 2018; Turel et al., 2018; Barthorpe et al., 2020) |
| **Social risk** | The potential loss of status in one's social group due to adopting DSM. | My signing up for and using DSM would lead to a social loss for me because my friends and relatives would think less highly of me. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Aldás-Manzano et al., 2009; Hong & Cha, 2013; Khan et al., 2014; Kansal, 2016; Khedmatgozar & Shahnazi, 2018) |
| **Financial risk** | The potential loss of money due to adopting DSM. | There are the chances that you stand to lose money if you use the DSM. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Munnukka & Järvi, 2014; Nepomuceno et al., 2014; Khedmatgozar & Shahnazi, 2018) |

| Codes | Description | Example | Evidence from literature |
|---|---|---|---|
| **Performance risk** | The possibility of the DSM not performing as it was designed and advertised. | DSM might not perform well and create problems. | (Featherman & Pavlou, 2003; Hassan et al., 2006; Hong & Cha, 2013; Khan et al., 2014; Munnukka & Järvi, 2014; Nepomuceno et al., 2014; Khedmatgozar & Shahnazi, 2018) |
| **Non-evidence-based information** | The possibility of using/sharing non-evidence-based information on DSM. | On YouTube and Google, you have to be careful in terms of accepting information as evidence-based or not. | (Spallek et al., 2015a; Bhola & Hellyer, 2016; A. Das et al., 2017) |
| **Non-compliance with governing bodies' guidelines** | The possibility of violating guidelines when using DSM. | It is crucial to make sure that all the regulations are followed when using DSM. | (Henry & Molnar, 2013; Kenny & Johnson, 2016; Knott & Wassif, 2018; Nason et al., 2018; Shah et al., 2019; Dobson et al., 2019; Karveleas et al., 2020) |
| **Breaching patient confidentiality** | The possibility of violating and breaching patients' confidentiality when using DSM. | I believe that using DSM is good as long as they do not breach patient privacy. | (Martorell et al., 2015; Kenny & Johnson, 2016; Leal et al., 2018; Costa et al., 2020) |

Table 9. 3 Example of the interview transcript with dental students.

| |
|---|
| **Interviewee 1:** [AD] [BDS]<br>**Interviewer:** [RS]<br>**Date and Time:** [03 June 2019, 13:37:40]<br>**Location:** [Floor 26, Clinical Area]<br>**Audio file information:** [190603_0061] |
| **RS: Can you tell me how you use DSM in your personal/general use in daily life?**<br>(00:00:35) AD: I only have Facebook, Instagram, and what's up. I use it really just during break time or just wake up and go through.<br><br>**RS: Yes, I see, so could you explain why DSM are important for your social life, and professional life?**<br>(00:58:00) AD: I guess it is important just to fill time and like maybe update and see what's going on in the world. Also, to communicate with friends as well. I think social media become like source of information and everyone seems like get information from.<br><br>**RS: You have mentioned DSM become a source of information? Can you explain more?**<br>(00:01:31) AD: Most of the time I don't trust it. The source or where the information is coming from. Sometimes you can see a post and the next post is completely contradictory it's just like depends on what types of pages you follow and peers who following as well. In terms of dentistry, there dentists who own pages doing fillings, but they are more invasive than we have been taught! You can see that and recognise that and not to following these pages.<br><br>**RS: What about posting dental procedures photos/videos/CT scan, x-ray which include patient data in DSM? What is your opinion about that?** |

(00:02:28) AD: Possibly I will do like them.

**RS: Why?**

(00:02:35) AD: I just feel like that if your patient wants to see what kind of work you do. As people already do that on the website so if you are going to any dentist's website you will have list of their cases such as before and after pictures so to do it on the Instagram is exactly the same as you are doing on the website it's just will become more accessible, I feel like people would go the Facebook page more than website now.

**RS: Great, I'm not talking about social media or social networks only, can you tell me how you use DSM such as smartphones apps and websites in your daily life? social life?**

(00:03:19) AD: Yes, I did have apps about tooth morphology to help me in anatomy but once I have done with that, I just delete it. I do not use it daily.

**RS: Why?**

(00:03:43) AD: I feel like DSM is more easy to access but a website you have physically go on but social media it's like automatically given post or information you would like so do not have to put much effort just you need to like a page and it will be generating for you.

**RS: On average, how much time do you spend on social media each day? Or how many times you check social media daily?**

(00:04:12) AD: Probably long time.

**RS: Do you have any favourite DSM application?**

(00:04:28) AD: I hate Facebook, I use it because it was useful, now I use it because I have to, but I wish like it did not exist I do not like it. But I like Instagram, I have Snapchat, but I delete it I do not like it.

**RS: How do you use DSM in your studies? during dental training and seeking dental information, peer communication, part of studies? Social groups/studies groups/academic project)?**

(00:05:13) AD: So, I follow a lot of dentist pages on DSM, but I have different account to do that! I do not do that on my personal account. I do not want lots of dentistry on my personal account I want to keep like things separate since I want to keep my hobbies separate from work. I do have separate dentistry account where I just look for these dental materials.

**RS: You have mentioned an interesting point about your usage, but what about seeking dental information, peer communication, part of your studies?**

(00:06:10) AD: We have like a Facebook group that people posting their cases.

**RS: Is it for BDS4?**

(00:06:15) AD: No, it's for all dentists for everyone. You can join these groups and see posting cases and show how they did it and what kind of restoration they used and is the bonding technique. I guess it's like for people to learn. If we have a project to do. We usually create a group like on what's up to talk to each other. We do like have a Facebook group for the all cohort but this like more for sharing events we don't like to talk about clinical dentistry or discussing exams.

**RS: What sort of things/reasons you do not like or discourage you from using DSM? for professional and for studying use?**

(00:08:16) AD: I do not know for personal use I feel like I do DSM when I'm in lunch time or when I'm waiting the bus or the tube, so I do not have time to create a content. I could use that time wisely I have time to look at the stuff, but I do not have time to make stuff. For professional, maybe like the mitigation, cases and trying to get a consent for photos. It's like a drawback for posting photos. Because even if you get

patient consent and can withdraw it anytime but then all photos are on the internet technically forever so any people can download and share it. There are like a sticky situation to do that. So, I think I need to be careful. Because even I get patient consent to share photo on the internet it's not a green card. There are many limitations I need extra time and a good camera to take photos. Also, you know some people posting their work they think it's good but everyone else just like making fun of their work saying that your work is actually bad it's too invasive and things like that there always risks like humiliation and personally I do not like that.

**RS: Can you tell me your opinion about posting dental procedures, photos/videos/CT scan, x-rays which include patient data in DSM?**

(00:10:55) AD: Actually, the last account I followed just post photo of the x-ray. It's a good learning when I see the x-ray photo online then I see it in a real work life. For instances I can see how a good root canal it looks like and I can see how the bad root canal looks like as well so.

**RS: Could you describe how DSM affect the dentists-patient/tutors-students professional relationship?**

(00:11:53) AD: I feel like it might blur the boundary but if you have a professional account for example on Instagram account and patients are following that it's not too much issue because it's not your personal account. Because some of the tutors have a professional account as well and I'm following them and comments and stuff like that. But as no need to interact with my tutor on social media just email them if they did not exist then I can contact them on DSM. I personally will not do it on DSM if I have questions, I will just email it or ask them in person I feel it's like a weird to do it on social media.

**RS: To what extent do you feel DSM can affect your feelings and self-image?**

(00:13:55) AD: I do not know. Now I did not post because I do not have an academic dental qualification yet. I do not think my work get enough to show. My personal account on Instagram is private account and only my friend follow, and I'm only share like what I have seen such photos it's not affects me.

**RS: Any other points you would like to raise? Intention for using in the future. Further support that would have been useful/should be available?**

(00:15:01) AD: I actually I wrote an article about that on a student BDJ journal about social media and If we have a page that post like quizzes, post MCQs questions, also involved with the university all students will follow that and I will use it as well. Currently I follow like an MCQ pages about my practice questions but obviously from different countries. So, it's like not a representative but if we have a king's version of that it will really a great idea and it will not cost either very simple and when we are off the school we still get learning, discussions, comments I do not think there is a draw back about it.

**Interviewee:** [IS] [PG MclinDent student]

**Interviewer:** [RS]

**Date and Time:** [ 13 June 2019, 16:37:38]

**Location:** [Floor 26, PG room]

**Audio file information:** [190613_0066]

**RS: Can you tell me how you use DSM in your personal/general use in daily life?**

(00:01:13) IS: As a person I use to use it a lot. I use like Facebook and Instagram, but I do not use it anymore because the course and time. I'm on WhatsApp where I socially contact people.

**RS: What about professionally?**

(00:01:46) IS: Professionally, I do use Facebook for getting information but I'm not active on any group because I do not have time. So, professionally as well I'm on a few WhatsApp group and keep that like that professionally.

**RS: What are the favourite DSM application use? And why?**

(00:02:13) IS: I think Facebook is a good platform.

**RS: But you are not an active user at the moment?**

(00:02:26) I would say no. No time.

**RS: So, how do you use DSM in your studies? during dental training? seeking dental information, peer communication, part of studies?**

(00:02:25) IS: I think it's amazing to have such a technology where I can go online to find all information, I want more than sometimes because there are really good active groups you know to get information from.

**RS: you have mentioned a good point; do you mean DSM is good from academic project for example?**

(00:03:50) IS: Actually, I'm practicing so I use it to find any clinical caries and what is the best technique or if to find something to buy. There are lots of groups are out there which we discuss all these matters.

Academically we do have like a prosthodontics group, and we do use that for discussion especially on What's up we do use that in a regular basis.

**RS: Ok, what about using DSM for consultation and communication with patient?**

(00:04:40) IS: I do not think consultation on DSM or without see the patient I do not think this something that I admire to do. But I think you know you can help people like on emergency or something otherwise.

**RS: What sort of things/reasons you do not like or discourage you from using DSM? You already mention time as a main barrier to use what else? for professional use, for studying use.**

(00:05:30) IS: No, I'm not discouraged from using this at all. Actually, I think it is good and I really like it. I think it is really good for self-promotion, practice promotion, you know to get social media presence in these days to be you know everybody are using DSM and you need to have a DSM presence you need to have a practice website you need to be out there I'm not discouraged but I do not have time now but this something definitely I will do.

**RS: I like the last point you mentioned website and DSM? What do you think which one is more important nowadays?**

(00:06:21) IS: I think both are important. Website is only for one way to talk but I think social media is like two ways of talk and both get advantages and

disadvantages. On website will get advantage of just showing without anybody saying any comments like why you did not this or did that?
But social media could be a way of learning and website as a show.

