

The Digitally Mediated Study Experiences of Undergraduate Students in South Africa

by

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Declaration

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Abstract

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The academic experiences of today's undergraduate students have become increasingly digitally-mediated. The growing prevalence of ubiquitous information systems and pervasive media use in educational contexts has been shown to have the potential to produce detrimental effects for students' learning and academic achievement. Media multitasking behaviour poses profound implications for cognition and academic functioning. The objective of this study is to explore undergraduate students' new media usage patterns whilst in academic contexts. Three key aspects of these usage patterns are focused on: behavioural beliefs, behavioural triggers, and, the behaviour itself. Previously studies have focused on determining the prevalence of media multitasking behaviour, or, the implications of such behaviour. Little focus has been placed on studying students' mediated experiences and beliefs. In this study a qualitative approach is adopted in order to gather the data necessary for furthering the understanding of students' experiences and usage patterns. In this regard,

a series of focus groups were conducted with undergraduate students at Stellenbosch University. Through a thematic analysis approach these focus groups provided a number of useful themes describing many aspects of students' mediated study experiences, relating to their beliefs, behavioural triggers and behaviour. Synthesizing all of the themes, the principal contribution of this study to this area is the finding that students' use of media is based on a reasoned evaluation of the impact of their media multitasking behaviour. This implies that contextual factors are primarily responsible for initiating use instances. In addition to this, this study identifies the existence of a 'snowball' effect, prompting unplanned, extended media engagement, prolonging use instances. Finally, a model describing students' media multitasking behaviour in structured and self-regulated academic contexts is proposed.

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Contents

Declaration	i
Abstract	ii
Acknowledgements	iv
Contents	v
List of Figures	ix
List of Tables	x
1 Introduction	1
1.1 Background	1
1.2 Motivation for the Study	3
1.3 Research Questions	4
1.4 Research Design	5
1.5 Outline of the Thesis	6
2 Conceptual Foundations	7
2.1 Attention	7
2.1.1 Theories of Attention	8
2.1.2 Working Definition	10
2.2 Media	10
2.2.1 Modern Conceptualisations of Media	11
2.2.2 Modern Media Technologies	12
2.2.3 Working Definition	12
2.3 Multitasking	13
2.3.1 Task Switching	14

2.3.2	Cognitive Aspects of Multitasking Behaviour	15
2.3.3	Working Definition	15
2.4	Media Multitasking	15
2.4.1	Cognitive Aspects of Media Multitasking	16
2.4.2	Working Definition	17
2.5	Context	18
2.5.1	Structured Environment	18
2.5.2	Self-regulated Environment	19
2.5.3	Working Definitions	20
3	Literature Review	21
3.1	Theories of Human Behaviour	22
3.1.1	Theory of Reasoned Action	22
3.1.2	Theory of Planned Behaviour	23
3.1.3	Conclusion	24
3.2	Ubiquity of New Media in Students' Lives	25
3.2.1	Prevalence of New Media in Everyday Life	26
3.2.2	Prevalence of New Media in Academic Contexts	27
3.2.3	Conclusion	32
3.3	'The medium is the message'	32
3.3.1	Interactivity	33
3.3.2	Hypertextual Navigation	33
3.3.3	Mediated Social Reality	35
3.3.4	Personal	36
3.3.5	Summary	37
3.4	New Media and the Brain	38
3.4.1	Neuroplasticity	38
3.4.2	Impacts of Media Use on Cognitive Functioning	39
3.4.3	The Attention Economy	41
3.4.4	Embodied Technological Relations	43
3.4.5	Conclusion	44
3.5	Implications for Academic Performance	45
3.5.1	Media Multitasking and Learning	45
3.5.2	Academic Performance Outcomes	47
3.5.3	Conclusion	52

3.6	Conclusion	53
4	Methodology	55
4.1	Purpose of the study	55
4.2	Research design	56
4.2.1	Suitability of the research design	57
4.2.2	Instrumentation	60
4.3	Data Collection	62
4.3.1	Research participants	62
4.3.2	Procedure	63
4.4	Ethical considerations	64
4.5	Data Analysis	65
4.5.1	Thematic Analysis	65
4.6	Summary	68
5	Findings	69
5.1	Students' Beliefs	69
5.1.1	Behavioural Beliefs	70
5.1.2	Normative Beliefs	72
5.1.3	Control Beliefs	74
5.2	Triggers Underlying Media Use	77
5.2.1	Intrinsic Triggers	77
5.2.2	Extrinsic Triggers	82
5.3	Media Use Behaviour	85
5.3.1	Structured Contexts	86
5.3.2	Self-Regulated Contexts	87
5.3.3	General Use Pattern	89
5.4	Conclusion	90
6	Discussion	92
6.1	Beliefs	93
6.2	Triggers	95
6.2.1	Intrinsic Triggers	95
6.2.2	Extrinsic Triggers	97
6.3	Behaviour	98
6.4	Conclusion	100

<i>CONTENTS</i>	viii
6.4.1 Proposed Model	102
7 Conclusion	104
7.1 Recommendations	105
7.1.1 Recommendations for Practice	105
7.1.2 Recommendations for Research	106
7.1.3 Conclusion	108
Bibliography	109

List of Figures

3.1	The Theory of Reasoned Action	23
3.2	The Theory of Planned Behaviour	24
6.1	Proposed model describing the relationships observed in the data. .	103

List of Tables

4.1	Final codes used in analysis of the focus groups.	67
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Chapter 1

Introduction

1.1 Background

Mobile digital media such as laptops, tablets and smartphones have become ubiquitous companions to the 21st century denizen, attracting increasingly greater proportions of their attention and time. Coupled with this ubiquity, and prevalence across numerous and diverse social and personal environments, modern digital media and ubiquitous information systems provide increasingly powerful means of interaction and connectivity, further enhancing their role as essential aspects of modern daily life. In particular, extensive media use has emerged as a defining feature of the millennial generation. In describing members of this generation, including today's university students, as the 'net generation' (Tapscott, 1998) or the 'digital natives' (Prensky, 2001), the significant role media play in their lives is further highlighted. Moreover, through establishing these generational distinctions Tapscott (1998) and Prensky (2001) have drawn attention to the technologically mediated behavioural changes emerging in the millennial generation. Building on these early foundations, a growing area of research within the field of *Human Computer Interaction* (HCI) has emerged, focusing on further understanding digital media use and the implications for individuals and societies that it produces.

While many of the contemporary studies involving digital media draw from areas within HCI research such as cognitive and social psychology, early work within the field of media studies provides many important insights and foundations central to research with digital media. In 1962, in *The Gutenberg Galaxy*,

Marshal McLuhan, a seminal communications and media theorist, outlined the social and cognitive changes emerging from the invention of mass print media. Through this process McLuhan (1962) highlights how different forms of media possess the capability to alter human consciousness and behaviour, bringing about many social and psychological changes. In addition to suggesting that media are capable of promoting specific forms of consciousness, McLuhan places particular emphasis on the role played by the medium itself. For McLuhan, the characteristics of the medium determine how the “scale and form of human association and action” are influenced (McLuhan, 1964, p. 9). Accordingly, the phrase: “The medium is the message” coined by McLuhan captures the essence of this stance. Essentially, McLuhan suggests that in order to understand a medium (A mobile phone, the Internet, a laptop, for instance), focus should not be placed on the messages (The content) conveyed therein. Rather, focus should be placed on understanding how the medium comes to shape human perception and behaviour. In this way, McLuhan (1964) recommends that a medium, not the content it conveys, should be the primary focus of study.

For McLuhan, mediated experiences involve a perceptual interaction between the various senses; visual, aural, touch, smell and taste (McLuhan, 1962, p. 314). Which sense, or which view of reality is experienced is influenced by the selective biases present in the particular medium in use. These selective biases in sensory perception brought upon through mediated experiences shape how the environment is perceived — fluctuating between perceptual awareness and ignorance. In this way, media, the tools between an individual and the environment, impose their influence on sensory perception (Vieta and Ralon, 2013).

The manner in which people engage with modern digital media thus has the potential to influence how such media impact upon individuals and society. The ubiquity of media, as well as the characteristics inherent in modern digital media have contributed to the growing prevalence of continuous media use among today’s university students. Increasingly, students are engaging in media multitasking behaviour, rapidly switching between various ongoing activities, disrupting their attention (Fried, 2008; Junco, 2012). Previous research in this area indicates that there is a negative correlation between media mul-

multitasking behaviour in academic contexts and academic performance (Van der Schuur *et al.*, 2015; Leysens *et al.*, 2016). These outcomes suggest that media multitasking behaviour implies cognitive costs, impeding the processing and encoding of information into long term memory — key functions necessary for learning (Junco, 2012). Owing to the ubiquity of extensive media use and media multitasking behaviour amongst today’s student population, and the negative correlations with important learning processes suggested by previous research, it is clear that for today’s students the issue of attention management in the context of media use is of central importance to their academic lives.

Vodanovich *et al.* (2010) suggest that the rise of the digital native generation coupled with the ubiquity of modern digital media and information systems creates profound implications for research within the field of Information Systems (IS). Through a review of research published within the Association for Information Systems (AIS) basket of six top IS journals¹, Vodanovich *et al.* (2010) indicate that research within the field of IS into ubiquitous information systems is particularly limited. Moreover, this review indicates that research within the field of IS involving ubiquitous information systems, modern digital media and digital natives is especially limited. In order to address these deficiencies Vodanovich *et al.* (2010) propose a research agenda focusing on the manner in which digital natives interact with ubiquitous information systems; the design and implementation of these systems, as well as the determination of the potential impacts arising from the use of ubiquitous information systems and modern digital media. This research project aims to approach aspects of this agenda

1.2 Motivation for the Study

This research is implemented on the basis of three primary concerns. First, this study aims to extend earlier research focusing on digital media use and its implications for cognitive functioning. Much of the research within this area focuses on identifying either the precursors leading to digital media use (e.g.

¹*Information Systems Research, MIS Quarterly, Journal of Management Information Systems, Information Systems Journal, European Journal of Information Systems and Journal of the AIS*

Cheung *et al.*, 2011; Venkatesh *et al.*, 2012, amongst others), the prevalence of media multitasking behaviour (e.g. Thompson, 2013; Fried, 2008; Rosen *et al.*, 2013; Junco, 2012), or the implications of media multitasking behaviour for task performance (e.g. Hembrooke and Gay, 2003; Risko *et al.*, 2013; Junco and Cotten, 2011; Burak, 2012). Little focus has been directed towards understanding students' mediated study experiences. For this reason, the second concern motivating the execution of this study is the necessity to contribute to this research area by focusing on the behavioural dynamics and media usage patterns prevalent amongst university students.

Not only does the research seek to answer gaps in the local and global understanding of the media usage patterns prevalent amongst university students, but the findings are likely to be of value for pedagogy and other educational practices. So it follows that, the third issue motivating this study concerns the application of its findings for pedagogy within South Africa and globally.

1.3 Research Questions

The purpose of the study is to explore undergraduate students' new media usage patterns whilst in academic learning contexts. The following primary research questions arise from this purpose.

1. *What beliefs do students hold in relation to their use of media in both structured as well as self-regulated academic contexts?*
2. *What are the triggers that underly students' use of media in structured and self-regulated academic contexts?*
3. *What form of behaviour do students exhibit when using media in structured and self-regulated academic contexts?*

1.4 Research Design

This study situates itself within the qualitative research tradition, adopting an interpretivist paradigm for analysis². The study consists of two overarching phases: The conceptual foundations and narrative construction phase; and an empirical, qualitative investigation phase.

In the first phase a narrative is constructed through reviewing literature relevant to the study of students' media behaviours. This narrative argues that *it is the characteristics of new media which have profound negative connotations for cognitive functioning such as attention, memory and learning, coupled with their ubiquity in students' lives, that lead to the hypothesized decreases in academic performance*. This narrative serves to provide a theoretical justification for the study as well as to aid in structuring a search for gaps in the current understanding of this research problem.

Working definitions for the following key concepts are provided in order to form a basis upon which the narrative builds: Attention, Media, Multitasking, Media Multitasking and Academic Contexts. The primary component of the first phase involves establishing the narrative through a process of deductive reasoning, on the basis of four key arguments:

1. New media is a ubiquitous presence in students' lives.
2. It is the characteristics of new media that alter their use.
3. These characteristics have implications for cognition and behaviour.
4. Therefore, media multitasking behaviour has an impact on academic performance.

The second phase involves an empirical, qualitative investigation of undergraduate students' new media usage habits in various academic contexts. A focus group methodology is employed to gather the necessary data to address the three primary research questions outlined in Section 1.3. The data gathered during the focus group discussions is analysed using a thematic analysis

²The key paradigmatic foundations underlying this research are discussed in Section 4.2.

methodology, with the responses being analysed and described in terms of emergent themes and patterns. The analysis primarily focuses on the following themes relating to the primary research questions:

1. Students' *beliefs* in relation to media use.
2. The *triggers* underlying media use.
3. The form that students' media *behaviour* takes.