**RS: You mentioned DSM as a way of learning?**
(00:07:06) IS: Yes. Absolutely.

**RS: You don't have any issue about the quality of the information?**
(00:07:23) IS: ooh yeah. It depends on where to get the information from. Unfortunately, all these groups are very close to professionals, so the professionals discuss cases and learning from discussion, but the public unfortunately get a lot of wrong information from all DSM and they always go to the wring places to get information. I think people are promoting information of people get benefit from it like snap on smile and get so much publicity. Also, what I have noticed they are happy to see video and say that something is work really well.

**RS: Can you tell me your opinion about posting, dental procedures, photos/videos/CT scan, x-ray which include patient data in DSM?**
(00:09:15) IS: I think patient need to know what you can do, your colleague need to know what you are can do.
It depends on what you post why to post whether you have consent and consent is very important but also you have to make sure the patient identity and nobody can recognise the patient and just a photograph of the teeth. Then I will be very comfortable to post it on my website.

**RS: People talk a lot about the doctors-patient-students professional relationship on DSM could affect this?**
(00:11:01) IS: so I think that's why sometimes I stay away from social media when study as a student because your social life should be private and people with certain power like your supervisor or consultant in the clinic or examiner you do not want them to have something about other than what shown in the clinic.

Table 9. 4 Example of the interview transcript with dental professionals.

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|---|
| **Interviewee:** [AB] [Specialist in Endodontics]<br>**Interviewer:** [RS]<br>**Date and Time:** [15 October 2019, 16:30:40]<br>**Location:** [Floor 18, iTel Hub]<br>**Audio file information:** [191015_0083] |
| **RS: Can you tell me how do you use DSM in your personal life (everyday use)?**<br>(00:01:01) I usually use it for personal use. For example, I use Twitter for news, following people as well, just see what happens in the world. On Instagram, I follow a lot of endodontists where I can look at different cases as an interactive platform between different professionals within like the whole world.<br><br>**RS: Ok, so do you only use social media? What about other digital media such as mobile apps?**<br>(00:01:55) It's just the media of the phone like the normal applications. Socially, I use WhatsApp for social interactions as the digital media of the phone. So everyday use just like the normal apps.<br><br>**RS: So, from your opinion, why DSM is important in your life?**<br>(00:02:32) For me, to be honest, it's the availability because it is always available. So the social media apps let's say for example, as I mentioned earlier, Twitter I always like refresh it regularly just to look at the news and see what happens like around the world this is how I usually use it to see if anything happens. Also, as you know, when you are far from home just, I need to know and keep myself update with news.<br><br>**RS: Do you have any favourite platforms?**<br>(00:03:10) yeah, Twitter is my favourite.<br><br>**RS: Why?**<br>(00:03:15) it's easier to use and it's to the point it just likes having bullet points like reading a bullet point instead of reading the story of something. |

**RS: On average, how much time do you spend on DSM each day?**
(00:03:38) I would say maybe an hour and a half up to two hours a day.

**RS: Do you remember when did you start using DSM?**
(00:04:00) maybe around 2009 or 2010.

**RS: What benefits have you actually experienced for using it?**
(00:04:29) yeah as I also mentioned for Instagram the benefits especially in our profession is that you keep yourself up to date with cases. You will see people from different part of the world doing some nice cases for example in Endodontics we use different instruments so just to see how people approach difficult cases from different areas like different protocols how did they use it and that's a beneficial you know like clinical tips and tricks.

**RS: How do you use DSM in your professional work? In dental practice?**
(00:05:41) For myself, I do not post any cases, or any things related to my cases. I kind of see it like a breach of patient confidentiality even with consent form. You know if I have taken the consent from patients and everything, but I do not feel comfortable just posting cases like day to day cases as well. I'd rather do something else like get new information than just posting cases. As we know most of the things out there are quite biased, I can say because most people will only post their good cases but rarely find someone post their bad cases which could be an area of discussion and interaction.

**RS: Its interesting points! And you know that some dental professionals are posting every day? Are you agree with what they are doing?**
(00:07:06) I agree to a certain extent. The benefit of that you can get the information from any part of the world. Let's say for example I'm here in the UK I'm posting something, and then someone in Nigeria can get my information. It gets the world connected to each other. And some of them doing it for teaching benefit and others for financial purposes for example if someone in the private practice and just post their cases, people do not know if this treatment is good or its bad I mean form the

outside the dental professionals they will see only how it looks nice or fancy and then they will be biased and actually they will go to these dental practices event if it not might be good and this like the financial way and as we all know someone can easily photoshop they can just play with the quality of work and enhance how the treatment looks like.

**RS: So, from your perspectives, what do you see as the main problems of using social media in dental practice?**

(00:09:25) so there is one thing that I think if I will post a case for someone who give me a consent to post this photo but some else just take the photo and post it and that person does not have consent from this patient to post this photo so it's a breaching for patient confidentiality even though if I'm not might posting patient information it might be just a photo of teeth or radiograph, that does not give right to anyone to post it unless the patient agrees to do it.

**RS: good point! So, let's move to academia, what do you think about using DSM for teaching purposes?**

(00:10:17) I would not prefer to use social media for teaching but rather I would prefer to use a new technology in teaching like incorporation of new technologies with social media to enhance learning or teaching for my dental students. It's a good way to interact with students, and you can have good communication with students as well. Also, people will see how friendly you might be and break the superiority of teacher and student, and the teacher and educator are interacting with students on social media either posting their personal life or professional life this is a good way to give students an idea, yes I can be your friend as well not as a teacher. We need to increase our teaching weapons and make the information much closer to students and make it available so using social media for such things might be a benefit for students as long as you use it in a right way.

So, I do not like when someone just have an account for professional use let's say for teaching purpose then just posting their personal life on within the same account I'd prefer to use two accounts, one just for professional use and one for personal use that would be much better I think. Because Yes, I want to give information, but I do not want to show people my day to day life. I do not want to share it with everyone.

My personal life I want to share it with certain group of people like my close friends, but I do not want to share it like with everyone.

**RS: What sort of things/reasons you do not like or discourage you from using DSM?**

(00:14:00) The most concern for me is the hacking stuff, we know that we can create a fake accounts and posting stuff as yourself and this is one of the general risk of social media either for professional or personal use especially if you are a well-known person like a head of department or rector of the university you definitely have a friends and enemies and people can use your information and do fake accounts and write stuff about you which is untrue.

**RS: So, I understand that you have a concern with about disclose your (personal data) in social media? i.e. photos, name, marital status, interests? And being searchable or very obvious on social media?**

(00:15: 42) Yes, I usually keep my accounts secure, you know when someone send you a request to follow you or see your posts then I will filter these requests like for yes or no. You know sometimes you get add or follow from people you do not even know and have strange names and accounts and you do not even understand and these make things a bit questionable and you do not know if these are real people or fake accounts.

I do not know if there is a platform that shows you whether that a fake account or a true account like for example, when you buy something online you can put a link and then it can tells you whether if it's fake website or a good website I do not know if we have such a thing on social media or not.

**RS: what about use DSM to interact and communicate with students/patients?**

(00:17:06) I do not think it is a formal way to contact patients. It might be in the future will be a formal way like email but at the moment I do not think it is a formal way. I do not think it's a good idea.

**RS: What about using it for promoting your dental practice?**

(00:18:00) that's fine as long as its within official account of practice not from my personal account. I'm against using social media and contact patient like for example saying Hello, you have an appointment tomorrow at nine clock I'm against that. It's not a formal way. But I'm with like someone have a question as long as within formal professional account I do not mind answering questions from patients. But communication with patients personally or like giving them like a test results through social media I do not agree with that. I'd rather prefer use email or post.

**RS: What is your opinion about the health and oral health information that is available on social media?**

(00:20:05) You can get like a true and proper information through social media such as Twitter and Facebook but you can get a fake information or untrue information as well because not all the posts are created or written by dental professionals and people sometime just go with emotions or anything and just write anything and posted and then this post gets shared like everywhere. If we follow a well trusted account then we will consider and trust this information but if not, we have to think that this information might be untrue, fake, or totally wrong.

**RS: Do you see these technologies tools will become more useful or risky to dental professionals in future?**

(00:21:44) I think it will become more useful because I think companies are trying to get things more secured not to breached personal data or information or anything. So the trust between people and platforms will increase in the future. Its kind be more helpful to us as dental professional or day to day use.

**Interviewee:** [VM] [Dental Professional]

**Interviewer:** [RS]

**Date and Time:** [28 May 2019, 15:10:20]

**Location:** [Floor 18, iTEL Hub]

**Audio file information:** [190528_0060]

**RS: Can you tell me how you use DSM in your daily life?**

(00:00:20) VM: Yes, in daily life I use Facebook, Instagram as social media and I use Linked In as social professional media. I try on my Instagram to be a little bit more

professional when sharing daily life activities. Facebook as well but I do not use it that more it's just to see my family but mostly I use Instagram because I like pictures. This what I'm doing on social media wise. In terms of digital media, I have a website I use digital media to deliver talk online.

**RS: Why DSM are important for your social life and professional life, why do you like it?**

(00:01:44) VM: The way I use website to share an online public CV, achievements, awards, and offer my services as a professional dental educator. I offer clients who wants to hire me giving talk about my expertise subject and my specialty. I do not do that on Facebook. Although I know that in the UK it's not widely used but in other country such as Brazil Facebook is super used by professionals for promotions, have a page and post contents their but I do not do much that. But I think it's important to have a little bit of self publicly exposed and people can get to reach you easier.

**RS: What are the favourite DSM application use? And why?**

(00:03:17) VM: I think digital and social media compliment other. I think you can have a digital platform such as a website for promoting a product then promote website on social media as a way for people to reach you and buy your product. Its like one link to other.

**RS: let me move to dental professional use? How do you use digital and social media in your professional dental work? In dental practice? With colleagues? with your students? with your patients? For academia (teaching purposes)?**

(00:04:30) VM: it's very interesting question. Lots of dentists in Brazil share their cases, and before and after photos. Suddenly, the Brazilian GDC cut it and says its illegal to post it. And there was a vote by lots of dentists to show their right to post and share on Facebook because it is a promotion for their own work, and they won and took their right to share again. Now, everybody has a right to post before and after and you have a legal right as professional which I think it's fair if you have a good case you want to post it and promoting how good you are that good. You are not prices, mysterious or subjective things you are a professional you have an experience your hints and your techniques. Social media has their value and I post my thoughts

for example in my research area in stem cells and future translation technique, I kind I put my thought forward, On Instagram for example what I think about the procedures today and what it should be in the future based on history and science.

**RS: What sort of things/reasons you do not like or discourage you from using DSM? For professional use**

(00:06:49) VM: Professionally, I think it depends on how you are running and set up your profile on the internet because if you set up your professional profile you cannot be like a normal human being as a perception!

You cannot be a guy who having a party on Sunday or weekend. You have to be a professional guy. If you go to social profile for example on social media and that's my opinion and feeling if someone talk about a professional life on social profile it is more difficult to accept that person as a professional because you have seen all people on their social life. So, I think the biggest problem of social media to understand the balance between a professional and human being. That's might not be a problem of social media platforms itself, but I think it's the problem of users.

**RS: I like what you said! What about using DSM for teaching use and for communication use?**

(00:08:53) VM: I think this is a good question, in my opinion I think it's a great idea I have seen lots of social media groups happening and I agree with that.

**RS: It's not necessarily a social media platform I mean?**

(00:09:07) VM: Yes, I think any social media or digital media platforms can create an environment that people can go and learn more and more especially in a closed group its very interesting. The problem I see when the group is too big, and anyone can have a say. I think If I create a group by myself for teaching, I will limit the amount of people can comment based on their degree for example. If you have a question, I will create a separate question panel and the answer will be given by only those group of people not anyone.

What I have seen is if someone post an x-ray on let's say on an implant case and you will have a thousand of people from everywhere give you their comment. I do not think this will be a good way to learn may be just a way of someone tell you how to do it. I think this is one of the biggest problems on social media. It's difficult to create

a structured group but you know some people can come with some genius idea but chance to that happen is low. On digital media we can create a hierarchy and more useful to control but on social media is difficult.

**RS: Doctors-patient-students professional relationship, how DSM could affect this professional relationship?**

(00:12:19) VM: Again, as I said before the problem is not about the digital and social media it's about the users. I think you can use social media as a professional and as a normal person and this will be more power to you because we are not just a professional person. You are a professional and you are good but you also like barbeque and little bear or doing something I think you might attract patients they might like you because you have shown your human part that bond with how people live life.

**RS: So, you do not have any problems to interact with your students on DSM?**

(00:14:03) VM: That's a good point, I do not think this should be a problem as long as people you are interacting with understand that I'm their teacher and a normal person as well.

**RS: How your current use of DSM might affect the way others think of you?**

(00:15:29) VM: I think once you fall in this trap you will never evolve. Whatever you are doing on social media for professional benefits you have to think from your professional point of view not what other people think. It's more likely people are not going to like what are you do. But the people who like you will give you a money why I would care.

**RS: To what extent think that using DSM could reduce your productivity and engagement with people?**

(00:17:27) VM: It's really depended on what you classify your engagement with people. If you a physical contact of people I would say no. If you think about reaching people, I would say social media tremendously help you.

In terms of productivity, I think it depends on what is the task? Forex ample if I have to advertise for a product and distribute a research questionnaire, I cannot do anything of that without social media today. I can reach a hundred thousand of people on social

media. On other hand I would say I will reach let's say a hundred if I do contact them physically. So, this will increase my productivity. But if I have to sit down and study, I'm not going to use social media because it will decrease my productivity of studying.

**RS: What is your opinion about the health and oral health information that is available on: websites: professional official, websites: consumer, patient groups? DSM?**

(00:19:52) VM: I think this is the most difficult part on social media that's why as I mentioned before if I going to use social media group for example, I should create a hierarchy because of that.

On social media everyone has an opinion you will have lots of rubbish information and a few valid and spot on information. Personally, as a dental professional in terms of consuming knowledge No but for personal interaction.

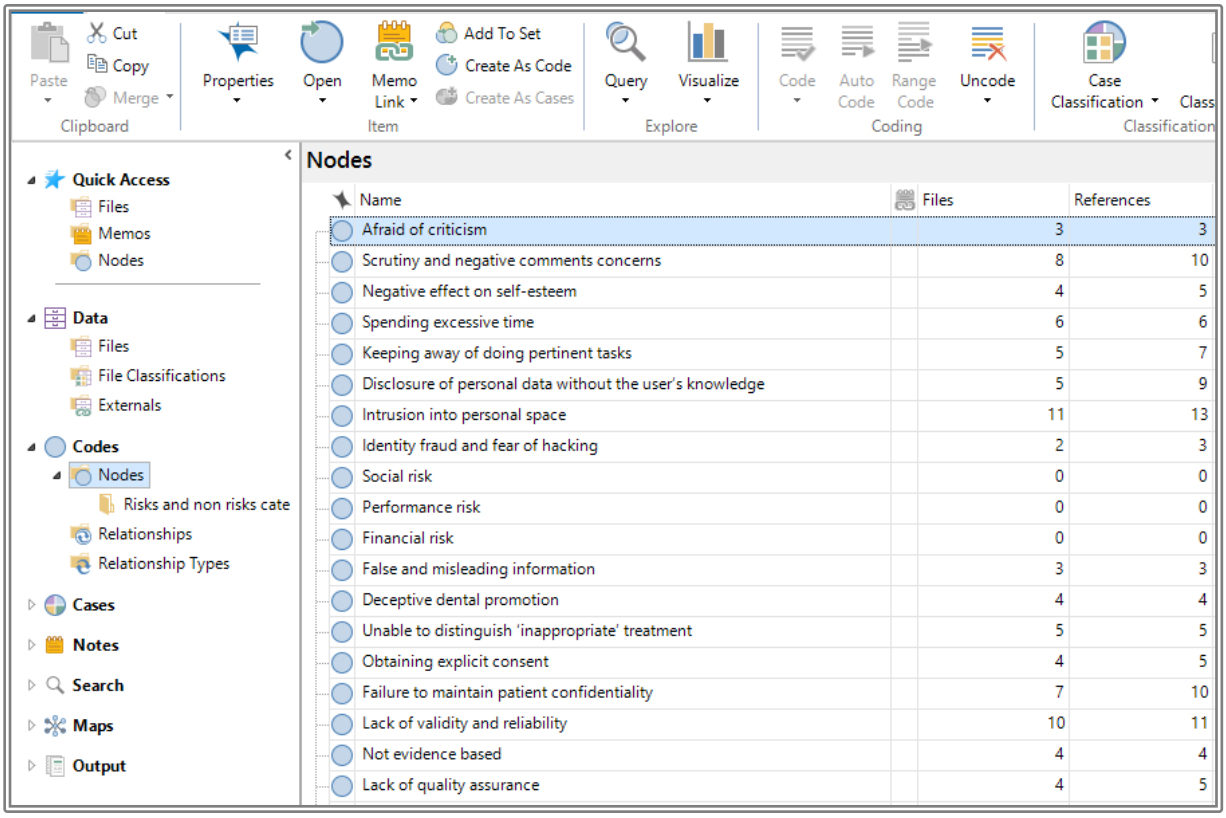


Figure 9. 4 Screenshot from Nvivo12

## 10.4 Appendix D: Study Two Methods

Table 9. 5 The invitation email for study two.

**INVESTIGATING THE IMPACT OF DIGITAL AND SOCIAL MEDIA ON THE DENTAL PROFESSION AND DENTAL EDUCATION**

KING'S College LONDON

Dear colleagues,

I would like to invite you to take part in this study, (Investigating the Impact of Digital and Social Media on Dental education and The Dental Profession), which forms part of my PhD research.

The purpose of the study is to explore and understand the perceived risks of using digital and social media (DSM) as pertained by dental students and dental professionals.

The participants should be dental students (undergraduate at BDS level or postgraduate in PhD, MSc, PG Dip, and MclinDent programs) and dental professionals (faculty members who are providing dental care and teaching) to be eligible to take part.

The study has received ethical approval from King's College London Ethical Clearance Reference Number: MOD-19/20-8867.

Your participation in the questionnaire is completely voluntary and all of your responses will be kept confidential. If you are interested in taking part in the study, please click the below link to access the questionnaire:

Begin Your Survey Here

It is expected that the questionnaire will take a few minutes to complete. If you have any further information, do not hesitate to contact me on the following email: rayan.sharka@kcl.ac.uk

Kind regards,

**Rayan**
PhD Student
Centre for Dental Education
Faculty of Dentistry Oral & Craniofacial Sciences
King's College London

Table 9. 6 The initial items pool derived from the literature review and interviews for eventual inclusion in the perceived risk questionnaire.

| Perceived risk items | References |
|---|---|
| 1. Lose control over the privacy of payment information.<br>2. Loss of privacy because my personal information would be used without my knowledge.<br>3. Internet hackers (criminals) might take control of my checking account if I used DSM.<br>4. The DSM will not fit in well with my self-image or self-concept.<br>5. The usage of DSM would lead to a psychological loss for me because it would not fit in well with my self-image or self-concept.<br>6. There are the chances that using DSM will negatively affect the way others think of me.<br>7. My signing up for and using DSM would lead to a social loss for me because my friends and relatives would think less highly of me.<br>8. Lose time due to having to switch to a different payment method.<br>9. The possible time loss from having to set-up and learn how to use DSM makes them.<br>10. DSM are time consuming<br>11. Using DSM is a waste of time<br>12. It is risky to consider the investment of my time involved to set up and use DSM.<br>13. It is risky to have the possible time loss from having to set up and learn to use DSM.<br>14. I am concerned about my privacy while I am using DSM.<br>15. I am not comfortable with giving personal information on DSM. | (Dobson et al., 2019; Featherman & Pavlou, 2003; Henry & Molnar, 2013; Kenny & Johnson, 2016; Khan et al., 2014; Wyatt et al., 2016) |

| | |
|---|---|
| 16. The DSM might not perform well and create problems with my credit.<br>17. There will be something wrong with the performance of the or that it will not work properly.<br>18. Considering the expected level of service performance of the DSM, for you to sign up for and use it would be.<br>19. DSM servers may not perform well and process payments incorrectly.<br>20. There are chances that you stand to lose money if you use DSM.<br>21. Using DSM service subjects your checking account to potential fraud.<br>22. My signing up for and using DSM would lead to a financial loss for me.<br>23. Using DSM service subjects your checking account to financial risk.<br>24. Using DSM groups to discuss patients.<br>25. Accept friend request from patients on DSM.<br>26. Accept friend request from tutors/students on DSM. | |
| 27. I feel that the privacy of my personal information is not protected by DSM. I fear of hacking stuff (AB, DP6)<br>28. Someone can create a fake account (AB, DP6)<br>29. I have to activate the privacy setting (AB, DP6)<br>30. I usually limit people who can visualise and access my posts (RA, DP8)<br>31. I only share it with my friends and colleagues (KA, DP7)<br>32. I get worried and I feel I'm not good enough (AE, DS7)<br>33. I afraid of criticism from people when using DSM (JJ, DS8)<br>34. I would be affected by the negative comments from people (SA, DS4)<br>35. there is always risks of humiliation, shame or embarrassment (AD, DS9) | Study 1 transcripts |