1.5 Outline of the Thesis

This chapter presented an overview of the research background, study motivations, research questions and the research design. The remainder of the thesis is organised as follows: Chapter 2 provides working definitions for several key concepts applicable to this study through a brief focus on relevant prior research. In chapter 3 the narrative outlined in Section 1.4 is constructed through a thorough review of existing literature. Chapter 4 presents a detailed description of the research design as well as the procedures for data collection and analysis. In chapter 5 the findings of the thematic analysis process are presented. Chapter 6 presents a discussion of the results achieved in the study. This discussion relates the findings of the study to prior research in this area. Finally, in chapter 7 a summary of the study is provided, along with a discussion of the areas where future research is necessary in order to strengthen the current understanding of this body of knowledge.

Chapter 2

Conceptual Foundations

Before focusing on prior research within this domain, several key concepts pertinent to this study require clarification in order to eliminate any ambiguity that may exist. Through this process working definitions for the following concepts will be established: attention, media, multitasking, and media multitasking. Finally, the nature of the specific academic contexts upon which this research focuses will be clarified.

2.1 Attention

In *Cognitive Psychology*, the concept of attention is commonly understood as the capacity to attend to some stimuli while ignoring other stimuli (Gazzaniga *et al.*, 2009). This concept was first formalised by psychologist and philosopher William James in 1890. Using a method of ‘folk-psychology’, building on collective experience, James (1890, p. 403) defined attention as “the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought [...] it implies withdrawal from some things in order to deal effectively with others.”

Subsequently, in modern studies of attention it has become known that human attention is divided along two dimensions: voluntary, top-down attention and involuntary, reflexive attention (Müller and Rabbitt, 1989). Goldstein (2009) describes how voluntary attention enables people to act in a goal-orientated manner, enacting control over their attentional resources. In contrast, reflexive

attention is characterised by exogenous stimuli diverting attention from one stimuli to another in a bottom-up manner (Goldstein, 2009). Since James' early conceptualisation of attention, many prominent psychologists have proposed various models for understanding selective attention (e.g. Broadbent, 1958; Treisman, 1964; Duncan, 1984). In addition to this, the concept of divided attention, which is particularly relevant to this research, has been explained by many different theories. In order to arrive at a working definition for divided attention, several of the prominent theories explaining selective and divided attention merit exploration.

2.1.1 Theories of Attention

Despite the significant sensory processing capacity possessed by the human brain, it is unable to adequately analyse all of the information received (Tsotsos *et al.*, 1995). In order to explain how the brain's limited capacity for short term memory does not become overloaded, *Broadbent's Filter Model of Attention* suggests that sensory stimuli are filtered, allowing only certain stimuli to receive further processing (Broadbent, 1958). While this filtering mechanism renders the vast amount of sensory stimuli more controllable, it creates bottlenecks in sensory processing (Tombu *et al.*, 2011). Bottlenecks occur due to the sequential filtering of stimuli (Levy and Pashler, 2008). Collectively, the *Central Bottleneck* theories imply that there are structural limitations to humans' cognitive processing capacities, limiting the potential for the processing of simultaneous stimuli that might occur when engaged in multitasking behaviour (Marois and Ivanoff, 2005).

In contrast to Broadbent's Filter Model of Attention and the Central Bottleneck theories, psychologist Daniel Kahneman proposes a different approach for describing attention. In Kahneman's *Capacity Model of Attention* focus is placed on the division of attention rather than the mechanisms through which stimuli are selected (Kahneman, 1973). In this model attention is defined as a resource requiring mental effort, with more complex attentional tasks requiring more effort to process. To summarise Kahneman's model, an individual's ability to pay attention is determined by their available attentional capacity — a resource directly affected by their current level of arousal; determined by

factors such as sleep, stress, as well as their ability to evaluate the demands on their attentional capacity. These factors represent an individual's underlying ability to pay attention at any given moment. Extending this, Kahneman (1973) explains that this attentional capacity must now be allocated to the various cognitive activities taking place, by means of an allocation policy. In addition to the underlying attentional ability, the allocation of attention is influenced by enduring dispositions, events that automatically draw attention, and momentary intentions, conscious decisions to focus on a particular task (Kahneman, 1973). These final two influences on the allocation of the attentional resource represent the ideas of reflexive and voluntary attention.

Another theory of attention drawing from the limited capacity model is the *Multiple Resource Theory* (MRT) proposed by Christopher Wickens in 1984 (Wickens, 1984). In this theory, there exist multiple streams of mental resources within an individual's cognitive systems (Wickens, 2002). Each cognitive stream is related to different modalities of sensory information. Wickens (2002) explains that differences in how sensory information are received impact upon the amount of concurrent information able to be processed by a particular stream. Lang (2006b) describes how within this framework cognitive processing resources can be allocated both voluntarily and reflexively, depending on the nature of the attentional stimuli as well as the motivations of the individual. Under the MRT performance on simultaneous attentional tasks is dependent on the competition for resources between these various cognitive processing streams (Wickens, 2002). Additionally, the ability to focus on simultaneous stimuli is determined by whether the stimuli are attempting to pull from the same cognitive processing stream.

In contrast to the various theories built upon the limited capacity model, motivated cognition theories of attention assert that the allocation of attention as a cognitive resource is directed by motivation (Lang, 2006b). In the *Motivated Cognition Model* (MCM) motivation is described as a strategic activation of appetitive and aversive cognitive systems (Lang, 2006a). This implies that motivation is a function of the relationship between positive and negative affect, regulated by the appetitive and aversive cognitive systems (Cacioppo and Berntson, 1994). This view of attention is particularly useful in the context of understanding the relationship between attention and multitasking.

2.1.2 Working Definition

It is clear that for the concept of attention there exist many different interpretations and theories. It must be noted that many of the conceptualisations of attention do not stand in complete opposition, rather, they are supplementary. For example Kahneman's capacity model augments selection models of attention by further explaining the interdependencies and influences involved in the allocation of attention (Reed, 2012). Likewise, the idea that the allocation of attention is determined by the inherent motivation of the individual towards activities is coherent with the ideas espoused in many of the limited capacity theories. So it follows that, for the purposes of this study, attention is defined as *the isolated and devoted cognitive processing of one particular sensory stimulus while ignoring extraneous sensory stimuli*.

2.2 Media

Like attention, the concept of media holds many different meanings and connotations depending on the context or school of thought adhered to. In order to eliminate any ambiguity that might exist when thinking of the term a brief exploration of the concept is warranted, concluding with a working definition to be used throughout this study. This process begins by examining early conceptualisations of media in the mid-20th century before moving to more recent conceptualisations and issues. Finally, the specific characteristics and tools of modern digital media and *New Media* are explored.

The term 'media' understood as relating to communication channels can be attributed to works published in the 1960s by the Canadian communications and media theorist, Marshal McLuhan (e.g. McLuhan, 1962, 1964). Two key tenets of McLuhan's work revolve around the relationship between media and people, and how this relationship should be studied. McLuhan argued that technologically embodied communication media should be viewed simply as a tool, with no moral or ethical predispositions (McLuhan, 1962). Formalising this, McLuhan (1964, p. 22) explains that a medium is 'any extension of ourselves'. However, McLuhan (1962) further explains that while media should be viewed as a tool, they do possess the capability to profoundly alter society's

self-conceptions and functioning. This is because, as McLuhan (1964, p. 6) postulates; media, as extensions of man, within the context of the body's sensorium (the sum of human perception) alter the "psychic and social complex". However, it must be noted that as a result of the technological determinism pervading McLuhan's writing, his works have been subject to criticism and suspicion by various media theorists and philosophers over the subsequent half century (e.g. Debray, 1996; Bolter, 2003).

2.2.1 Modern Conceptualisations of Media

With the advent and proliferation of digital technology the modern understanding of communications media has changed significantly over the subsequent half century. In the 1970s the term 'personal media' referring to the rise of personal computers and other personal communication devices, gained significant prominence (Lüders, 2008). Prior to this, conceptualisations of media technologies primarily referred to mass media — media catering to larger audiences such as traditional television, radio or newspapers (Wimmer and Dominick, 2013). The personalisation and socialisation of media has been heightened with the development of the *World Wide Web*. Bolter (2003) explains that in addition to personalisation, modern forms of media are becoming increasingly uni-directional. Individuals are becoming included in the production processes. The distinction between traditional notions of media and modern manifestations is sufficient to warrant the creation of a new descriptive term. Modern means of personal and mass communication conducted through the mechanism of digital technologies such as the World Wide Web are collectively known as *New Media* (Bolter, 2003).

In addition to technological shifts in the media environment, cultural and behavioural adaptations have come about through the digitisation of media technology (Judd and Kennedy, 2011). In a report on an investigation into differences in technology usage habits by net generation students, Judd and Kennedy (2011) describe three key adaptations in the way media have become situated in individuals' cultural and social environments. First, owing to increased levels of interactivity and its co-productive nature, media have become an ever present feature in peoples' daily lives (Judd and Kennedy, 2011). Second,

because of the personal nature of modern media, participation with modern media has transitioned from a predominately reading culture to that of an audio-visual culture (Judd and Kennedy, 2011). Third, Judd and Kennedy (2011) explain that media consumption has become more individualistic and discrete rather than social and participatory.

2.2.2 Modern Media Technologies

Digitisation has brought about a whole raft of changes in how media is conceptualised and viewed in the 21st century. Modern digital media or New Media now exist in many different forms and arrangements, each playing different roles in the social and cultural landscape of the 21st Century. Baron (2008) notes that the ability of modern operating systems and personal computers to display multiple concurrent applications has changed the way engaging with media is viewed. The manner in which media is conceptualised and viewed as an always-on, socially interactive, technologically mediated communication mechanism has in part been brought about through the proliferation of modern mobile devices such as laptops, tablets and smartphones (Panek, 2014; Wardley and Mang, 2015). These tools provide access to the World Wide Web, providing opportunities for communication, collaboration and other forms of social interaction, anywhere and with minimal effort (Wardley and Mang, 2015; Ericson, 2011). Applications in use on such media tools include: instant messaging, social networking, email, blogging, and news reading amongst other forms of information gathering, entertainment and communication (Alison Bryant *et al.*, 2006; Ericson, 2011).

2.2.3 Working Definition

Over the preceding half century the concept ‘media’ has been viewed in many different ways, as well as experiencing a significant degree of change as technological innovation has preceded. For the purposes of this study the concept media is defined as referring to the *technological tools used to facilitate communication, entertainment and information gathering in the 21st Century*. It is understood that these tools play a significant role in shaping the social and

cultural landscape as a consequence of their ubiquity and depth of involvement in peoples' lives. In accordance with McLuhan (1964), the study accepts the premise that media may indeed lead to social impacts on its users.

2.3 Multitasking

The term 'multitasking' is commonly understood to refer to the act of simultaneously performing more than a single task at any given time (Burak, 2012; Tokan, 2011; Wood *et al.*, 2012). However, for the purposes of this study a more in depth investigation of various interpretations for the concept of multitasking is required in order to arrive at a comprehensive working definition. The primary differences in conceptualisations arise due to differences in how the task and time dimensions inherent in multitasking are defined (Wild *et al.*, 2004; Rubinstein *et al.*, 2001).

When defining multitasking, an accurate understanding of both the time and task dimensions needs to be explained (Benbunan-Fich *et al.*, 2011; Wild *et al.*, 2004). One approach to perceiving the task dimension is to view each task as a self-contained unit encompassing a range of different activities (Benbunan-Fich *et al.*, 2011). For example, working on an assignment could include activities such as writing, editing, looking up articles and referencing. Each of these individual activities constitute one single task; while the activity of browsing social media would be part of a distinctly different task, engaging different cognitive processes. Using this approach Benbunan-Fich *et al.* (2011) define tasks as a higher level activity, subtly shifting the definition of multitasking from focusing on the act of simultaneously engaging in different low level activities to that of engaging in multiple higher level activities simultaneously. Similarly, Benbunan-Fich *et al.* (2011) argue that the time dimension of multitasking should be viewed in terms of sessions rather than a more conventional unit of time such as hours or minutes. So it follows that, under this conceptualisation multitasking is viewed as engaging in many different high level activities within a single demarcated session of time.

A further mechanism through which distinctions in defining multitasking arise is whether the multitasking behaviour taking place is externally or internally

motivated. Benbunan-Fich *et al.* (2011) explain that studies researching multitasking typically define multitasking as either arising as the result of external task interruptions, or as the result of discretionary task switching behaviour conducted purposefully. In contrast to these conceptualisations, Benbunan-Fich *et al.* (2011) argue that multitasking behaviour is in fact characterised by both internal cognitive choices as well as external interruptions. Therefore, any comprehensive conceptualisation of multitasking behaviour should be cognisant of the duality that exists in terms of potential origins. This is possible by viewing multitasking behaviour as a time allocation decision, with attention being constantly shifted between various internally and externally motivated tasks (Benbunan-Fich *et al.*, 2011; Junco, 2012; Konig *et al.*, 2005).