| | |
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| 36. DSM takes my time that I could doing other things (AE, DS7)<br>37. I spend just ages browsing DSM and achieving nothing in your work (SA, DS11)<br>38. DSM is very time consuming, and it keeps you away from daily physical activities (RA, DP8)<br>39. I do not like too much interaction between demonstrator and student on DSM (AE, DS7)<br>40. I should not accept friend request from patient because it is not professional (JJ, DS8)<br>41. Using DSM could be informal, and people could cross the boundaries (SA, DS11)<br>42. The barrier between students and tutors can be abused (HP, DP3)<br>43. I don't trust the source (AD, DS9)<br>44. I do not know the quality of the information (AE, DS7)<br>45. There are lots of variation of the information, no formal of quality assurance (AE, DS7)<br>46. different sources (JJ, DS8)<br>47. an evidence based or not (SA, DS4)<br>48. not valid or not true (SN, DS2)<br>49. There are lots of rubbish information and a few valid and spot-on information (VM, DP2)<br>50. There is no filtering feature that helps the user to distinguish between the right and wrong information (MA, DP9)<br>51. The dental cases look visually stunning, but the quality of work is questionable (AE, DS7)<br>52. The public unfortunately get a lot of wrong (IH, DS3)<br>53. DSM creating a body image problem for people (SA, DS4)<br>54. Advertising on digital media it could be different than the real-life (SA, DS4) | |

| | |
|---|---|
| 55. It can be easily photoshoped and played with the quality of work and enhance how the treatment looks like (AB, DP6)<br>56. The public can get a false expectations from digital and social media promotion (KA, DP7)<br>57. The public users cannot distinguish between the right and wrong dental treatment shared on DSM (MA, DP9)<br>58. If I tag my tutor for example on the Facebook post and say hi mate this would be less professional than I would like (TP, DS1).<br>59. I think using DSM is breaching of patient confidentiality even with consent form (AB, DP6)<br>60. All patient photos are on the internet technically forever (AD, DS9)<br>61. I do not post a case due to patient privacy (FF, DP4)<br>62. The issue with the NHS and clinical governance policy is quite straining (AE. DS7)<br>63. There is a policy from King's trying to limit the use of DSM (FF, DP4)<br>64. I should be careful as it could not be seen by my patient (AZ, DS5) | |

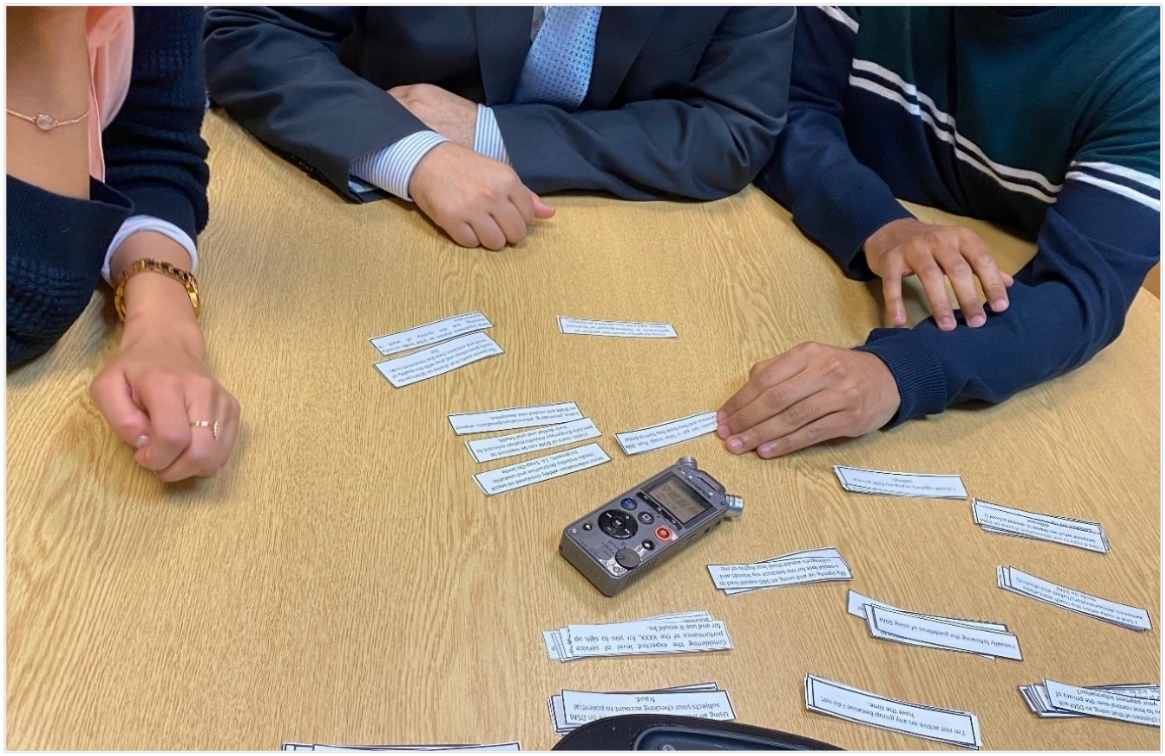


Figure 9. 5 Snapshot from focus group interviews.

Figure 9. 6 The phases of focus group interviews.

| | |
|---|---|
| Preparation phase | • Designing and printing the questions into the stack of cards.<br>• Book an accessible room.<br>• Recruit and invite participants.<br>• Prepare the room and arrange the chairs in circular form.<br>• Make sure all equipment needed for the interview is prepared. |
| Phase 1 | • Establish a rapport interaction with participants.<br>• Explain the aim of the research.<br>• Participants read the information sheet.<br>• Participants sign the consent form.<br>• Read a detail instruction how card sorting works. |
| Phase 2 | • Give participants the stack of cards.<br>• Ask participants to lay the cards out in front of them on the table.<br>• Ask participants to read each card aloud.<br>• Ask participants to arrange the cards into piles or groups that |
| Phase 3 | • Ask participants why they sorted cards in the current piles or groups.<br>• Reassure anonymity and confidentiality.<br>• £5 Amazon voucher given for each participant.<br>• Thanks, participants, for their time and contribution. |

Table 9. 7 A pre-task instruction for participants of focus group interviews.

| **Pre-task instructions:** |
| --- |
| 1. In this study, I have 13 stacks of cards. I will give you one stack of card in each round. Each card has one question written on it.<br>2. In each round, I will ask you to lay the cards out in front of you all. Then, I will ask you all to read it and think loud and arrange the cards into piles of groups that make sense to you.<br>3. After sorting the given cards into groups, I will ask you the following questions:<br>A. Can you tell me in your own words what this group or categories mean?<br>B. Why you grouped these specific questions under one category?<br>C. What does this group mean to you?<br>4. After round 7, I will give you 10 mins rest.<br>5. There are no right or wrong answers. There are no minimum/maximum number of cards to create a group: If you think all cards are distinct please say that.<br>6. During your sorting cards I will note your discussions, interactions and understanding for each card. Also, you can ask me to clarify unclear questions. |

Table 9. 8 The questionnaire Items revised based on feedback from expert reviews and meetings discussion with supervisory team.

| Perceived risk themes/items | Items after expert reviews |
|---|---|
| 1. My signing up for and using DSM would lead to a loss of privacy for me because my personal information would be used without my knowledge<br>2. Internet hackers (criminals) might take control of my checking account if I used an DSM.<br>3. I should have a very small circle of people who can visualise and access that.<br>4. Using DSM will not fit in well with my self-image or self-concept<br>5. The usage of an DSM would lead to a psychological loss for me because it would not fit in well with my self-image or self-concept.<br>6. I decrease posting on DSM because the negative feeling that people show when you over show or oversharing.<br>7. DSM are time consuming.<br>8. I think DSM takes my time that I could doing other things.<br>9. It is risky to have the possible time loss from having to set up and learn to use DSM. | 1. There is a risk of shared personal information on DSM being disclosed to third parties without my knowledge.<br>2. Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals).<br>3. There is a risk of invasion of my personal space without my permission when using DSM which makes me feel uncomfortable.<br>4. Using DSM will not fit well with my self-image or self-concept.<br>5. Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept.<br>6. Using DSM would expose me to negative comments from others which negatively affect my self-esteem.<br>7. There is a risk of DSM being time consuming.<br>8. DSM are wasting my time.<br>9. There is a risk of significant time wasted in having to learn how to use DSM. |

| | |
|---|---|
| 10. It is risky to consider the investment of my time involved to set up and use DSM.<br>11. There is a chance that there will be something wrong with the performance of the DSM.<br>12. I am concerned that using DSM might not perform well to achieve the desired advantages.<br>13. My signing up for and using an DSM would lead to a financial loss for me.<br>14. Using an Internet bill-payment service subjects your checking account to financial risk.<br>15. There are chances that using DSM will lead to lose money.<br>16. Using DSM will negatively affect the way others think of me.<br>*17.* My signing up and using an DSM would lead to a social loss for me because my friends and colleagues would think less highly of me.<br>18. I think using DSM the image your friends and relations have of you.<br>19. I find it risky to use DSM because the information shared is not evidence based.<br>20. I find it risky to use DSM because the information shared is lacking validity and reliability. | 10. There is a risk of significant time wasted from having to cope with the technical aspects of using DSM.<br>11. There is a risk of using DSM inappropriately due to technical reasons from the providers.<br>12. Using DSM might not technically perform well to achieve the desired advantages.<br>13. There is a risk of using DSM inappropriately because of my lacking in technical know-how.<br>14. There is a risk of losing money when subscribing to premium paid services of DSM.<br>15. Using DSM payment service subjects my checking account to potential fraud.<br>16. There is a risk of losing money if I use DSM for advertisement of services.<br>17. Using DSM would negatively affect the way others think of me.<br>18. Using DSM would lead to personal social detriment because my friends and colleagues would think less highly of me.<br>19. Using DSM worsens the image my friends and colleagues have of me. |

| | |
|---|---|
| 21. I find it risky to use DSM because the information is not monitored to assure compliance with quality criteria.<br>22. I find it risky to use DSM because the information shared is lacking validity and reliability.<br>23. The public can get a false image from digital and social media promotion and they think they have to do same cases.<br>24. The public unfortunately get a lot of wrong information from all digital and social media platforms.<br>25. The public they cannot distinguish between the right and wrong information<br>26. I find it risky to use DSM because the policy is quite restraining.<br>27. I do not use DSM because I do not want to put myself in unfavourable position with the university policy<br>28. If you are a dental student and professional, you have to be aware and do not make mistake to avoid discipline action.<br>29. I find it risky to post and share dental procedure with identified patient information.<br>30. I'm not so comfortable with pictures being on Digital and social media even with patient consent. | 20. I find it risky to use information shared on DSM because it is not evidence-based.<br>21. I find it risky to use information shared on DSM because of its lack of reliability.<br>22. I find it risky to use information shared on DSM because it is not subjected to sufficient quality control.<br>23. I find it risky to use information shared on DSM because of a lack of quality.<br>24. There is a risk of the public deception from the dental promotion shared on DSM.<br>25. There is a risk of the public getting misleading information related to their oral/dental health on DSM.<br>26. There is a risk of the public not being able to understand / appreciate the 'unrealistic' dental treatment shared on DSM.<br>27. I find it risky to use DSM without complying with the guidelines set by governing bodies.<br>28. I find it risky to use DSM as it would put me in an unfavourable position with the policy set by my employer / university. |

| | |
|---|---|
| 31. I find it risky to discuss anonymised cases without their explicit consent.<br>32. Using DSM could be informal, and people could cross the professional boundaries.<br>33. I would not accept friend request from patient because I have to consider the professionalism and professional relationship.<br>34. I think sometimes the professional barrier can be abused quite a lot, so patients try to come a friend with you on digital and social media or follow your profile.<br>35. If I publish something on digital social media I have to think because maybe this should not be seen by my patient.<br>36. If I say I'm a doctor on my profile and then posting a questionable stuff is bit risky.<br>37. I have to be cautious what to put on digital and social media as people will say I'm not a good or skilful dentist or I do not have knowledge. | 29. I find it risky to use DSM as posting unprofessional content on DSM could lead to disciplinary action by the governing bodies.<br>30. There is a risk of using DSM for sharing dental procedures with identifiable patient information.<br>31. There is a risk of using DSM for sharing sensitive personal information that can be accessed by others due to system security breaches.<br>32. There is a risk of using DSM to discuss anonymised cases / material without explicit consent.<br>33. There is a risk of blurring the professional boundary between dental students and dental professionals when interacting on DSM.<br>34. There is a risk of blurring professional boundaries if I accept a friend request from a patient on DSM.<br>35. I find it risky to accept a friend request from a patient.<br>36. There is a risk of damaging the profession if I share unprofessional content on DSM.<br>37. There is a risk of damaging the profession when my professional image is negatively affected by using DSM. |

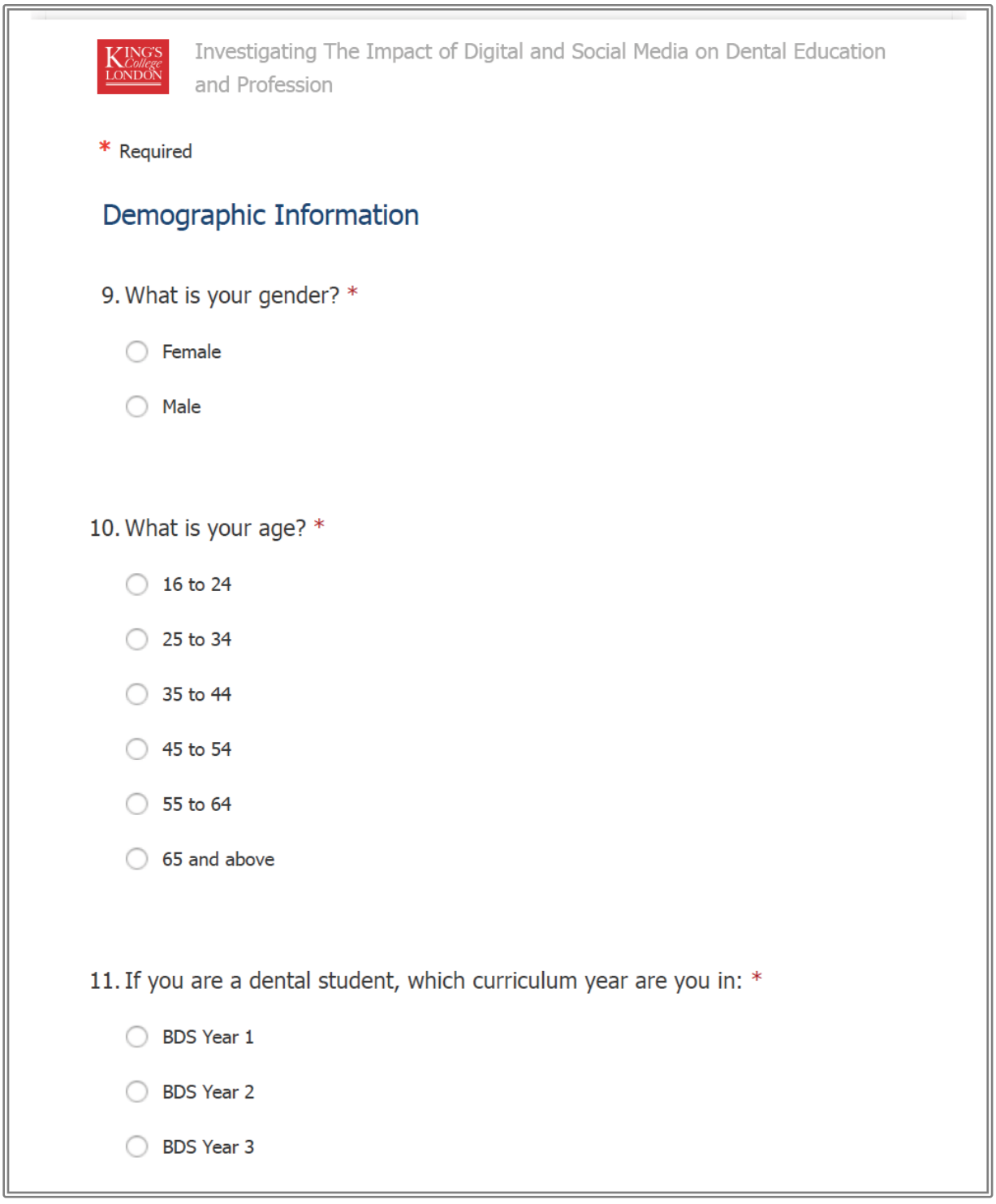
| | |
|---|---|
| | 38. There is a risk of creating a negative impression about me based on the content I shared on DSM. |

Table 9. 9 Descriptive statistics of the pilot study responses for the perceived risk items (N=18).

| Perceived risk items | Mean | Std. Deviation | Median | Interquartile range |
|---|---|---|---|---|
| I find it risky to use information shared on DSM that is not evidence-based. | 4.3333 | .59409 | 4 | 1 |
| I find it risky to use information shared on DSM that is difficult to ascertain its validity. | 4.2222 | .54832 | 4 | 1 |
| I find it risky to use information shared on DSM because of lack of quality. | 4.0556 | .72536 | 4 | 1.25 |
| I find it risky to use information that is not subjected to quality control on DSM. | 4.1111 | .67640 | 4 | 1 |
| Dentists would face difficulties to meet patients' expectations due to misleading dental information on DSM. | 4.5000 | .85749 | 5 | 1 |
| Public users of DSM would expose to possibly dangerous misinformation relevant to their dental health. | 4.3889 | .91644 | 5 | 1 |
| Patients put themselves at risk of harm from deceptive dental information shared on DSM. | 4.5556 | .61570 | 5 | 1 |
| DSM are time consuming. | 3.6667 | .84017 | 4 | 1 |
| DSM are wasting my time. | 2.9444 | 1.10997 | 3 | 1 |
| There is a risk of a possible time loss from having to learn how to use DSM. | 2.8333 | 1.09813 | 3 | 2 |
| There is a risk of significant time wasted from having to cope with the technical aspects of DSM. | 3.2778 | .95828 | 3 | 1.25 |
| Internet hackers (criminals) might take control of my account if I use DSM. | 3.5000 | 1.04319 | 4 | 2 |
| Using DSM would lead to a loss of privacy for me because my personal information would be used without my knowledge. | 3.5556 | .85559 | 4 | 1 |
| I find it risky to share my private life on DSM because it is going to be observed by others. | 3.5556 | 1.14903 | 4 | 1.25 |
| I am afraid of negative comments from other users when using DSM. | 2.7222 | 1.12749 | 3 | 1.25 |
| The usage of DSM would lead to a psychological loss for me because it would not fit in well with my self-image. | 2.3333 | 1.23669 | 2 | 2.25 |
| Using DSM will not fit with my self-image or self-concept. | 2.2222 | 1.00326 | 2 | 1.25 |
| Using DSM will negatively affect the way others think of me. | 2.4444 | 1.19913 | 2 | 1 |
| Using DSM would lead to a social loss for me because my friends would think less highly of me. | 1.7222 | 1.12749 | 1 | 1 |
| Using DSM worsens the image my friends and colleauges have of me. | 1.8333 | .70711 | 2 | 1 |
| I find it risky to use DSM without complying with the guidelines set by governing bodies. | 3.4444 | 1.24722 | 4 | 1.25 |

| | | | | |
|---|---|---|---|---|
| I find it risky when making negative comments relating to people's characteristics (e.g. gender, race, disability) on DSM. | 4.0000 | 1.13759 | 4 | 1.25 |
| I find it risky to discuss members of staff/students on DSM. | 4.1111 | .96338 | 4 | 2 |
| I find it risky to share dental procedures with identified patient information. | 4.6667 | .84017 | 5 | 1 |
| Maintaining patient privacy has restricted my use of DSM. | 3.6111 | 1.28973 | 4 | 2.25 |
| I find it risky to discuss anonymised cases to discuss best practice without their explicit consent | 4.0000 | 1.02899 | 4 | 2 |
| I find it risky to accept a friend request from a patient. | 3.4444 | 1.19913 | 3.5 | 1.5 |
| Using DSM could cross the boundaries and professional relationship between dental professionals and patients | 3.2778 | 1.12749 | 3.5 | 2 |
| There is a risk of blurring the professional boundary between dental students and dental professionals. | 3.6667 | 1.02899 | 3.5 | 2 |
| The public can reflect unfavourably on my professional image if I share unprofessional content on DSM. | 3.4444 | 1.42343 | 4 | 3 |
| The public can get a negative impression about me based on the content I shared on DSM. | 3.7778 | 1.21537 | 4 | 2 |
| There is a risk of damaging the profession when my professional image is negatively affected. | 4.1667 | .78591 | 4 | 1.25 |
| There are the chances that you stand to lose money if you use the DSM platforms. | 2.8333 | 1.09813 | 3 | 1 |
| Using a DSM would lead to a financial loss for me. | 2.2778 | 1.17851 | 2 | 1.25 |
| There is a risk of losing money when subscribing to premium paid services of DSM. | 3.6111 | 1.19503 | 4 | 1.25 |
| DSM platforms might not perform well to achieve the desired advantages. | 3.5556 | 1.04162 | 4 | 1 |
| There is the chance that there will be something wrong with the performance of the DSM or that it will not work properly. | 3.5556 | 1.04162 | 4 | 1 |
| There is a risk of using DSM inappropriately due to lacking my technical know-how. | 3.3889 | .97853 | 3.5 | 1.25 |

Figure 9. 7 Study two DSM perceived risks questionnaire.