2.3.1 Task Switching

Another conceptualisation of multitasking proposes that rather than referring to the simultaneous engagement in multiple tasks, the act of multitasking refers to the execution of multiple tasks sequentially, in quick succession (Burak, 2012). This conceptualisation is based on the idea that while individuals can engage in tasks simultaneously (studying while listening to music, walking and talking), only one particular task is consciously focused on at any particular instant (Pashler, 2000; Bannister and Remenyi, 2009). Accordingly, when multitasking, tasks alternate sequentially in and out of conscious attention. Therefore, the act of task switching requires temporary cognitive disengagement from one task in order to engage in other tasks (David *et al.*, 2015). Rather than viewing task switching as a sub-component of multitasking, David *et al.* (2015) view task switching and multitasking as two distinct classes of behaviour. Under this conceptualisation instant messaging while engaging in academic work is viewed as task switching whereas listening to music while working is viewed as multitasking behaviour (David *et al.*, 2015). Conversely, Judd (2013) offers a different explanation for the relationship between task switching and multitasking. Judd (2013) argues that task switching occurs when an individual changes between a series of tasks without returning to previous tasks. Multitasking occurs when an individual switches between tasks, returning to previous tasks, multiple times (Judd, 2013).

2.3.2 Cognitive Aspects of Multitasking Behaviour

Multitasking behaviour whether internally or externally motivated sets various cognitive events in motion. Multitasking behaviour engages a particular section of the frontal cortex known as Brodmann area 10 (Burgess, 2000; Burak, 2012). Functional Magnetic Resonance Imaging (fMRI) studies have shown that multitasking behaviour can send too many stimuli to this area, overloading it — creating a bottleneck (Dux *et al.*, 2006). In addition to creating a bottleneck in cognitive processing, multitasking behaviour has been shown to impede the transfer of information from short to long term memory (Edwards and Gronlund, 1998; Oulasvirta and Saariluoma, 2004). Moreover, fMRI research has shown that multitasking behaviour is responsible for shifting cognitive activity from the hippocampus, responsible for declarative memory, to the striatum, responsible for procedural memory (Foerde *et al.*, 2006).

2.3.3 Working Definition

For the purposes of this study multitasking behaviour is defined as *the act of engaging in multiple high level tasks simultaneously, by frequently switching between individual sub tasks or activities within a given period of time (session)*. Furthermore, multitasking behaviour is viewed as being influenced by both internal and external motivations. When multitasking, an individual's attention is constantly shifting between various tasks, resulting in cognitive bottlenecks and decreases in the efficiency of the transfer of information from short to long term memory.

2.4 Media Multitasking

Media multitasking can be viewed as a concept distinct from multitasking because of the varied and nuanced ways in which this behaviour takes place, affects cognitive functioning and is viewed in the body of existing research. Media multitasking behaviour has been defined primarily along two lines: multiple media use, and, multitasking while engaged in media activities (Ophir *et al.*, 2009; Jeong and Hwang, 2012; Baumgartner *et al.*, 2014). In order to arrive

at a working definition the key characteristics of these two conceptualisations are briefly considered.

Under the multiple media use conceptualisation media multitasking behaviour is viewed as the act of simultaneously consuming more than one stream or source of media content (Ophir *et al.*, 2009; Bardhi *et al.*, 2010; Wang *et al.*, 2010). This behaviour could take place on the same medium or be spread across various media (Van der Schuur *et al.*, 2015). Examples of such simultaneous behaviour include watching a television program while texting on a mobile phone or using a computer for academic work while listening to music (Yeykelis *et al.*, 2014). A major limitation of this conceptualisation for media multitasking behaviour is that it largely ignores the role played by non-media activities conducted alongside media use. In order to arrive at a more comprehensive definition for media multitasking, the relationship between media and non-media activities needs to be understood and incorporated into any interpretation of media multitasking behaviour.

A broader definition for the concept views media multitasking as the act of “engaging in one medium along with other media *or* non-media activities” (Zhang and Zhang, 2012, p. 1883). This definition is not restricted by only focusing on the media component of media multitasking. Rather, by incorporating non-media activities it sits closer to the definition for traditional multitasking behaviour. To this end, some researchers do not view multitasking behaviour involving both media and non-media tasks as constituting a form of behaviour distinct from the traditional idea of multitasking behaviour (Foehr, 2006).

When defining the task dimension inherent to media multitasking researchers have noted that each activity serves a different purpose. Through incorporating this notion, media multitasking is typically defined as the act of using a form of media to achieve a particular objective while simultaneously being engaged in a different media or non-media related task, with a different intention to the first task (Jeong and Fishbein, 2007; Wang *et al.*, 2012).

2.4.1 Cognitive Aspects of Media Multitasking

When defining media multitasking several researchers have considered the cognitive impacts of the tasks involved. More specifically, the resource demands

placed on cognitive systems by media multitasking tasks have been incorporated into conceptualisations of media multitasking (Wang *et al.*, 2015). In a study characterising the cognitive dimensions of media multitasking Wang *et al.* (2015) developed an image of media multitasking behaviour, describing it as being multidimensional, with the tasks involved placing different kinds of demands upon various cognitive resources. In a later study Xu *et al.* (2016) expand this conceptualisation explaining that media multitasking activities occurring across vastly different modalities (for example, visual vs. auditory), are less cognitively demanding than media multitasking behaviour in which the activities are in competition for the same cognitive processing resources (for example, instant messaging whilst watching television – both activities engage visual processing systems).

In addition to involving activities drawing from different cognitive resource pools, media multitasking behaviour plays a significant role in affecting an individual's attentional capacities (Ophir *et al.*, 2009; Wallis, 2010). Wallis (2010) notes that media multitasking behaviour has been shown to erode cognitive control, an individual's capacity to select thoughts and actions enabling the accomplishment of internal goals (Miller and Cohen, 2001). This notion echoes the findings of Ophir (2009) showing that higher levels of media multitasking resulted in an increased propensity for bottom-up attentional control — increased distractibility.

2.4.2 Working Definition

Two primary conceptualisations for media multitasking have emerged. First, media multitasking has been defined as the simultaneous engagement in multiple media activities. Second, media multitasking has been defined in the same manner as conventional multitasking — the simultaneous engagement in multiple high level tasks through rapid task switching, with the understanding that one of the tasks involve some form of media engagement. In this study, the second conceptualisation is preferred. Media multitasking is defined as *simultaneously using at least one type of media while engaging in any number of media or non-media activities*, as described by Jeong and Hwang (2012).

2.5 Context

When focusing on media multitasking behaviour it is necessary to understand the context within which this behaviour takes place. While it has been extensively shown that those belonging to the net generation engage with technology throughout their daily activities (Junco and Cotten, 2011), this study focuses on the meeting point between students' technologically mediated lives and their education. In particular, two key academic contexts forming the majority of students' academic experiences are focused on. Typically lectures or classes form the primary academic context experienced by students (Lee, 2009; Lomas and Oblinger, 2006). In this study, this context is characterised as a formal, structured educational context. In addition to the formal classroom environment students engage in academic work in self-regulated, personal or social contexts. Each of these contexts, structured and self-regulated are characterised by unique rules, behaviours, social structures and opportunities for distraction. In order to eliminate possible uncertainties about these contexts, a brief discussion of the elements characterising each context is necessary.

2.5.1 Structured Environment

Typically, a structured academic context takes the form of one hour lectures in lecture halls or classrooms under the control of a facilitator. The presence of a facilitator is the key element characterising a structured academic environment. The role of the facilitator is twofold. First, they are responsible for presenting material to the students. Second, the facilitator regulates the behaviour of the students within this context through the establishment of rules and the maintenance of order (Bain, 2011). However, students' behaviour within a controlled lecture environment is not only a function of the facilitator's conduct, it is also modulated by the cultural and social norms established by their peers within the environment (Berkowitz, 2004). It is clear then, that any behaviour displayed in this context is as a result of the duality between formal, top down rules and the contextual behavioural norms of the individuals as well as the peer group as a whole.

The degree to which a student's in-class behaviour is regulated by the facilitator is dependent on several contextual characteristics particular to the environment. For instance, the size of a classroom both in terms of space as well as the number of occupants impacts upon the ability of the facilitator to influence those present (Cuseo, 2007). Moreover, the size of the class impacts upon the level of interaction available within this context (Cuseo, 2007). In a smaller class, the facilitator is able to provide more personal attention, as well as a greater degree of interaction and control (Cuseo, 2007). In addition to the influence of the facilitator, students can be influenced by the behaviour of those around them (Williams and Cox, 2011; Sana *et al.*, 2013). In a typical lecture students sit in rows, with other students sitting around them, within their eye line. This implies that one student's behaviour is within view of many students around them. Typically, students use laptops, tablets or physical notebooks to record material presented by the facilitator. In addition to the use of these media for note-taking, it is common for students to have other mobile devices on their person during lectures (Junco, 2012).

2.5.2 Self-regulated Environment

While structured lecture contexts might constitute the primary formal academic environment students experience, students spend a far larger amount of their time engaged in informal, self-regulated study environments outside of scheduled class times (Lomas and Oblinger, 2006). A self-regulated academic context is described as a situation in which a student or group of students undertake academic work without direct supervision by a facilitator. Potential locations where self-regulated academic work take place include one's own home, friends' houses or public locations such as coffee shops or libraries (Whiteside *et al.*, 2010). Some of these environments such as libraries are purpose built to facilitate distraction free work whereas other environments such as bedrooms or coffee shops are not designed with this purpose in mind.

These environments are defined as being self-regulated, because the behaviour exhibited within them is not dependent on external rules placed by a facilitator. For the most part, the nature of these environments is determined by the individual's personal choices (Zimmerman, 2008). For instance, a personal

study environment might have multiple digital media, as well as other non-digital characteristics such as the level of noise or the potential to engage in other non-media activities. In addition to being characterised by environmental qualities, self-regulated academic contexts are characterised by different rules, norms and opportunities than controlled academic contexts. Within a self-regulated academic context an individual possesses the ability to change their environment as well as regulate the impact that elements within this environment have on their behaviour (Azevedo *et al.*, 2004) — an ability not present to the same extent in a more controlled context such as a lecture.

2.5.3 Working Definitions

In this study a structured academic context is defined as a *classroom based environment within which students observe and record material provided by a facilitator*. Correspondingly, a self-regulated academic context is defined as *a student or group of students undertaking academic work without direct supervision by a facilitator, either within a personal or public study environment*. From the aforementioned descriptions it is clear that structured and self-regulated academic contexts are characterised by different physical properties as well as distinct social, and cultural constructs.

Chapter 3

Literature Review

In order to adequately understand the dynamics of the relationship between new media, media multitasking behaviour, attention, cognition and academic performance a review of literature pertaining to these areas is conducted. This review takes a narrative form, establishing the following argument on the basis of the research reviewed: *It is the characteristics of new media which have profound negative connotations for cognitive functioning such as attention, memory and learning, coupled with their ubiquity in students' lives, that lead to the hypothesized decreases in academic performance.* In order to accomplish this, primary and secondary studies are explored; aiding the construction of a holistic interpretation of the association between new media and cognitive outcomes. The narrative follows a four step process, involving a process of deductive reasoning. The aforementioned argument is based on the concordance of the arguments presented in each section.

Prior to the establishment of this argument, this chapter commences with a brief overview of theories of human behaviour. The purpose of this section is to establish a basis upon which the rationale underlying students' behaviour with media in academic contexts can be further understood and analysed.

Following this, research into the ubiquity of media in students' lives is reviewed. This section reviews research into students' digital media behaviour in general, followed by findings regarding the prevalence of media multitasking behaviour in structured academic contexts as well as self-regulated contexts. The aim of this section is to establish the ubiquity of new media while studying, as well as the nature of students' media use behaviour. In the next section, literature

describing the characteristics inherent in new media will be presented. The purpose of this is to provide a distinction between previous forms of media and new media, as well as to inform an understanding of how certain aspects inherent in new media have the potential for shaping the manner in which individuals interact with media. The next section explores this issue further by providing a review of research into the implications of new media use for cognitive functioning. Specifically, focus is placed on the implications for attention and learning associated with the use of new media. Finally, the fourth section brings the research from the previous three sections together, exploring research into the implications of media multitasking for academic performance. In this section a brief overview of how multitasking behaviour impacts upon attention and learning is presented before reviewing specific studies focusing on establishing the correlation between media multitasking while studying and decreased academic performance among university students.

3.1 Theories of Human Behaviour

The following section presents a brief overview of two prominent theories attempting to model and explain human behaviour. It is useful to focus on such theories in order to lay a foundation upon which students' use of media in academic learning contexts may build. Specifically, focus within this section is placed on the *Theory of Reasoned Action* (TRA) and the *Theory of Planned Behaviour* (TPB). In the first instance, the TRA proposes that individuals consider the consequences of a behaviour before executing such behaviour (Fishbein and Ajzen, 1975). This theory brings the notion of intention into the analysis of behaviour and behavioural motivations and triggers. The TPB is seen as an expansion upon the ideas of the TRA, including constructs which cover instances in which the individual is not in total control of all the potential factors affecting their behaviour (Ajzen, 1985).

3.1.1 Theory of Reasoned Action

The *Theory of Reasoned Action* is an early behavioural model proposed by Fishbein and Ajzen (1975) presenting an interpretation of the mechanisms un-

derlying voluntary behaviour. Figure 3.1 presents a visual illustration of the TRA. Under the TRA Fishbein and Ajzen (1975) assert that all behaviour is preceded by intention. This behavioural intention is then itself determined by individuals' attitudes towards the behaviour as well as their perceptions of subjective norms surrounding the behaviour. An attitude toward behaviour describes the individuals' perceptions of whether the behaviour will yield positive or negative results (Fishbein and Ajzen, 1975). Subjective norms describe the perceived social pressure to engage in specific behaviour (Fishbein and Ajzen, 1975). So it follows that, individuals' attitudes and perceptions of social norms shape their behavioural intentions, which in turn determine their overall behaviour.