Investigating The Impact of Digital and Social Media on Dental Education and Profession

* Required

## Demographic Information

9. What is your gender? *

- Female
- Male

10. What is your age? *

- 16 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65 and above

11. If you are a dental student, which curriculum year are you in: *

- BDS Year 1
- BDS Year 2
- BDS Year 3

- ○ BDS Year 4
- ○ BDS Year 5
- ○ Dental Hygiene and Dental Therapy (BSc)
- ○ Post-graduate taught/clinical courses (PhD, MClinDent, MSc, PG Dip, PG Cert and equivalent programme)
- ○ Other
- ○ Does not apply to me

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Investigating The Impact of Digital and Social Media on Dental Education and Profession

* Required

## Digital and Social Media Usage

12. Select top active Digital and Social Media applications/platforms you use it most frequently last three years (tick all that apply): *

- [ ] Facebook
- [ ] Twitter
- [ ] Instagram
- [ ] YouTube
- [ ] Snapchat
- [ ] LinkedIn
- [ ] WhatsApp
- [ ] Skype
- [ ] Other
- [ ] I do not use any form of digital and social media applications/platforms

13. If select other, please specify:

Enter your answer

14. Usage in hours per day in total: *

- ○ I don't use it on a daily basis.
- ○ Less than 30 minutes.
- ○ More than 30 minutes but less than 1 hour.
- ○ More than 1 hour but less than 2 hours.
- ○ More than 2 hours but less than 3 hours.
- ○ More than 3 hours.

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Investigating The Impact of Digital and Social Media on Dental Education and Profession

* Required

## Perceptions of using Digital and Social Media in Dental Education and Dental Profession

15. • Digital and Social Media (DSM) are defined in this research as internet-based applications that allow the creation and exchange of user-generated content and the associated digital media technologies.
• The following survey sections contain statements aiming to gather dental students and dental professionals' perception of using Digital and Social Media (DSM) as a means of communication and learning in dental education and the wider profession.
• Please indicate your level of agreement about each perceived risk statement by selecting a rating accordingly. *

| | Strongly Disagree | Disagree | Neither disagree nor agree | Agree | Strongly agree |
|---|---|---|---|---|---|
| I find it risky to use information shared on DSM because it is not evidence-based. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of significant time wasted from having to cope with the technical aspects of using DSM. | ○ | ○ | ○ | ○ | ○ |
| Using DSM would lead to personal social detriment because my friends and colleagues would think less highly of me. | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| I find it risky to use information shared on DSM because it is not subjected to quality control. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of DSM being too time-consuming. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of abuse of the professional boundary between dental professionals and patients when using DSM. | ○ | ○ | ○ | ○ | ○ |
| Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of shared personal information on DSM being disclosed to third parties without my knowledge. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of the public getting misleading information related to their oral/dental health on DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of invasion of my personal space without my permission when using DSM which makes me feel uncomfortable. | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| There is a risk of the public deception from the dental promotion shared on DSM. | ○ | ○ | ○ | ○ | ○ |
| Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals). | ○ | ○ | ○ | ○ | ○ |
| There is a risk of the public not being able to recognise the 'inappropriate' dental treatment shared on DSM. | ○ | ○ | ○ | ○ | ○ |
| Using DSM will not fit well with my self-image or self-concept. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of damaging the profession when my professional image is negatively affected by using DSM. | ○ | ○ | ○ | ○ | ○ |
| Using DSM would expose me to negative comments from others which negatively affect my self-esteem. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of using DSM inappropriately because of my lacking in technical know-how. | ○ | ○ | ○ | ○ | ○ |
| I find it risky to use information shared on DSM because of a lack of quality. | ○ | ○ | ○ | ○ | ○ |

| | | | | | |
|---|---|---|---|---|---|
| I find it risky to use DSM without complying with the guidelines set by governing bodies. | ○ | ○ | ○ | ○ | ○ |
| Using DSM might not technically perform well to achieve the desired advantages. | ○ | ○ | ○ | ○ | ○ |
| I find it risky to use DSM as posting unprofessional content on DSM could lead to disciplinary action by the governing bodies. | ○ | ○ | ○ | ○ | ○ |
| Using DSM would negatively affect the way others think of me. | ○ | ○ | ○ | ○ | ○ |
| I find it risky to use information shared on DSM because of a lack of reliability. | ○ | ○ | ○ | ○ | ○ |
| Using DSM worsens the image my friends and colleagues have of me. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of using DSM for sharing dental procedures with identified patient information. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of using | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| DSM for sharing sensitive personal information that can be accessed by others due to system security breaches. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of using DSM to discuss anonymised patients cases/material without explicit consent. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of blurring professional boundaries if I accept a friend request from a patient on DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of blurring the professional boundary between dental students and dental professionals when interacting on DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of damaging the profession if I share unprofessional content on DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of creating a negative impression about me based on the content I shared on DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| significant time wasted in having to learn how to use DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of losing money if I use DSM for advertisement of services. | ○ | ○ | ○ | ○ | ○ |
| I find it risky to use DSM as it would put me in an unfavourable position with the policy set by my employer / university. | ○ | ○ | ○ | ○ | ○ |
| Using DSM payment service subjects my checking account to potential fraud. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of losing money when subscribing to premium paid services of DSM. | ○ | ○ | ○ | ○ | ○ |
| There is a risk of using DSM inappropriately due to technical reasons from the providers. | ○ | ○ | ○ | ○ | ○ |

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Never give out your password. Report abuse

## 10.5 Appendix E: Study One Additional Results

Table 9. 10 Additional exemplar quotes of perceived risk themes from interviews.

| Theme | Sub-themes | Example quotes from interviews |
|---|---|---|
| ❶ **Privacy risks** | 1) Intrusion into personal space | "*I usually keep my accounts secure; you know when someone sends you a request to follow you or see your posts, I filter these requests for yes [to confirm] or no [to delete] the request. Sometimes you get added or followed by people you do not even know them*" (DP. 6).<br>"*On social media, people will interfere and invade your personal life. They will try to know more about you, your patients and your works and everything*" (DP. 9).<br>"*As a dentist, I prefer keeping my life professional, which should mean keeping everything of my social life private [...] I will try to keep that private and the patient cannot access it*" (DS. 10). |
| | 2) Disclosure of personal data without user's knowledge | "*There is one thing that I think if I will post a case for someone who gives me consent to post this photo, but someone else just take the photo and post it, and that person does not have consent from this patient to post this photo."* (DP. 6).<br>"*Sometimes you do not realise how much personal information you put out [...], then you will realise how you become obvious online. I found it weird because I have seen many dentists; they shared their personal life on DSM. I just always think what if we have something going wrong or have a bad relationship or have an argument then they will see so much of your data online it is a bit tricky*". (DS. 6) |
| | 3) Identity fraud | *"it's easy to get hacked, maybe many people did not review it as a risk, but if we think about it, it's a real risk" DS.4* |

| | | |
|---|---|---|
| | | *"someone can create a fake account or hack your personal profile and posting stuff as yourself [...] especially if you are a well-known person [...] you definitely have friends and enemies, and they can use your information on DSM and write untrue information about you"* (DP.6). |
| ❷ **Psychological risks** | 4) Negative effect on self esteem | *"I believe that DSM does affect younger age self-esteem due to exposing them to a vast amount of images and pictures of people about themselves and how they look and encourage them to copy what they do like because they are a role model to them"* (DP. 8).<br>*"Let's say if my colleague would interfere with my reputation and judge my cases [I posted on DSM] in front of everyone and commented on my posts by saying: [that not the right treatment plan and you should do this and this, I would disagree with you] and let's say my students are following me on DSM such as Twitter or Instagram they will see such unfavourable comments, and they will lose the confidence on me as an educator or as a dentist so that one of the issues"* (DP. 10). |
| | 5) Scrutiny and negative comments concerns | *"this is one of the reasons I do not like to use DSM to avoid any unnecessary negative comments that make me inconvenient"* (DP.4).<br>*"Sometimes images of treatment posted maybe it is not a proper treatment, but someone is just happy with this treatment, and they do not accept a criticism showing how the proper treatment should be done*" (DP. 3).<br>"*People will feel afraid of criticism with posting their clinical works because it is going to be posted in public*" (DS. 8). |
| ❸ **Time risks** | 6) Spending excessive time | *"I do not have time. It really needs dedication, and some people are posting dental cases on a regular basis and posting every single case, then they discuss it and respond to people"* (DP. 1). |

| | | |
|---|---|---|
| | 7) Being distracted of doing pertinent tasks | *"Honestly speaking, at the current moment, I'm not using DMS that much in my career because, as a dentist, I do not have enough time. You know, doing teaching stuff in the morning then working at a dental practice in the evening, so I do not have much time to tweet or share information about dentistry in general"* (DP. 9). |
| **❹ Using invalid information risks** | 8) Difficult to assure the validity and reliability | *"there is no reference or validity"* (DP. 8)<br>"*Not all information is correct or applicable to anyone. The information on DSM are varied in quality*" (DP. 7)<br>"*Dental information might not be valid, or you have to think if this is true or not true. So, you cannot always accept everything published or written on DSM*" (DS. 2) |
| | 9) Not evidence-based information | *"I would have to look to the information that I have been given from professors, lecturers and books because that is evidence-based, but on YouTube and Google, you have to be careful in terms of what you are taking as an evidence-based or not"* (DS. 11) |
| | 10) Lack of quality assurance | *"there is no filtering feature that helps the user to distinguish between the right and wrong information"* (DP.7)<br>*"Sometimes you look at things on Instagram and say, look how many teeth they have taken away and ask yourself should I do like that? No, of course not. The quality of information is different from what we taught a lot of the time. Because there are lots of variation and there is no formal quality assurance, that's the main issue"* (DS. 7) |
| **❺ Non-compliance risks** | 11) Legal and ethical issues | *"It looks visually stanning, but it is not either ethical in dentistry I think that the main problem"* (DS. 7) |
| | 12) Facing disciplinary action due to not comply | *"I would prefer to follow the guidelines of using these platforms such as consent and giving the patients the right when using their details"* (DP. 10) |

| | | |
|---|---|---|
| | with governing bodies guidelines | *“I think advertising like group offer, getting this treatment half price or buying one and getting one free and something like that, I think it is not good and breach the GDC guideline. You should not be advertised in this way because you almost push people to get for your advertisement anyway. [...] I think DSM is a good thing, but it has to be used in a proper way following a standard”* (DS. 11) |
| ❻ **Breaches patient’s confidentiality** | 13) Maintain patient confidentiality | *"I do not use it for a patient-related matter like basically, I do not post a clinical case due to patient privacy"* (DP. 4)<br>*"I believe that is good as long as they do not expose patient privacy or photos of the patient"* (DP. 8) |
| | 14) Obtaining explicit consent | *“I see it as a breach of patient confidentiality even with obtained consent form*” (DP.1)<br>*"I think I need to be careful. Because even I get patient consent to share a photo on the internet, it's not a green card"* (DS. 9) |
| ❼ **Deceptive and misleading information** | 15) False and misleading information | *“The issue with the DSM is not controlled anyone can post anything supported as they want without any scientific bases whether other dentists, patients or dental students will follow and believe because it is attractive but not the quality of the work, it is how to make your work attractive, that what will attract people the way you present your stuff rather than the actual work or the quality”* (DP. 1)<br>*"Some dentists own pages doing fillings, but they are more invasive than we have been taught! You can see that and recognise that and not to following these pages"* (DS. 9) |
| | 16) Deceptive dental promotion | *“the patient just comes to your clinic and says that I have read that this dental procedure is painful. When asking them, have you experienced that by yourself? They said no, but I just read it through DSM*” (DP. 9) |

| | | |
|---|---|---|
| | | *"Someone can easily photoshop and play with the quality of clinical work and enhance how the treatment looks like"* (DP. 6) |
| | 17) Not being able to distinguish 'inappropriate' treatment | *"the public they cannot distinguish between the right and wrong information"* (DP.9).<br>*"I think it can be a double-edged sword. It can be a beneficial and negative thing because what being advertising on DSM could be different from the real-life so people cannot spot the difference" (DS .4).* |
| ❽ **Blurring the professional boundary** | 18) Issues with accepting friendship with patients | *"It might blur the professional boundary with patients, but if you have a professional account on an Instagram account and patients follow that professional profile, it's not too much issue because it's not your personal account"* (DS. 9) |
| | 19) Abusing professional relationship with clinical teachers | *"people could cross the boundaries and professionalism, and at the end of the day, you have to have a strictly professional relationship with your lecturer, not too friendly one"* (DS. 4) |
| ❾ **Loss of the public trust** | 20) Damaging professional image | *"Basically, when you post something, you give an idea and create a professional image that you have to think of. On DSM, you know people coming from different backgrounds and views, and what you post could be used in the wrong way and affect your professional image"* (DP. 8)<br>*"What I meant is if that happens will damage my reputation. People will say I'm not a good or skilful clinician"* (DP. 5) |
| | 21) Damaging profession reputation | *"if I start publishing something on DSM I have to think because maybe this should not be seen by public including my patient as a dental professional. when you are a dental professional, we have to be careful about what to put on digital and social media" (*DS. 5) |

Table 9. 11 Exemplar quotes of perceived non risk codes from interviews.

| Example quotes of non-risks codes |
| --- |
| *"I have friends in my hometown. I would not see them every day, whereas DSM helps me keep in touch with them"* (DS.10) |
| *"It helps to interact with people and see what they opt for and comment on certain occasions like say congratulations and happy birthdays"* (DS.10). |
| "*I use it mostly to communicate with friends"* (DS.5) |
| *"DSM are important to communicate and keep me in touch with others"* (DP.7) |
| *"On Facebook, I created a page for swimmers because I'm a swimmer so through this page I can invite and meet some people who interested in swimming to train together here in London"* (DS. 6) |
| *"I have international friends, and DSM are a very good way to keep me aware of their activities and their trips."* (DS.1) |
| *"For looking at other people stories and news and stuff like that and looking at celebrities' stuff"* (DS.11) |
| *"For everyday life, outside of my dental practice work, I usually consider using DSM to do a routine activity such as learn how to cook food and read the news"* (DP.5) |
| "*I guess it is important just to fill time during break time"* (DS.9) |
| *"Listening to music and podcasts"* (DS. 1) |
| "*Watching the live news*" (DS. 6) |
| *"Looking at celebrities' stuff"* (DS. 11). |
| *"For everyday life, outside of my dental practice work, I usually consider using DSM to do a routine activity such as learn how to cook food and read the news"* (DP.5) |
| *"Facebook is more like for academic stuff, keeping for the university stuff. Instagram is for fun. Twitter is good for news and update on what happened in the world."* (DS. 6). |

*"Snapchat is more for the family and friends, Instagram is for the same thing as well, but I use Twitter for following journals and updating for conferences and things that related to my work"* (DP. 10).

"*I find it very easy to access very easy to use, quick, available all the time"* (DP.9)

*"It is quicker and easier"* (DP.3)

*"It is very easy to use"* (DP.9)

*"Quicker and always available"* (DP. 1)

*"It is a helpful aid, reachable and easy to access to everyone"* (DP. 7)

*"DSM are quicker and easier to get to"* (DP. 3)

*"DSM it has like automatically given the information you would like so you do not have to put much effort"* (DS.9)

"*Always available at my hand"* (DS.5)

*"I follow accounts who posting nice looking dental fillings [...] because it is very beneficial especially when you stuck with something within the school you can see something online which might open up your perception or give you an idea how to do something differently or how to make your work better"* (DS.10)

*"DSM are a good place for learning because these platforms [...] for example, if you are in the second year or third year and you want to see how to do an IANB block injection. Now the lecture will tell you have to palpate the coronoid notch and you find a pterygomandibular. In contrast, digital media or YouTube actually show you the different techniques being done"* (DS.7)

"*I guess it is beneficial when you see clinical cases online [...] and see how they manage it and diagnose it. Then you can apply it to your cases after if you see similar patients"* (DS. 10)

*"I follow many dentists where I can look at different cases from the whole world. In our profession, it is important to keep yourself up to date with clinical practices [...] For example, in endodontics, we use different instruments so you can see how people approach difficult cases, how they are applying different protocols"* (DP.5)

*"If you want to disseminate knowledge in dentistry. For example, on Twitter, just write down a case scenario and write down what is the proper treatment or treatment options would be beneficial"* (DP.8)

*"I use DSM such as YouTube a lot of the time when something I do not quite understand at school, such as periodontal surgeries steps and techniques, YouTube videos is quite good"* (DS.7).

*"I used to record educational videos such as step by step waxing up and the dental anatomy. Then I uploaded to YouTube and send it to students before the session"* (DP.7).

*"What I post could be educating for the junior dentists and public as well about dental and oral health problems such as caries or periodontal problems"* (DP. 9).

*"I do use WhatsApp to communicate with my postgrads and share some posts that may be relevant to them in terms of dental technique*" (DP. 3)

*"I see a lot of accounts for educating the whole community. The advantage of that the patient will know more, for example, early signs of changes on their mouth"* (DP.10).

*"You can post a case scenario and just write down what do you think as a proper treatment or treatment options [...] people are really using it for oral health education in the dental and medical field."* (DP. 8).

"*You can create a study group and networking with your students as well as for collaborative work because nowadays everyone has his smart mobile and its apps so they can share and search*" (DP. 9)

*"We have so many group chats and (BDS group chat for the whole cohort). If I need support, I can ask someone who knows better than me or ask my peers to share their lecture notes"* (DS.4).

"*DSM platforms can create an environment that people can engage and learn more, especially in a closed group*" (DP.2)

"*I host a Twitter account for our research lab. I think it is interesting for professional development [...] to see what others publish to make sure you do not step on people feet. I think science communication is lacking right now, and DSM, like Twitter doing a good job filling this gap"* (DS. 1)

*"I joined groups with colleagues where we are posting clinical cases for discussions, posting upcoming conferences and scientific meetings*" (DP. 4).

*"I offer clients who wants to hire me to give a talk about my expertise subject and my specialty*" (DP.2)

*"People keep asking where do you work? How can I do this? How much this treatment does it cost? So, it's a way of marketing.*" (DP.8)

*"When I have to advertise for a product, [...] I cannot do it without DSM today. I can reach a hundred thousand people*" (DP. 2)

*"It will become more accessible on DSM because people would go to the Facebook page or see Instagram post more than the website now"* (DS. 9)

*"On Instagram, there are lots of sponsors for dental materials you can follow, and then they will follow you back to see what products they advertise"* (DS. 10).

*"I post to show my CV, achievements, awards, and show my experience as a dental professional […] to promote how good you are"* (DP. 2).

*"I think it is really good for self-promotion, you know to get such presence these days is crucial. You know everybody is using DSM"* (DS.3).