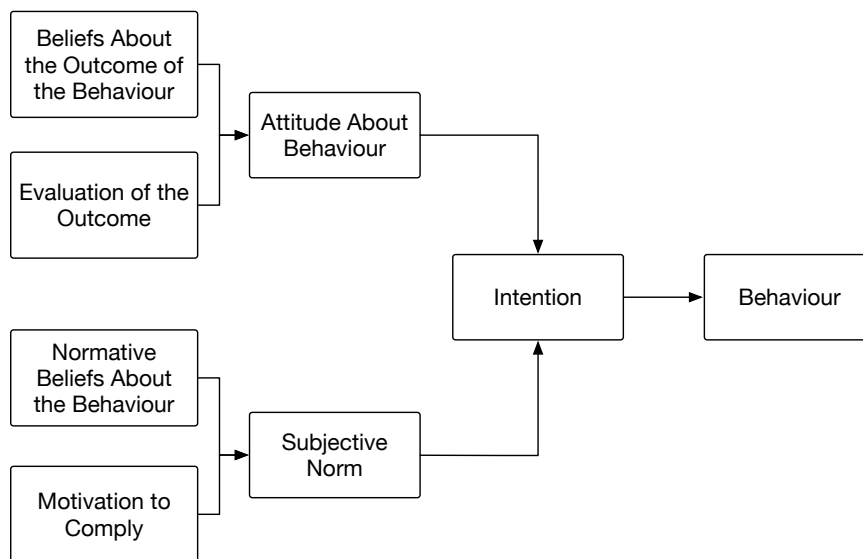


Figure 3.1: The Theory of Reasoned Action

3.1.2 Theory of Planned Behaviour

Ajzen (1985) extended the TRA, designating this extended theory the *Theory of Planned Behaviour*. The TRA was extended by means of the addition of one key predictor — perceived behavioural control. By introducing this new predictor, the TPB now accounts for situations in which individuals hold the intention to participate in a certain behaviour, but for subjective or objective

reasons do not in fact behave in this manner. Therefore, the TPB asserts that it is the individual's attitude towards behaviour, the subjective norms, *and* their perceived behavioural control that inform their behavioural intentions and through this, their behaviour (Ajzen, 1985). Figure 3.2 provides a visual illustration of the TPB. Focusing on the left-hand side of the diagram, the three key beliefs informing behavioural intentions are: behavioural beliefs, normative beliefs and control beliefs. As is the case with the TRA, normative beliefs are defined as an individual's perception of social normative pressures on them to perform a certain behaviour. Similarly, behavioural beliefs are described as an individual's belief about the consequences of particular behaviour. The new concept, control beliefs, are defined as an individual's beliefs about the presence of factors that may either facilitate or hinder the performance of the behaviour (Ajzen, 1985).

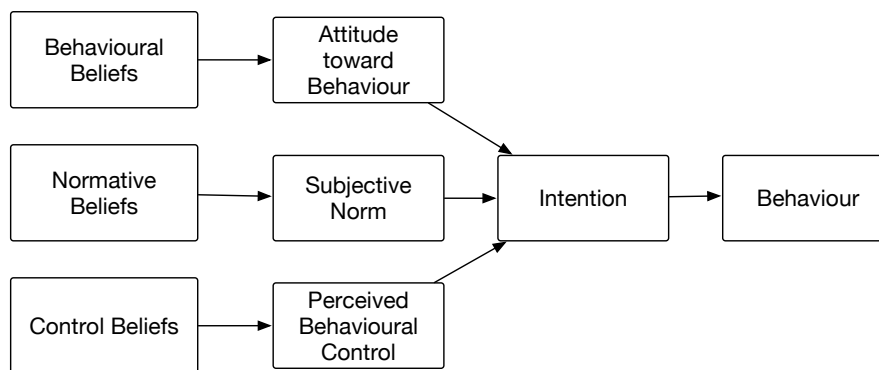


Figure 3.2: The Theory of Planned Behaviour

3.1.3 Conclusion

The TRA and the TPB seek to model how an individual chooses to perform certain behaviours. In the context of this study, these two theories are useful in understanding what elements shape a student's choice to engage in media multitasking behaviour. More specifically, through the TRA and the TPB elements such as behavioural beliefs, normative beliefs and control beliefs are brought into the analytical framework.

3.2 Ubiquity of New Media in Students' Lives

Presently, university students are considered part of the net generation, a cohort displaying an unprecedented propensity for engaging and interacting with new media (Cotten *et al.*, 2011). New media is ubiquitous in students' everyday lives — playing a central role in many of their daily tasks and activities (Cotten *et al.*, 2011). Moreover, as part of the net generation, students display a generally positive relationship with technology and digital media, exhibiting significantly higher adoption and engagement rates than other generations (Dahlstrom *et al.*, 2015).

While there is an extensive body of research focusing on students' use of new media and other related technologies, there is little research in this area in a South African context. However, the results from investigations focusing on South African students' use of new media are largely in agreement with studies focusing on international contexts. For instance, North *et al.* (2014) explore mobile phone usage by South African university students, determining that in their sample of 362 students only 1% did not own a mobile phone, or had not owned one recently. Moreover, in an earlier study Kreutzer (2009) surveys 500 low income South African students, reporting extensive use of mobile devices amongst this demographic. Kreutzer (2009) finds that for low income students in South Africa, a mobile device constitutes their primary connection to the Internet, with 83% of participants accessing mobile Internet applications on a daily basis. These findings are congruent with results gathered across other countries. For instance, a recent EDUCAUSE Center for Applied Research (ECAR) study (N = 50,274 respondents, 11 countries, 161 universities) reveals that 98% of students own at least one mobile device (laptop, smartphone or tablet), capable of receiving an Internet connection (Dahlstrom *et al.*, 2015). So it follows that, the findings from international studies are in agreement with the limited research in this context within the South Africa context. Therefore, it has been deemed that findings from international studies are applicable to the present investigation into the ubiquity of new media in South African students' lives.

3.2.1 Prevalence of New Media in Everyday Life

As these studies reveal, digital device ownership is extremely prevalent amongst university students. However, in addition to possessing digital devices, students spend a significant proportion of their time engaging with these new media (Junco and Cotten, 2011). Thompson (2013) collected data on the variety and frequency of media used by students. The digital media used by students were subsequently classified into nine distinct categories. However, of these nine categories, only the two categories referred to by Thompson (2013) as ‘rapid communication technology’ and ‘web resources’ were used frequently by a majority of the students surveyed. Combined, the rapid communication technology and web resources categories include activities such as: calling or texting on a mobile phone, using social networking sites, watching online video, and web-searching.

Many of the studies examining students’ usage behaviour with media in unstructured contexts rely on self-reported data (Lenhart *et al.*, 2010; Elder, 2013; Jacobsen and Forste, 2011). At the University of Wisconsin, Moreno *et al.* (2012) set out to reduce the potential for recall bias by conducting a real time examination of Internet behaviour using an experience sampling method. Analysis of the data gathered over the seven day experience sampling investigation shows that on average students spent 56 min online per day (Moreno *et al.*, 2012). This result represents a significantly smaller amount of time than suggested by studies relying on self-reported data. For instance, Junco and Cotten (2011) administered a survey to students from four American universities, asking questions about their digital media usage habits. Results from this survey indicate that on average students spend more than two hours per day engaging with online media (social networking, instant messaging and emailing). Interestingly, Moreno *et al.* (2012) discover that students tend to engage in particular media activities simultaneously in clusters. For example, it was shown that social networking, email activities, academic work and browsing commonly co-occur together in a single, multitasked session.

3.2.2 Prevalence of New Media in Academic Contexts

Research into two academic contexts is reviewed. First, research into students use of new media in self-regulated academic contexts is presented, before exploring findings from research into new media use in structured academic contexts.

3.2.2.1 Self-regulated Academic Contexts

Extending from studies into the prevalence of media in students' everyday lives are investigations into the frequency with which students engage in media multitasking while involved in self-regulated study. For instance, Jacobsen and Forste (2011) use online questionnaires to gather data about media use during academic study. Through these self-reported measures, two-thirds of the sampled students reported using media while in class or studying.

In another study, Rosen *et al.* (2013) research students' media multitasking habits in their own personal study environments. In order to create an accurate image of students' media behaviour in personal study environments Rosen *et al.* (2013) combine survey results gauging task-switching preferences with observations of students' media multitasking behaviour within their learning environments. The results show that students averaged less than six minutes on task before switching to another task (Rosen *et al.*, 2013). The observers noted that technological distractions in the learning environment, such as social media and texting, were the most frequent causes of task-switching. In addition to this, Rosen *et al.* (2013) find that a positive attitude towards technology was not a strong predictor for remaining on-task while studying. However, it was determined that students who indicated a preference for task-switching behaviour studied in an environment with more distracting technologies available to them. Consequently, these students were more likely to engage in off-task activities than others (Rosen *et al.*, 2013).

In a later study, David *et al.* (2015) research students' self-regulated behaviour while completing assignments outside of a lecture context, endeavouring to examine the relationship between mobile phone mediated multitasking activities while studying or completing homework and self-reported deficiencies in

self-regulation with mobile devices. David *et al.* (2015) characterise impaired mobile device related behaviour as *mobile phone interference in life* (MPIL). Despite the initial expectations of the researchers, students reported that they devoted 60% of their attention to academically related tasks. David *et al.* (2015) show that listening to music whilst completing academic assignments was the most common method of media multitasking the students engaged in. In addition to multitasking with music, students texted and used social media while studying. The results also reveal that students engaged in browsing, video watching, emailing and gaming to a much lesser extent than the aforementioned activities. David *et al.* (2015) compare these results to the measures for MPIL, with it transpiring that both the frequency and the amount of attention allocated to texting and social media activities are positively correlated with MPIL. Conversely, the frequency of listening to music, the most commonly engaged in activity, was not positively associated with MPIL (David *et al.*, 2015). However, David *et al.* (2015) do show that the degree to which students divided their attention between listening to music and concentrating on academic work was associated with MPIL.

Another study was conducted into the frequency and duration of potentially distracting activities while engaged in a self-regulated study session. Calderwood *et al.* (2014) sought to determine how many interruptions students experience, the duration of these interruptions as well as the proportion of study time devoted to media multitasking. This study made use of an experimental approach employing three different techniques for recording the participants' behaviour and attention. Students were asked to engage in their normal study behaviour in a simulated study environment. While studying, the participants' actions were observed using remote surveillance cameras, a head-mounted point-of-view camera and a mobile eye tracker. Despite these intrusions, Calderwood *et al.* (2014) claim that no evidence was gathered indicating that these methods interfered with the students' behaviour. The results of the recordings indicate that on average out of the 180 minute study session students spent 73 minutes listening to music while working. This outcome is in agreement with the results shown by David *et al.* (2015). In terms of multitasking behaviour, Calderwood *et al.* (2014) indicate that students engaged with an average of 35 distractions of 6 seconds or longer, with an aggregated mean duration of 25 minutes. However, Calderwood *et al.* (2014) note that

their data was non-normal in nature with students in the 75th percentile devoting four times the amount of time to distracting interruptions than those in the 25th percentile. Calderwood *et al.* (2014) report that cellphone and laptop use constituted the largest frequency and duration of distraction from academic work. The specific activities with which the students were found to engage in, including: texting, off-topic browsing, video streaming and email, are commensurate with other studies into this area of student multitasking behaviour (Fried, 2008; Rosen *et al.*, 2013; David *et al.*, 2015). Unsurprisingly, Calderwood *et al.* (2014) determine that higher task motivation and self-efficacy were associated with a decrease in the frequency and duration in multitasking behaviours.

3.2.2.2 Structured Academic Contexts

Over the preceding decade there has been a profusion of studies exploring the growing prevalence of media usage in structured academic contexts (Fried, 2008; Kay and Lauricella, 2011; Junco and Cotten, 2011; Junco, 2012; Burak, 2012; Blackburn *et al.*, 2013). These studies reveal that use of new media has become increasingly common in university lectures. This is especially the case for mobile phones. A study conducted by Elder (2013) investigating student mobile phone usage found that 99% of students sampled reported in-class mobile phone use. To follow, a number of these studies will be reviewed, highlighting aspects particularly relevant to this investigation.

In a survey-based study examining the nature as well as the impact of laptop use in a university lecture context Fried (2008) investigated students' in-lecture behaviour. Additionally, this study sought to determine whether laptops pose a significant distraction to the student directly using it, as well as to other students within the class setting. The results of this investigation indicate that students spend a substantial amount of time multitasking on laptops within a lecture. Over the 20 week period of the study students reported using their laptops for non-class related activities for an average of 17 minutes out of each 75 minute lecture (Fried, 2008). The most common activities students engage in include checking email, instant messaging, browsing the Internet and playing games. Furthermore, the results of the weekly surveys indicate that

students perceive their own use of a laptop as well as that of others to be the single greatest distraction to learning in the classroom setting (Fried, 2008).

Based on a survey of 1839 students, Junco (2012) classifies in-class media use into three categories: high frequency, moderate frequency and low frequency. The use of mobile phones for texting purposes emerged to be the only media activity which could be classified as high-frequency, with 69% of students disclosing texting activity during class (Junco, 2012). Engaging social media services, emailing and searching for content unrelated to the lecture were found to occur with moderate frequency. Finally, instant messaging and calling on a phone did not appear to be common in-class activities engaged in by students in this study (Junco, 2012). The finding that students hardly engage in instant messaging throughout class time stands in contrast to earlier research conducted by Fried (2008) who found that 68% of surveyed students reported using instant messaging while in a university class.

A qualitative study into students' information seeking behaviours in a university lecture context was conducted at a university in the United States. Blackburn *et al.* (2013) examine the influence of digitally mediated task interruptions on students' expectations of their university experience as well as how their expectations relate to their in-class behaviour. Blackburn *et al.* (2013) make use of semi-structured interviews consisting of open-ended questions to evaluate students' attitudes, beliefs and technology use behaviours. Through analysis of the interviews, Blackburn *et al.* (2013) determine that for most students use of technology is an active process, voluntarily engaged in by the students themselves. Blackburn *et al.* (2013) report that many of the respondents indicated using their laptops in class for multiple tasks simultaneously, switching between windows or tabs containing various on or off-task activities. Common task interruptions reported by the students included text messaging, checking Facebook or instant messaging. To this end, one student explained that: "If you see my laptop open, then I am most probably instant messaging in class and am caught up in the conversation" (Blackburn *et al.*, 2013, p. 112). Interestingly, not all the off-task activities reported by students were for non-academic purposes. Blackburn *et al.* (2013) explain that while social media such as Facebook and email were the primary activities engaged in, many students mentioned working on assignments for other classes while in a

different class.

Not all in-lecture activities were found to be voluntary. Some participants in the study conducted by Blackburn *et al.* (2013) indicated that while they might not voluntarily engage in technologically mediated task interruptions themselves, they often involuntarily multitask when classmates are involved in technologically mediated task interrupting behaviour. Students become distracted by the content visible on their classmate's screens (Blackburn *et al.*, 2013). In addition to these findings, it is shown that a major factor influencing multitasking behaviour is the desire to maintain and participate in social networks as well as organising complicated social and extracurricular activities (Blackburn *et al.*, 2013). Furthermore, many students in this study ascribe their media use to a coping mechanism for boredom with lectures, seeking entertainment and a distraction from the material being presented (Blackburn *et al.*, 2013).

In a survey of 777 students at six American universities McCoy (2013) reveals that 92.1% of respondents used a digital device during class for off-task activities at least once during a typical day. Moreover, on average respondents indicated using a digital device for non-class related activities 10.93 times in the course of a typical day (McCoy, 2013). Similar to the results obtained by Junco (2012), texting was found to be the activity engaged in most frequently, with email, social networking and browsing following. In this study over 80% of students indicated that multitasking with a digital device in class caused them to pay less attention (McCoy, 2013). Students characterised the distractions emerging from digital devices in class as being predominantly visual in nature. In addition to this, McCoy (2013) indicate that females were more likely than males to list some level of distraction caused by their use of digital media during class for off-task activities.

Building upon prior research into students' use of digital media in university lectures Roberts and Rees (2014) investigate students' use of mobile devices such as smartphones, laptops and tablets whilst attending lectures. The results of qualitative and quantitative research processes reveal that 66% of respondents used a mobile device whilst in lectures. Of those who used a mobile device, 45% used a mobile phone and 38% used a laptop (Roberts and Rees, 2014). Focusing on the specific activities which students engaged in on each

device Roberts and Rees (2014) found that laptops were primarily used for non-academic purposes. Contrasting this, only a single student reported using a mobile phone for academic purposes, whereas the remainder of the respondents indicated using their mobile phones in the lecture for texting, emailing and social networking (Roberts and Rees, 2014). These findings differ from an earlier study conducted by Fried (2008), showing that the most common laptop-based activities engaged in by students include checking email, instant messaging, browsing the Internet and playing games.

3.2.3 Conclusion

It is clear from the research reviewed thus far, that as members of the net generation, new media plays a ubiquitous role in students' lives. It has been found that students spend a significant amount of their time engaging with new media in many varied forms and contexts, in general as well as throughout formal, structured educational settings. The research reviewed in this section lends credence to the idea that students' lives are in fact mediated by the digital technology through which they engage many aspects of the world.

3.3 'The medium is the message'

Having established a working definition for media as *the technological tools used to facilitate communication, entertainment and information gathering in the 21st Century*, a further investigation into the specific nature and characteristics of new media is required in order to understand the implications of media use for attention and distractibility. McLuhan (1964) distinguishes new media from earlier forms of media, describing how modern technology enables new media to exist as an extension of man's internal functions. McLuhan explains this succinctly, stating: "with the arrival of electric technology, man extended, or set outside himself, a live model of the central nervous system itself" (McLuhan, 1964, p. 84). In this way, McLuhan makes it evident that new media have a greater environmental dimension than previous forms of media. In describing media as a technological extension of man, McLuhan (1964) predicts the networked, cybernetic form that media takes in the twenty-first

century. In addition to this quality there exist many characteristics of new media differentiating it from earlier forms of media, including: interactivity, hypertextuality, ubiquity, digitalisation, individuality and hypermediacy (Livingstone, 1999; Lister *et al.*, 2009). Through understanding the characteristics of new media, the implications for attention will become more apparent.

3.3.1 Interactivity

Interactivity and uni-directional communication have emerged as key qualities characterising new media (Bolter, 2003). Steuer, an early pioneer in online publishing defines interactivity as “the extent to which users can participate in modifying the form and content of a mediated environment in real time” (Steuer, 1992, p. 14). Rafaeli and Ariel (2007) note that in defining interactivity in this manner Steuer is describing interactivity as a feature of the medium. Typically, earlier forms of media were consumed in a passive, uni-directional manner, devoid of any form of interactivity now inherent in new media (Livingstone, 1999). The interactive nature of new media requires a reconceptualisation of how the concept of audience is defined, from passive viewers or readers, to active users (Lister *et al.*, 2009). In this regard, interactivity denotes the users’ ability to play an active role in the creation, production, and development of aspects of the communication process (Lister *et al.*, 2009). Indeed, interactive, *computer-mediated communication* (CMC) is one of the primary manifestations of new media. Due to the interactive nature of CMC, conversations conducted through instant messaging or email applications attempt to emulate real-life person-to-person connections (Lister *et al.*, 2009) — adding a human quality to communication conducted through new media.

3.3.2 Hypertextual Navigation

A further fundamental property differentiating new media from previous incarnations of media in terms of user interaction as well as ideological understanding is the concept of hypertextuality (Conklin, 1987; Lister *et al.*, 2009). The modifying prefix ‘*hyper*’ is derived from the Greek *huper* meaning ‘over’

or ‘beyond’. Accordingly, the term hypertext, coined by Theodore Nelson in 1965, describes a text providing a network of links to other texts which are *over* or *beyond* itself (Nelson, 1965). Through the combination of digital storage, Internet technology and hypertextuality the processes of communication and interaction with knowledge and information have come to be fundamentally changed, impacting upon the cognitive operations responsible for attention and learning (Niederhauser *et al.*, 2000; Lister *et al.*, 2009).

Since the invention of the printing press by Gutenberg in the 15th century, all recorded knowledge has been communicated primarily in a sequential, linear manner (Chartier, 1994). The creation of hypertext has changed this. Through hypertextuality there is now the possibility of non-sequential media interactions (Conklin, 1987; Nielsen, 1990). Technology commentator and author Nicholas Carr (2011) notes that the World Wide Web combines hypertext with multimedia, delivering words, sounds, images and video content as hypermedia. Continuing this line of thought, Carr (2011) postulates that hypermedia pose further detriments to our cognitive abilities, dividing attention, leading to non-sequential browsing behaviour. This non-sequential, distracted browsing mode of media interaction has been empirically observed in several studies (e.g. McAleese, 1999; Hirashima *et al.*, 1997; Ford and Chen, 2000).

Early theorists and commentators believed that hypertextuality would facilitate improvements in communication, reading and writing as well as learning because of the resemblance between hypertext and the associational structure of information in human memory (Landow, 1997). However, Charney (1994) argues that this view is based on an incorrect understanding of the psychological basis through which new information is acquired and organised. This position is based on two key arguments. First, a large proportion of knowledge is in fact stored hierarchically and sequentially, rather than in an associative manner (Bransford, 1979; Just and Carpenter, 1987; Charney, 1994). Second, there is a lack of empirical evidence supporting the original position that hypertextual representations lead to improvements in learning and understanding (Charney, 1994). Moreover, research from cognitive psychology suggests that the process of moving information from working to long term memory accounts for the absence of advantages brought about through hypertextual representation (Bransford, 1979; Charney, 1994). The hypertextual and non-linear

manner in which new media are used places pressure on working memory, potentially causing cognitive overload — reducing the accuracy of information storage in long-term memory (Williams, 2012).

3.3.3 Mediated Social Reality

It is important to understand that there is little distinction between individuals' mediated lives and their real world lives. Individuals' offline experiences are entangled with their online presence and vice versa (Kennedy, 2006). Lister *et al.* (2009) believes that the integration of offline and online lives will become even more pronounced with the increased ubiquity of media due to the proliferation of mobile devices capable of accessing the Internet. This assertion is strengthened by the continued popularity of social networking websites. Social networking websites are online communication tools allowing users to create profiles and interact with others both within and external to their offline social networks (Ellison and Boyd, 2007). The ability to communicate with and extend existing offline networks and communities through the medium has been a crucial factor leading to the success and popularity of online social networking websites (Ellison and Boyd, 2007). Research conducted with students in Los Angeles indicates that students typically use digitally mediated instant messaging and social networking websites to communicate and interact with other students from their offline lives (Subrahmanyam *et al.*, 2008). Subrahmanyam *et al.* (2008) note however, that their findings do not indicate that students' mediated, online lives are identical to their offline lives. Rather, they maintain that individuals' mediated experiences are shaped by the affordances of the medium. What this research does indicate though, is that new media have come to play a central role in how individuals communicate and interact with those around them — a finding observed in many studies (e.g. Gemmill and Peterson, 2006; Lenhart and Madden, 2007; Buckingham, 2008; Cheung *et al.*, 2011).

3.3.4 Personal

As noted previously, new media have been characterised by the distinction between mass communication and personal communication. Lüders (2008) explains, that for new media, this distinction manifests as a difference in the manner of consumption and level of involvement required of users — “Personal communication media are more symmetrical and require users to perform actively as both receivers and producers of messages” (Lüders, 2008, p. 691). One of the defining tenets of mass media was the idea of ‘one-to-many’ transmission — one communication signal mediated to many consumers (Lister *et al.*, 2009). In contrast, new, personal media are characterised by ‘many-to-many’ communication. This many-to-many, personal communication has been facilitated by the digitisation and embedding of media with network capabilities (Manovich, 2001). In particular, mobile computing media have significantly increased the potential for individual expression and communication, creating implications for individuals and society as a whole (Lüders, 2008). Andrew Feenberg, a philosopher of technology, suggests that the personalisation of media creates important questions for the future of community as well as the creation of individual identity (Feenberg and Bakardjieva, 2004).

In focusing on the characteristics of new media, it is important to understand the relationship between new media use and the development of individual identity. As previously explored, use of new media is extremely consequential for forming peoples’ experiences of their social reality (Kennedy, 2006; Gemmill and Peterson, 2006; Lenhart and Madden, 2007; Buckingham, 2008; Cheung *et al.*, 2011). Moreover, one’s individual identity is seen to be a factor of group identity (Tajfel, 1974). Prominent sociologist Anthony Giddens supports the view that modern people have to be constantly “self-reflexive”, making decisions about what they should do and who they should be (Giddens, 1991, p. 202). This view implies that identity is a process, requiring constant work and maintenance. Millennials use digital media as a means to create their individual identities, leaving digital footprints of their actions, thoughts and experiences (Weber and Mitchell, 2008). Weber and Mitchell (2008) define this behaviour as ‘identity-in-action’. Through the use of four case studies Weber and Mitchell (2008) determine that millennials rely on media to construct their identities, in terms of their own self-identity as well as the identity that they

project to the world. These findings further highlight the importance and attraction of new media to millennials.

3.3.5 Summary

From the review conducted thus far, it is evident that it is the characteristics of the medium that have the potential for profound impacts on individuals and society at large, and, not necessarily the content conveyed therein. These characteristics inherent in new media create a greater propensity for multitasking behaviour to take place. To follow will be a brief summary of the characteristics of new media and how they potentially lead to multitasking behaviour and cognitive impairment.