## 10.6 Appendix F: Study Two Additional Results

Table 9. 12 Descriptive statistics of the 38-perceived risk items (N=301).

| Perceived risk Items | Mean | Std. Deviation | Median | Interquartile Range |
|---|---|---|---|---|
| I find it risky to use information shared on DSM because it is not evidence-based. | 3.49 | .965 | 4.00 | 1 |
| There is a risk of significant time wasted from having to cope with the technical aspects of using DSM. | 2.86 | 1.145 | 3.00 | 2 |
| Using DSM would lead to personal social detriment because my friends and colleagues would think less highly of me. | 2.47 | .974 | 2.00 | 1 |
| I find it risky to use information shared on DSM because it is not subjected to quality control. | 3.69 | .980 | 4.00 | 1 |
| There is a risk of DSM being too time-consuming. | 3.89 | .1.053 | 4.00 | 2 |
| There is a risk of abuse of the professional boundary between dental professionals and patients when using DSM. | 3.93 | .886 | 4 | 1 |
| Using DSM would create psychological issues for me because it would not fit in well with my self-image or self-concept. | 2.80 | 1.098 | 3 | 2 |
| There is a risk of shared personal information on DSM being disclosed to third parties without my knowledge. | 4.13 | .854 | 4 | 1 |
| There is a risk of the public getting misleading information related to their oral/dental health on DSM. | 4.28 | .792 | 4 | 1 |
| There is a risk of invasion of my personal space without my permission when using DSM which makes me feel uncomfortable. | 3.71 | .997 | 4 | 1 |
| There is a risk of the public deception from the dental promotion shared on DSM. | 3.94 | .846 | 4 | 2 |
| Using DSM may subject my online accounts to privacy breaches from internet hackers (criminals). | 3.84 | .863 | 4 | 1 |
| There is a risk of the public not being able to recognise the ‘inappropriate’ dental treatment shared on DSM. | 4.25 | .770 | 4 | 1 |

| | | | | |
|---|---|---|---|---|
| Using DSM will not fit well with my self-image or self-concept. | 2.75 | 1.02 | 2 | 2 |
| There is a risk of damaging the profession when my professional image is negatively affected by using DSM. | 3.85 | .913 | 3 | 2 |
| Using DSM would expose me to negative comments from others which negatively affect my self-esteem. | 3.40 | .977 | 3 | 1 |
| There is a risk of using DSM inappropriately because of my lacking in technical know-how. | 2.64 | 1.171 | 2 | 2 |
| I find it risky to use information shared on DSM because of a lack of quality. | 3.40 | .987 | 4 | 1 |
| I find it risky to use DSM without complying with the guidelines set by governing bodies. | 3.52 | 1.002 | 4 | 1 |
| Using DSM might not technically perform well to achieve the desired advantages. | 3.27 | .936 | 3 | 1 |
| I find it risky to use DSM as posting unprofessional content on DSM could lead to disciplinary action by the governing bodies. | 3.80 | .935 | 4 | 1 |
| Using DSM would negatively affect the way others think of me. | 2.72 | .994 | 3 | 1 |
| I find it risky to use information shared on DSM because of a lack of reliability. | 3.64 | .900 | 4 | 1 |
| Using DSM worsens the image my friends and colleagues have of me. | 2.38 | .964 | 2 | 1 |
| There is a risk of using DSM for sharing dental procedures with identified patient information. | 4.07 | .840 | 4 | 1 |
| There is a risk of using DSM for sharing sensitive personal information that can be accessed by others due to system security breaches. | 3.99 | .860 | 4 | 1 |
| There is a risk of using DSM to discuss anonymised patients cases/material without explicit consent. | 4 | .911 | 4 | 1 |
| There is a risk of blurring professional boundaries if I accept a friend request from a patient on DSM. | 4.19 | .852 | 4 | 1 |

| | | | | |
|---|---|---|---|---|
| There is a risk of wasting time when using DSM as it keeps you away from doing other important tasks. | 3.81 | 1 | 4 | 2 |
| There is a risk of blurring the professional boundary between dental students and dental professionals when interacting on DSM. | 3.44 | 1.098 | 4 | 2 |
| There is a risk of damaging the profession if I share unprofessional content on DSM. | 4.13 | .852 | 4 | 1 |
| There is a risk of creating a negative impression about me based on the content I shared on DSM. | 3.67 | .925 | 4 | 1 |
| There is a risk of significant time wasted in having to learn how to use DSM. | 2.71 | 1.182 | 3 | 2 |
| There is a risk of losing money if I use DSM for advertisement of services. | 2.91 | .991 | 3 | 2 |
| I find it risky to use DSM as it would put me in an unfavourable position with the policy set by my employer / university. | 2.99 | .980 | 3 | 2 |
| Using DSM payment service subjects my checking account to potential fraud. | 3.45 | .849 | 3 | 1 |
| There is a risk of losing money when subscribing to premium paid services of DSM. | 3.49 | .870 | 4 | 1 |
| There is a risk of using DSM inappropriately due to technical reasons from the providers. | 3.32 | .879 | 3 | 1 |

Table 9. 13 Comparison across the different type of participants with respect to their gender (Male N = 104; Female N = 197).

| Factors | Male | Female | *P* value |
|---|---|---|---|
| | Mean (SD) | Mean (SD) | |
| F I: Negative impact on self-image when using DSM | 2.603 (.851) | 2.635 (.746) | .757 |
| F II: Public deception and reputation damage | 4.080 (.617) | 4.092 (.566) | .970 |
| F III: Using invalid information | 3.531 (.794) | 3.569 (.721) | .638 |
| F IV: Time and resources spent on learning/training how to use DSM | 2.867 (.901) | 2.736 (.777) | .207 |
| F V: Breaches of patient confidentiality | 4.009 (.819) | 4.022 (.659) | .609 |
| F VI: Technical failure and non-compliance issue | 3.384 (.757) | 3.605 (.668) | .011* |
| F VII: Personal privacy risk | 3.793 (.891) | 3.766 (.794) | .605 |
| F VIII: Time spent on DSM | 3.774 (.957) | 3.893 (.839) | .370 |

Note: *Significant *P*-values < 0.05.

Table 9. 14 Comparison across the different type of participants with respect to their age (16-24 N = 154, 25-34 N = 110, 35 and above N = 37).

| Factors | 16-24 Years① | | 25-34 Years② | | 35 and above③ | | *P*-value | Post hoc |
|---|---|---|---|---|---|---|---|---|
| | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | Mean (SD) | Median (IQR) | | |
| F I: Negative impact on self-image when using DSM | 2.494 (.683) | 2.49 (1) | 2.861 (.838) | 2.8 (1.40) | 2.459 (.825) | 2.40 (.90) | .001* | ②>①, ②>③ |
| F II: Public deception and reputational damage | 4.176 (.524) | 4.2 (.80) | 3.949 (.662) | 4 (.90) | 4.135 (.494) | 4 (.60) | .016* | ①>② |
| F III: Using invalid information | 3.488 (.691) | 3.5 (1) | 3.625 (.760) | 3.75 (.81) | 3.635 (.906) | 3.75 (.88) | .127 | - |
| F IV: Time and resources spent on learning/training how to use DSM | 2.616 (.729) | 2.5 (1) | 2.918 (.869) | 3 (1.25) | 3.060 (.915) | 3 (1) | .003* | ②>①, ③>① |
| F V: Breaches of patient confidentiality | 4.045 (.657) | 4 (1) | 3.951 (.816) | 4 (1.08) | 4.099 (.637) | 4 (1) | .703 | - |
| F VI: Technical failure and non-compliance issue | 3.556 (.690) | 3.666 (1) | 3.503 (.676) | 3.5 (1) | 3.495 (.862) | 4 (1) | .934 | - |
| F VII: Personal privacy risk | 3.763 (.840) | 4 (1.5) | 3.718 (.847) | 4 (1.5) | 4.0 (.687) | 4 (1) | .346 | - |
| F VIII: Time spent on DSM | 3.886 (.862) | 4 (1.5) | 3.827 (.881) | 4 (1.5) | 3.783 (.982) | 4 (1.5) | .853 | - |

Note: Group 1: ①16-24 years; Group 2: ②25-34; Group 3: ③35 and above; SD, Standard Deviation; IQR, Interquartile Range; *Significant *P*-values < 0.05.

Table 9. 15 The types of DSM platforms and usages in hours per group.

| | | Total respondents N (%) | Respondents per group | | | *P*-value |
|---|---|---|---|---|---|---|
| | | | Undergraduate students N (%) | Postgraduate students N (%) | Dental professionals N (%) | |
| Type of DSM platforms | WhatsApp | 277 (92) | 175 (58) | 48 (16) | 54 (18) | 0.267 |
| | Instagram | 238 (79) | 162 (54) | 41 (14) | 35 (12) | < 0.001* |
| | YouTube | 210 (70) | 139 (46) | 40 (13) | 31 (10) | < 0.001* |
| | Facebook | 180 (60) | 107 (36) | 32 (11) | 41 (14) | 0.393 |
| | Snapchat | 135 (45) | 107 (35.5) | 18 (6) | 10 (3.5) | < 0.001* |
| | Twitter | 86 (29) | 52 (17) | 23 (8) | 11 (4) | 0.005* |
| | LinkedIn | 42 (14) | 16 (5) | 12 (4) | 14 (5) | 0.002* |
| | Skype | 28 (9) | 12 (4) | 9 (3) | 7 (2) | 0.041* |
| | Other | 20 (7) | 11 (4) | 2 (1) | 7 (2) | 0.228 |
| Usage in hours per day | Less than an hour | 51 (16) | 19 (6) | 6 (2) | 26 (8) | < 0.001* |
| | More than an hour | 82 (27) | 56 (18) | 14 (4) | 12 (4) | |
| | More than 2 hours | 63 (22) | 38 (13) | 11 (4) | 14 (5) | |
| | More than 3 hours | 105 (35) | 75 (25) | 20 (7) | 10 (3) | |

*Significant *P*-values < 0.05

## 10.7 Appendix D: List of Presentations and Publications in International Conferences and Peer-reviewed Journals

- **Sharka, R., San Diego, J, Nasseripour, M. and Banerjee, A.** A Mixed Method Study Protocol: Assessing the Risks of Using Digital and Social Amongst Dental Professionals and Dental Students. *Association for Dental Education in Europe Conference (ADEE)*, **2019** August, Berlin, Germany.
- **Sharka, R., San Diego, J, Nasseripour, M. and Banerjee, A.** Digital Media Risk Specific to Dental Education and Profession. *The International Association for Dental Research Conference (IADR)*, **2020** March, Washington DC, United States.
- **Sharka, R., San Diego, J, Nasseripour, M. and Banerjee, A.** Identifying Risk Factors Affecting the Usage of Digital and Social Media: A Preliminary Qualitative Study in the Dental Profession and Dental Education. *Dentistry Journal*, **2021** May;9(5):53. doi: 10.3390/dj9050053. PMID: 34066871.
- **Sharka, R., San Diego, J, Nasseripour, M. and Banerjee, A.** Dental Students and Professionals' Perceived Risks of Using Digital and Social Media. *The International Association for Dental Research Conference (IADR)*, **2021** July, Boston, United States.
- **Sharka, R., San Diego, J, Nasseripour, M. and Banerjee, A.** Perceived Risk Factors of Using Digital and Social Media in the General and Dental Professional Contexts. *British Alliance of Researchers in Dental Education and Scholarship Conference (BARDES)*, **2021** October, Glasgow, United Kingdom.

*The End*