For students, as users rather than viewers of new media, interactive communication conducted through new media is an active pursuit, taking on a ‘more real’, human quality — potentially reducing barriers to use. The hypertextual nature of new media lends itself to a scattered, browsing mode of operation. Information is explored and gathered in a non-sequential manner, often moving across many distinct topics simultaneously. The research reviewed suggests that this non-sequential mode of operation has cognitive implications for learning and attention. For millennials, media plays a central role in constructing their social reality as well as their identity. Offline and online lives are merged, with media forming the bridge between these two realities. It was found that social networks constitute a central locus for communication and group interaction. The networked nature of new media bestow them with a many-to-many, symmetrical manner of use, with each individual user or node being able to produce, respond to or edit content from any location, at any time. To summarise, media present users with the ability to constantly construct their individual identity; shape their social relationships; actively communicate with almost anyone; explore diverse sources of information and entertainment — from any location, at anytime. So it follows that, media present extremely attractive, appetitive options for engagement.

3.4 New Media and the Brain

This section aims to provide an understanding of the implications of media use for cognitive functioning. First, a brief definition for the concept of neuroplasticity, integral to the study of media and cognitive functioning, is provided. This creates a conceptual basis upon which the rest of the research reviewed builds upon. Following this, several key studies researching the impacts of media use on cognitive functioning are reviewed. Finally, having reviewed some of the internal impacts of media use, focus is placed on the attention economy, and how this relates to media use and attention.

3.4.1 Neuroplasticity

In order for a causal relationship between external stimuli such as new media, and cognitive functioning to have any chance of existing, the brain must possess the ability to change and alter its form in response to potential stimuli. This capacity is known as *neuroplasticity*. Through neuroplasticity the brain is able to reorganise itself in response to environmental stimuli as well as its own internal activity, forming new neural connections (Taupin, 2006; Choudhury and McKinney, 2013). Taupin (2006, p. 12) explains that: “neuroplasticity allows the nerve cells in the brain to adjust their activities in response to new situations or to changes in the[ir] environment”. A property of neuroplasticity particularly relevant to this study is the ‘use-it-or-lose-it’ phenomenon. This phenomenon has been observed in many different functional areas; for example two neuro-imaging studies, one with taxi drivers and one with musicians, observed its effects (Pantev *et al.*, 1998; Maguire *et al.*, 2000). These studies show that the processes of learning and memory can stimulate the growth of new neurons and strengthen synaptic connections in areas of the brain frequently used (‘use it’) while diminishing connections that are infrequently used (‘lose it’).

Neuroplasticity is a neutral phenomenon, oblivious to the merits of the processes or stimuli underlying it. As the neuro-imaging studies with taxi drivers and musicians illustrate, it is simply a function of the frequency with which neural connections are stimulated and used (Pantev *et al.*, 1998; Maguire *et al.*,

2000). So it follows that, the changes in neural functioning brought about through increased stimulation from media can manifest both positively and negatively. This has led some researchers to assert that millennials, growing up surrounded by digital media have developed augmented skills for parallel-processing and faster encoding of information (Prensky, 2001; Small and Vorgan, 2009). In this regard, however, in a critical review of the case for millennials possessing improved cognitive functioning as a result of their mediated upbringing, Bennett *et al.* (2008) find there to be little empirical evidence supporting the claim.

3.4.2 Impacts of Media Use on Cognitive Functioning

As the exploration into the defining properties inherent in new media found, many of the characteristics essential to new media are capable of impacting upon various cognitive processes and functions, both to the detriment as well as the benefit of the individual. In this section, research into cognitive changes brought upon through media use is explored.

In a cross-sectional study Small *et al.* (2009) find differences in the patterns of cerebral activation between experienced Internet users, and Internet novices when browsing and searching the Internet. In the experienced users group there was an increase in activation of areas of the prefrontal cortex, an area of the brain Small *et al.* (2009) note as being responsible for cognitive functions concerning decision-making, integration of thoughts and sensations, as well as aspects of working memory. Williams (2012) suggests that the continual activation of the prefrontal cortex for decisions related to browsing and search activity impedes the brain's capacity for critical thinking.

In addition to finding differences in the patterns of cerebral activation two other interesting findings emerged from this study. First, Small *et al.* (2009) find that experienced Internet users did not display a typical pattern of brain activation during problem-based activities. Typically, in a problem-based activity situation a point of insight is reached, creating the highest level of brain activation relative to the rest of the situation (Hadlington, 2015). Through further exposure to similar situations this peak of activation typically dissipates. However, in this study the experienced Internet users did not display such

a response — continuing to demonstrate peaks of activation at the moment of insight. Small *et al.* (2009) suggest that this finding implies that browsing and searching activities are continually presenting novel and mentally arousing stimuli to the brain. Hadlington (2015) comments on this finding, suggesting that it indicates a possible reason why engaging in digitally mediated, Internet-augmented activities is so attractive and rewarding. Furthermore, Small *et al.* (2009) find that after only a brief amount of practice with the Internet task, the relatively inexperienced group of Internet users began to exhibit the same level of brain activation as the more experienced group. This result underscores the sensitivity of the brain to digital media. Small *et al.* (2009) suggest that this sensitivity to digital media could potentially have detrimental impacts on attention capacities.

As research conducted by Small *et al.* (2009) indicates, digital media provide the brain with novel and mentally arousing stimuli. These stimuli have been shown to activate the neurotransmitter dopamine, typically associated with reward-driven behaviour (Small and Vorgan, 2009). In two separate studies into video game use, dopamine release was found to correlate with gameplay (Koepp *et al.*, 1998; Weinstein, 2010). These authors suggest that their results indicate that dopamine release is a possible cause for compulsive digital media use. However, Choudhury and McKinney (2013) comment on these studies, noting that this claim is based on speculation and not necessarily supported by empirical findings. Nonetheless, correlations between dopamine release and media use have been found in other studies. For instance, Tamir and Mitchell (2012) find that the process of social sharing increased activation of the dopamine system. Tamir and Mitchell (2012) suggest that this finding indicates that the anticipation and reward associated with digitally mediated social sharing contributes to the compulsion to engage with media at inappropriate times.

Memory and the processes for storing long-term information are further aspects of cognitive functioning impacted upon by extensive media use. As explained previously, it is theorised that there exist two distinct types of memory; working memory and long term memory (Baddeley, 1992). Baddeley (1992) explains that working memory is responsible for encoding, maintaining and retrieving information. Furthermore, as suggested by the Limited Capacity

Models of Attention, described in Chapter 2, an individual's capacity for information storage and retrieval, their cognitive load, is limited (Broadbent, 1958; Marois and Ivanoff, 2005; Kahneman, 1973). Media use inundates working memory with sensory stimuli, potentially overloading the brain's cognitive processing capacities, inhibiting the transmission of information from working to long term memory (Williams, 2012).

Another important aspect relevant to understanding the implications of new media use for cognitive functioning is self-control. One perspective on self-control described by Kahneman (2011) views self-control as a competition between automatic processes and relatively controlled processes. This perspective draws from a general theory of thinking proposed by Kahneman (2011). This general theory involves two distinct cognitive systems, System 1 and System 2. Under this theory, System 1 thinking is automatic, with low demands on attentional systems and low levels of voluntary control. In contrast, System 2 thinking is characterised by slower, more deliberate processes, with higher demands on attention and greater levels of control. Kahneman (2011) explains that the deliberate processes of System 2 are frequently required to evaluate potential actions proposed by System 1, playing a central role in enacting self-control. For instance, Kahneman and Frederick (2002) argue that appealing stimuli, (such as instant messaging notifications), activate System 1 thinking, while the decision to override these urges requires slower, more deliberate and cognitively taxing System 2 thinking.

3.4.3 The Attention Economy

As the discussion of new media made evident, the human brain is presented with an abundance of information and sensory stimuli, competing for attentional resources, giving rise to what is known as *the attention economy*, first theorised by Nobel Laureate Herbert Simon (1971) — a concept formalised by Davenport and Beck (2013). In theories of the attention economy, an individual's attentional capacity is considered a scarce resource, available in limited supply (Terranova, 2012). Terranova (2012) notes that the economic choice of attentional allocation is not merely a personal choice. Due to the mediated social reality and the hypersociality of the connected brain, brought about

through new media, attentional allocation is imbued with a profoundly social dimension. So it follows that, attending to the mediated actions of others can provoke acts of imitation and response (Terranova, 2012). Terranova (2012, p. 7) summarises this view of the attention economy stating that “participating in the attentional assemblages of digital media implies becoming part of social processes where paying attention triggers responses of imitation which shifts between the virtual form of a passing impression and the actual form of acts such as reading and writing, watching and listening, copying and pasting, downloading, and uploading, liking, sharing, following and bookmarking”. This implies that the attention economy is, like the media it relies upon, profoundly social, suggesting an incentive to make use of new media.

In an attention economy, some information or stimuli may possess a greater subjective value than others (Atchley and Lane, 2014). This is especially the case when such information possesses a social aspect to it. Atchley and Lane (2014) suggest that social information causes a larger amount of overallocation of attentional resources than other forms of information or attentional stimuli. This is important to be aware of in the context of media use because of the central role that new media play in shaping individuals’ social realities. Exemplifying this, Atchley and Lane (2014, p. 161) note that “when paired with devices (smart phones) and applications (Facebook) that can deliver that information rapidly and on a massive scale, a normally rational expense of attention to monitor social information of limited temporal value from a small set of physically nearby people, becomes an irrational attempt to monitor and respond to networks much larger than those for which our brains were adapted”. While this argument suggests that the allocation of attention to media for social purposes is irrational, findings from an earlier study using an intertemporal choice methodology, conducted by Atchley and Warden (2012) indicate that the motivation to communicate via new media at inappropriate times may in fact be a rational response to the temporal value of information. In addition to finding that information and communication have a declining temporal value, Atchley and Warden (2012) find that the value of immediate communication is a function of social distance. In this study, participants traded monetary rewards far quicker when presented with the choice to respond to messages from friends than with strangers.

3.4.4 Embodied Technological Relations

The investigation thus far has focused upon characteristics of the medium, exploring the potential impacts of these characteristics on cognitive functioning. In this way, the review has been grounded in a cognitive epistemology. *Phenomenology*, the study of shared experiences and consciousness (Creswell, 2013) offers a different approach to understanding the implications of media use for cognitive functioning. From this perspective, the impact of media multitasking is viewed in terms of habits, experiences and perceptions. Flanigan and Babchuk (2015) conducted a phenomenological study into the impact of social media use on the perceived educational experiences of university students. Following the analysis of semi-structured interviews Flanigan and Babchuk (2015) identify a number of important themes for both a structured lecture context and a self-regulated academic context. In a self-regulated context Flanigan and Babchuk (2015) report that students describe social media to be constantly available and frequently accessed. Furthermore, students in this study perceived social media use while study as something that degraded their study experience, impacting upon their ability to retain information, a perception carried over to a lecture context.

Building on this, idea of experience is another approach espoused by the American philosopher of science and technology, Don Ihde, *postphenomenology*, a philosophy increasingly being applied to the study of human-technology relations (Aagaard, 2015). This philosophy focuses on the situated, embodied relations with technology (Ihde, 1990). Aagaard (2014) explains that a post-phenomenological analysis requires a shift from focusing on attention to intention. This shift brings the notion of embodied habits into the analytical framework. Embodied habits exist as remnants of previous activities, guiding present action in a non-determinant manner, predisposing certain actions over others (Crossley, 2001; Aagaard, 2014). Aagaard (2014) argues that it is imperative to supplement cognitive research into human-technology relations with research into embodied habits and technological mediation.

Within this postphenomenological perspective, further insights into media multitasking behaviour can be gained by examining studies focusing on media multitasking in an entirely different domain to academic study. For instance,

two studies looking at media use and driving conducted by Strayer *et al.* (2011) and Rosenberger (2012) can provide useful insights into media multitasking and attention. Strayer *et al.* (2011) describe three factors, visual, manual and cognitive, that can cause the driver to be distracted. The interplay between these three factors determines to what extent multitasking behaviour will impact negatively upon the driver's ability to concentrate on the primary task of controlling the vehicle. Under this framework, Strayer *et al.* (2011) classify listening to music while driving as a low-level multitasking condition. However, using a mobile device while driving was deemed to constitute a high-level multitasking state, requiring a significant amount of visual, manual and cognitive processing.

The study conducted by Rosenberger (2012) approaches the issue of multitasking and driving from a different perspective. This study draws from the post phenomenological school of thought, focusing on embodied habits and technologically mediated awareness. Rosenberger (2012) notes that when driving or using a mobile device the user is not aware of the tool itself (the car or the mobile device), rather, they become drawn into the task at hand (navigating the road or the content of the conversation). Rosenberger (2012) suggests that the impairment brought about through simultaneously using a mobile device and driving is not as a consequence of cognitive overload, but rather, it is as a result of the manner in which the medium habitually inclines one towards an awareness composed of the conversation at the expense of the traffic.

While these two studies approach media multitasking from different perspectives, they are still able to provide useful insights. First, Strayer *et al.* (2011) show that media multitasking behaviour can exist across a continuum, and that the interplay between the sensory modalities is important for determining how much pressure the cognitive system is placed under. Second, Rosenberger (2012) introduces the notion of embodied habits, and how habitual uses of a particular medium can shape the use situation and experience.

3.4.5 Conclusion

The research presented in this section highlights many of the potential impacts on cognitive functioning emanating from engagement with new media.

Of initial importance, it was shown that the brain possesses the capability to change in response to stimuli such as those provided by media interaction. This understanding formed the basis upon which the rest of the cognitive impacts built upon. From the neuroplasticity studies reviewed it was shown that neural connections in those areas of the brain frequently activated are strengthened, while those areas which are infrequently activated are diminished. Use of new media was found to impede the brain's capacity for critical thinking, continually presenting novel and arousing stimuli to the brain. These stimuli have been shown to activate the neurotransmitter dopamine. Moreover, media use was also found to have the potential to overload working memory and undermine self-control. Other factors contributing to the propensity for media engagement were the declining temporal value of information, as well as the social nature of digitally mediated communication. The post phenomenological approach to understanding human-technology relations provides a useful shift in focus, from attention to intention. Under this approach, engagement with media is seen to be as a result of embodied habits rather than particular sensory cues. From these studies, it is clear that continuous use of new media leads to an increased propensity for distracted, multitasking behaviour and an inability to control attentional resources.

3.5 Implications for Academic Performance

This section aims to present an argument that engaging in media multitasking behaviour is to the detriment of academic performance. Initially, the focus will be placed on forming an understanding of how multitasking behaviour in general impacts upon the process of learning. Following this, a review of studies examining media multitasking in various academic environments will be conducted.

3.5.1 Media Multitasking and Learning

The working definition for media multitasking provided in this study *simultaneously using at least one type of media while engaging in any number of media or non-media activities*, implies rapid task-switching between various media or

non-media activities. Research in cognitive psychology indicates that peoples' ability to engage in simultaneous tasks is profoundly limited, implying reductions in performance (Broadbent, 1958; Tsotsos *et al.*, 1995; Marois and Ivanoff, 2005). Under the Limited Capacity Model, attention is theorised to be constrained by the brain's ability to selectively process simultaneous stimuli (Broadbent, 1958). Extending from theories based in cognitive psychology are a number of models describing the relationship between media multitasking, media use, attention and learning outcomes.

Mayer and Moreno (2003) developed the *Cognitive Theory of Multimedia Learning* to strengthen the understanding of how multitasking impacts upon students' learning. According to this theory, when using media, students are exposed to sensory information from multiple different processing channels. This idea draws from the MRT proposed by Wickens (1984), suggesting that different cognitive processing streams are employed to process stimuli across different sensory modalities. In addition to this, Mayer and Moreno (2003) describe three types of cognitive demands inherent in the learning process: essential processing, incidental processing, and representational holding. In order to process stimuli from multiple modalities, media multitasking behaviour requires different information processing channels. Incorporating these ideas with the understanding that people possess a limited capacity for attentional processing, leads to the position that media multitasking overburdens individuals' attentional capacities, as well as many of the processes necessary for learning to take place (Mayer and Moreno, 2003; Chen and Yan, 2016). Interestingly, Wang *et al.* (2012) show that attentional interruptions in the same modality reduce multitasking performance more than interrupting a task with another task in a different modality.

Another model for understanding the implications of multitasking behaviour for cognition is the unified theory of human multitasking, *Threaded Cognition*, proposed by Salvucci and Taatgen (2008). This theory advances the idea that there is a serial, procedural resource receiving stimuli for the various processing resources. Under this theory, unlike the MRT, there are no specialised processing resources. However, within Threaded Cognition, concurrent execution of tasks is possible, except for occasions when the serial procedural resource is required (Salvucci and Taatgen, 2008). Furthermore, under this

theory repeated execution of tasks depends to a lesser degree on declarative resources (knowledge) and to a greater degree on procedural processes, leading to reduced interference between tasks. This theory then implies that through repeated media multitasking activity the extent to which it interferes with cognitive processing and learning can become diminished to some extent.

In addition to media multitasking behaviour being linked with a reduced capacity for paying attention, and a greater propensity for cognitive overload to occur, results from a study conducted by Ophir *et al.* (2009) suggest that frequent media multitasking inhibits individuals' capacity to enact cognitive control. Ophir *et al.* (2009) find that frequent media multitaskers are more likely to respond to stimuli unrelated to their primary task than those who infrequently engage in media multitasking behaviour. Commenting on this finding, Ophir *et al.* (2009) propose that this indicates a greater proclivity for bottom-up attentional control and a bias toward exploratory information processing behaviour.

3.5.2 Academic Performance Outcomes

A number of studies involving students demonstrate how the learning process is negatively affected by media multitasking behaviour. In a majority of studies conducted into the relationship between media multitasking and academic performance, academic performance refers to academic outcomes, such as course marks, test scores or averages (GPA) (Van der Schuur *et al.*, 2015). In addition to these performance measures, studies have examined study-related attitudes and behaviors as well as students' perceptions of their learning. The two most common research methodologies are either experimental studies, or correlational, survey-based studies. In experimental studies, participants are generally exposed to media during an academic activity and subsequently their understanding and retention of content is measured. The correlational studies primarily make use of self-administered questionnaires to gather information on use frequency, habits and academic outcomes. Before focusing on specific outcomes emerging from a number of these studies, a review conducted by Van der Schuur *et al.* (2015) into 43 relevant studies will provide a useful overview of previous research in this area.

Van der Schuur *et al.* (2015) review 43 studies that examined the effect of media multitasking on academic performance, in order to clarify the theorised relationship between multitasking and academic performance. Van der Schuur *et al.* (2015) find that a majority of studies show that there exists a negative relationship between media multitasking while studying and academic performance, in terms of academic outcomes, study-related attitudes and behaviors, as well as perceptions of learning. More specifically, of the 43 studies reviewed 17 indicate a significant negative correlation, 4 studies showed no significant relationship and in the remainder of the studies the significance or direction of the relationship was either not shown or not able to be calculated. Negative correlations were found to exist in experimental as well as survey based studies. However, while negative correlations between media multitasking and academic performance were indicated, the correlations were found to be small to moderate in strength, with no studies showing a strong correlation between levels of media multitasking behaviour and decreased academic performance. Moreover, Van der Schuur *et al.* (2015) note that there is a dearth of studies exploring the causality underlying this correlation.

3.5.2.1 Experimental Studies

One of the earliest studies focusing on potential correlations between media multitasking and academic performance was conducted in 2003 by Hembrooke and Gay. Through the use of two experimental studies testing immediate recall after a lecture Hembrooke and Gay (2003) show that students who observed a lecture while browsing the Internet or communicating online, perform significantly worse on immediate measures of memory than those who are not engaged in media multitasking behaviour. Through further analysis of browsing logs it was shown that browsing content relevant to the lecture was not a predictor for improved recall performance (Hembrooke and Gay, 2003). This outcome suggests that it is not the content that impacts upon performance, but rather the use of the medium itself.

In addition to voluntarily engaging in media multitasking in a university lecture, students can be subjected to media distractions causing them to involuntarily multitask. Sana *et al.* (2013) investigate whether students who were in direct view of a peer engaging in some form of media multitasking be-

haviour achieve decreased performance on a comprehension test. Sana *et al.* (2013) show that students who could view the multitasking behaviour of those around them performed significantly worse on a recall test. This result that the multitasking behaviour of the surrounding peer group can have an influence on those not actively engaging in media multitasking behaviour is congruent with findings from other studies (Fried, 2008; Williams and Cox, 2011).

In a study conducted in 2008 students described how they perceived their peers' use of media around them to pose the single greatest impediment to their learning (Fried, 2008). Similarly, in a qualitative study employing focus groups, Williams and Cox (2011) report comments from students stating that they were often distracted from the instructor and that they frequently observed their classmates text messaging. A striking example of this behaviour is a statement provided by a student in the study conducted by Williams and Cox (2011, p. 53) "I get distracted by them being distracted". However, when queried about their own personal multitasking abilities students frequently indicated that they possess an adequate ability to cope with their own multitasking behaviour in a classroom setting (Williams and Cox, 2011). While this may be the case, 74% of students in this study also reported that texting interfered with their learning.

In another qualitative study conducted by Kay and Lauricella (2011) the analysis of student reports show that almost half of all the respondents indicated that they were sometimes or frequently distracted by other students' use of laptops in the classroom. Similarly, 43% of students felt that their academic performance would be improved sans the distracting influence of Internet based activities (Kay and Lauricella, 2011).

Risko *et al.* (2013) conducted a study in which participants observed a pre-recorded lecture. Half of the students were required to complete a series of online activities on laptops, while still observing the lecture. Following the conclusion of the lecture students were tested for content recall. Through filmed observations of the lecture Risko *et al.* (2013) found that those students who engaged in the mediated tasks spent less time attending to the lecture than their peers. In addition to spending less time attending to the lecture, the participants in the mediated condition retained less information than those in the control condition (Risko *et al.*, 2013). Through analysing the time-logs

for the activity and questions Risko *et al.* (2013) offer an explanation for the attention deficits shown, explaining that the participants failed to reallocate their attention back to the lecture once they had completed each task, spending this time ‘mindwandering’.

While these two experimental studies and others (Rosen *et al.*, 2013; Dietz and Henrich, 2014) have indicated a correlation between in-lecture media multitasking and decreased academic performance, other experimental studies have failed to find any difference in performance outcomes between those media multitasking and those not media multitasking (Lee *et al.*, 2012; Elder, 2013). This suggests that further research is required to better understand the dynamics of the relationship.

3.5.2.2 Correlational Studies

Junco and Cotten (2011) examine students’ multitasking behaviour with media, aiming to determine how media usage frequency while studying impacts upon academic performance. In this study Junco and Cotten (2011) survey a large sample of students (1839) about their media use habits while studying. The respondents reported spending a significant amount of time using digital media on a daily basis (Junco and Cotten, 2011). The results also indicate that students’ use of digital media was not curbed by academic tasks — students reported that they frequently engaged in technologically mediated, off-task behaviours whilst engaged in academic study. Upon analysis of the data, Junco and Cotten (2011) show that use of Facebook and texting activities was negatively correlated with indicators for academic achievement. Interestingly, Junco and Cotten (2011) determine that use of email while studying was positively correlated with a student’s grade point average (used as a proxy for academic performance). For this reason, Junco and Cotten (2011) conclude that the type as well as the purpose of the particular technologically mediated activity matters in terms of the educational impacts of multitasking. This conclusion stands in contrast to the earlier argument suggested by Hembrooke and Gay (2003), that the content engaged with is irrelevant for performance outcomes.

In a later study Junco set out to determine how frequently American students

media multitask in lectures and, in addition, the impact of this frequency on academic performance. Based on the surveyed sample, Junco (2012) shows that of the technologies students reported to use during lectures (texting, social networking and emailing), only social technologies, such as text messaging and social networks, had a negative impact on the measures for academic performance. This finding, that media imbued with social elements, show a stronger correlation with decreased academic performance was found in a more recent study conducted by Leysens *et al.* (2016). In their study, it was suggested that these forms of media lend themselves to a more frequent, ongoing mode of use, with each instance of use involving multiple individual distractions (Leysens *et al.*, 2016).

Burak (2012) describes the media multitasking behaviour engaged in by university students whilst in lectures, focusing on the relationships between media multitasking, academic performance and risk behaviours. Through surveying 774 students Burak (2012) shows a significant negative relationship between media multitasking activity and GPA, as well as common risk behaviours. For instance, Burak (2012) shows that students who frequently engaged in media multitasking were more likely to consume more alcohol, smoked more cigarettes, and used more drugs. The finding that multitaskers have an increased appetite for riskier behaviour supports earlier research conducted by Foehr (2006). Burak (2012) draws a comparison between the increased likelihood of engaging in risk behaviour, addiction, distraction and media multitasking — suggesting that there is a strong emotional pull behind media multitasking behaviour. This notion stands in agreement with the conclusion noted by Wang *et al.* (2012) that students' multitasking behaviours are emotionally gratifying.

At a medical university in the United States, all students were required to own and use laptops for study purposes. Annan-Coultas (2012) conducted a study to investigate the benefits and drawbacks of the required laptop program at this university. This study consisted of three different research techniques. However, focus groups were the primary means of data collection. Following the focus groups, Annan-Coultas (2012) employed a survey and classroom observations to triangulate the qualitative data gathered in the focus groups. Students reported frequent use of laptops for academically related activities

such as communication, note-taking, accessing learning material and email. While these activities might be academically related, in many instances they can in fact be classified as off-task if conducted simultaneously with attendance of a lecture. To this end, Annan-Coultas (2012) report that almost all students mentioned searching for concepts online during class. In addition to academically related tasks, almost all students in this study reported the usage of laptops for off-task, non-academic purposes whilst in a university lecture.

Students in the focus groups commented on the frequent use of laptops in class for off-task activities explaining that they commonly engage in social media and web browsing when they become bored with the lecture (Annan-Coultas, 2012). Despite reporting the use of laptops for off-task activities, the students explained that from their perspective, laptops improved their communication abilities, access to learning material as well as increased the flexibility of education (Annan-Coultas, 2012). However, the most frequently reported drawback of laptop use was distraction. Despite laptops being perceived as a distraction only 6.1% of students believed that possession of a laptop for academic purposes had been detrimental to their learning. Annan-Coultas (2012) report that conversations in the focus groups revolved around three aspects of distraction: the reluctance to ask questions once distracted from the core material, the impact of their distracted behaviour on the confidence of the instructor, and the factors leading to students allowing themselves to become distracted.

3.5.3 Conclusion

In this section it was shown that multitasking behaviour has the potential to interrupt the process of learning. In addition to showing this, a review into studies exploring outcomes for academic performance as a consequence of media multitasking behaviour was conducted. From these studies, it was shown that there does exist a correlation between media multitasking behaviour and decreased academic performance.

3.6 Conclusion

The purpose of the literature review is to present a reasonable argument based in deductive reasoning, that ubiquitous media multitasking behaviour in structured and self-regulated academic contexts can have detrimental consequences for academic performance. This argument is built upon four sub-arguments. First, research into students' use behaviour revealed that students spend a noteworthy proportion of their time engaging in media multitasking behaviour, throughout their lives as well as in learning contexts. Next, research describing the characteristics of new media was reviewed. From these studies, new media was found to possess characteristics such as interactivity, hypertextuality, individuality and to mediate peoples' social realities. These characteristics were found to afford users with the ability to constantly construct their individual identity; shape their social relationships; actively communicate with almost anyone; explore diverse sources of information and entertainment — from any location, at anytime. The third section focused on reviewing research examining media use and cognitive functioning. Studies reviewed in this section indicate that the brain and cognitive functioning is profoundly impacted by the stimuli they receive and the environment they experience. From these studies, it is clear that continuous use of new media leads to an increased propensity for distracted, multitasking behaviour and an inability to control attentional resources. The final section was established on the basis of the arguments presented in the first three sections. In this section research describing the implications of media multitasking for learning was reviewed. Following this, studies focusing on evaluating the correlation between media multitasking behaviour and academic performance were explored. From these studies it was shown that there does exist some degree of correlation between media multitasking behaviour and academic performance.

While certain aspects of media multitasking and cognition are well researched, there still exist many gaps in this area of research. For instance, a causal link between media multitasking and academic performance has yet to be established. Furthermore, many important motivating factors and characteristics of students' media use behaviour have yet to be adequately studied. For instance, as Aagaard (2014) suggests, further research is required into human-technology

relations such as embodied habits and technological mediation. A majority of studies in this area adopt a quantitative methodology, seeking to further quantify the theorised correlation between media multitasking and academic performance. This line of research is unlikely to yield a greater degree of insight into the causal link between these two elements, nor will it provide further insight into students' mediated study experiences. Therefore, it is suggested that in order to further understand students' mediated study experiences a qualitative study, into the underlying beliefs, triggers, behavioural dynamics, social norms and usage patterns is required. In this regard, Aagaard (2014) provides a number of questions yet to be answered in this domain.

1. Why do students continue media multitasking if they are aware of the negative impacts on academic achievements?
2. When using technologies such as laptops and tablets, which things stand forward as significant and which things recede into the background of awareness?
3. How do factors such as the rhythm of lessons, social norms, presented material, or even the physical layout of a classroom influence media multitasking?

Chapter 4

Methodology

This chapter describes the research methodology employed in this study. This process begins by introducing the purpose of the study, as well as the research questions arising from a review of previous research conducted into students' media multitasking behaviour. Following this, key aspects of the research design are described. In this regard, the motivations for selecting focus groups as the most appropriate exploratory research method to address the research objectives are outlined. Subsequently, the nature of the setting and the participants, as well as the instrumentation employed in the study are described. Following this, the ethical considerations for this research are addressed. Finally, this chapter concludes by presenting the strategy for data analysis.

4.1 Purpose of the study

The purpose of the study is to explore undergraduate students' new media usage patterns whilst in academic learning contexts. The following primary research questions arise from this purpose.

1. *What beliefs do students hold in relation to their use of media in both structured as well as self-regulated academic contexts?*
2. *What are the triggers that underly students' use of media in structured and self-regulated academic contexts?*

3. *What form of behaviour do students exhibit when using media in structured and self-regulated academic contexts?*

The following sections serve to describe the methodology by which these research questions are addressed.

4.2 Research design

This study employs a qualitative, focus group research design in order to generate narrative data through focused discussion. Before exploring the suitability of this research design, the key paradigmatic foundations underlying this study merit discussion.

Under a qualitative research approach, the primary aim is to interpret phenomena in terms of the meanings that people bring to them (Denzin and Lincoln, 2005). Furthermore, as this study focuses on evaluating individuals' accounts and interpretations of their behaviour, and, is not explicitly measuring their actual behaviour, it falls within an interpretivist paradigm. Interpretivism implies certain epistemological and ontological assumptions. For instance, as outlined by Chen and Hirschheim (2004), under an interpretivist paradigm a belief is held that reality is subjective and constructed through processes of human interaction. Knowledge of the world is shaped through a process of understanding and reflecting on experiences (Ritchie *et al.*, 2013).

Within the scope of qualitative research, this study adopts a contextual or descriptive frame. So it follows that in accordance with the stated research objectives the study intends to identify the existence and manner of behaviour within a social context. In this regard, Ritchie *et al.* (2013) note that a key capability of qualitative research methods is their ability to provide insights into phenomena from the experiences and perspectives of the sample population.

The adoption of a qualitative research approach implies the use of data generation methods which are flexible and sensitive to the social context in which the data are produced, involving close contact between the researcher and the participants (Ritchie *et al.*, 2013). Furthermore, these research processes

are capable of producing detailed descriptions based on an interpretation of perspectives held by the research participants.

4.2.1 Suitability of the research design

This section presents the strengths and weaknesses of a focus group methodology for data generation. In addition to this, the use of this methodology within the focal area of students' media multitasking behaviour is evaluated

4.2.1.1 Strengths of a focus group approach

Focus groups are a data generation methodology widely used to explore people's experiences and behaviour (Kitzinger, 1995). Moreover, they constitute a technique that is particularly well suited for investigating cultural values and social norms. Ritchie *et al.* (2013) suggest that focus groups are appropriate in situations where data generation is benefited by group interaction through the discussion of differences and similarities within the group. Furthermore, Ritchie *et al.* (2013) note that focus groups are particularly useful for exploring issues which are influenced by social norms, due to the social nature of the group discussion processes.

When using a focus group as a data generation methodology, data are generated not only by the direct responses of the participants, but also by the interaction between the group participants (Ritchie *et al.*, 2013). In this sense, focus groups have been described as synergistic (Morgan, 1996). Through the sharing of opinions, experiences and perceptions within the group setting, participants reflect on their own positions, triggering further responses and emergent insights (Ritchie *et al.*, 2013). This position is supported by Kitzinger (1995), who suggests that participant interaction is the critical defining feature of a focus group methodology, because it accentuates the level to which their world view becomes evident, as well as the fact that it allows for the reconsideration of opinions and experiences in the light of new information. In addition to this, the social nature of focus groups contribute to an increased level of spontaneity in terms of discourse and potential responses (Ritchie *et al.*, 2013).

Kitzinger (1995) explains that one of the key tenets of a focus group methodology is the ability of group processes to aid the participants in exploring and explaining their perceptions and experiences. The group dynamics at play in a focus group allow for the emergence of unexpected information and experiences. In addition to this, Kitzinger (1995) explains that the interpersonal communication between the focus group participants can be useful in focusing attention on cultural values and group norms, potentially providing key insights into behavioural norms extending beyond the opinions of the focus group participants.

To summarise, focus groups are useful for generating emergent insights and reflections on experiences because of the interactive manner in which the participants contribute to the process of data generation (Morgan, 1996). In addition to being able to provide data on experiences, perceptions and behaviour, focus groups are a useful data generation technique for collecting insights into cultural values and social norms underlying behaviour.

4.2.1.2 Limitations to a focus group methodology

Despite the many advantages to a focus group methodology, there do exist several key limitations to this manner of data generation. First, by their very nature focus groups are open ended and data is emergent. To this end, the researcher has less control over the data produced through focus groups than through other quantitative or qualitative data generation techniques (Morgan, 1996). Second, while the group nature of focus groups imbues them with many useful characteristics, it can also lead to limitations as well. For instance, through group discussion, the articulation of group norms may undermine dissenting individual opinions or experiences (Kitzinger, 1995). In addition to these limitations, Stewart and Shamdasani (2014, p. 48) summarise several other limitations inherent in a focus group methodology:

1. Limited generalisability owing to the small number of participants.
2. Arrival at false consensus, because the participants' responses are not independent of one another and may be biased by a dominant group member.

3. An over-estimation of the significance of the data, because it is provided 'live' in the presence of the researcher.
4. Difficulty in summarisation and interpretation of results from focus group data due to the open-ended nature of responses.
5. A degree of moderator bias due to the intentional or unintentional use of signals or replies to participants' responses.

Notwithstanding the aforementioned limitations inherent in a focus group methodology, this method for data generation is deemed to be capable of providing the data necessary for addressing the primary research questions posed in this study.

4.2.1.3 Focus groups and media multitasking research

As Van der Schuur *et al.* (2015) demonstrate in their review of 43 studies concerning media multitasking, 25 of these studies employ an experimental research methodology, and 16 studies are correlational in nature. Similarly, from the review of studies researching students' use of media in academic contexts conducted in this study, a majority of studies were found to make use of either experimental designs or survey methodologies. Within this body of research only four studies made use of focus groups as data generation tools to some extent (e.g. Annan-Coultas, 2012; Williams and Cox, 2011; Burak, 2012; Roberts and Rees, 2014). This dearth of studies employing a focus group methodology indicates that novel insights and perspectives within this field of research can be gained through the emergent nature of focus group discussion.

In particular, a focus group methodology allows for the primary research questions be addressed adequately. Through interactive discussion within focus groups the following key aspects concerning new media usage patterns prevalent among undergraduate students will emerge: their beliefs, behaviour, perceptions, cultural values and group norms. All of which, are integral to meeting the research objectives of this study.

4.2.2 Instrumentation

This section describes the general structure of the focus groups employed in this study. This is achieved through the provision of a topic guide outlining the key areas of discussion, as well as the description of the pilot study.

4.2.2.1 Topic guide

The following section briefly outlines the key discussion points used to guide the direction of discussion in the focus groups. The intention of the topic guide is to direct discussion within the focus groups in order to address the three primary research questions, relating to beliefs, triggers and behaviour.

Media in use: The primary aim of this discussion point is for the focus group participants to describe the media artefacts and content they use.

Manner of use: The purpose of focusing the discussion on the manner in which undergraduate students use media in both structured and self-regulated academic contexts is to determine the extent to which they engage in media multitasking behaviour. Furthermore, this point will facilitate discussion about task-switching behaviour. In order to understand media usage patterns it is useful to gauge whether students focus entirely on one task before moving to another, or, whether they jump between various media and non-media activities. In this way, through focusing on the manner of use, the extent to which students engage with media and academic tasks in a non-sequential, hypertextual manner will emerge.

Nature of use: Through this discussion point, the nature of how undergraduate students use media will emerge. More specifically, the purpose of this discussion point is to determine whether the participants typically engage with media for on-task or off-task behaviour.

Motivations for use: Through this discussion point, the motivations and beliefs underlying the use of media in academic contexts will emerge.

Social norms: The purpose of this discussion point is to determine the impact of social norms on undergraduate students' behaviour with new media.

Through exploring this issue, the extent to which students' behaviour is moderated by the surrounding peer group and the social norms of the context will become apparent. Furthermore, this discussion point will facilitate discourse around behavioural norms and the extent to which the participants' feel that their media behaviour is shared by their peer group.

Impact on attention and academic performance: As with the previous discussion point, the key purpose of this discussion point is to determine whether students' perceptions of the impact of media use on attention and academic performance modifies their behaviour in any way. Through discussing their awareness of the possible implications of media use, the ways in which they modify their usage patterns to either increase or mitigate these effects will emerge.

4.2.2.2 Pilot study

In order to test the validity of the focus group procedures as a research instrument, a pilot focus group was conducted with a small group of students several weeks prior to the primary focus groups. There exist many reasons for conducting a pilot focus group within this study. First, the pilot study allowed the suitability of focus groups as a research instrument to be tested. Following an analysis of the data gathered and a reflection on the pilot procedures, it was deemed that the chosen methodology produced the necessary data for addressing the research questions put forward in this study. In addition to this, as suggested by Breen (2006), the pilot procedures enabled the question structure to be subtly revised for the primary focus groups¹. Finally, through conducting a pilot focus group the logistics² of running the focus group sessions were able to be tested, and improved upon for the primary focus groups. In addition to being a useful tool for refining the procedures, the pilot focus group also allowed the analysis strategy to be tested and refined.

¹This involved the rephrasing of one or two questions, statements and prompts in order to enhance the understanding on the behalf of the participants.

²Venue, recording procedures, consent forms.

4.3 Data Collection

The primary data for this study was collected by means of five focus groups held with undergraduate students at Stellenbosch University. This number is in line with suggestions made by Morgan (1996), who indicates that for exploratory or contextual research following a structured focus group approach, approximately four to five focus groups are required. Moreover, in situations where the focus group participants are particularly homogenous in terms of socio-economic background, opinions and perspectives, as well as contextual factors such as location, age or shared experiences — a smaller number of focus groups is preferred to a greater number of focus groups due to diminishing returns with each additional focus group.

Each focus group was approximately one hour in length. This length of time falls within the time prescription for focus groups recommended by Ritchie *et al.* (2013). In addition to this, the primary reason for this length was to enable the focus group participants to participate within their scheduled lunch-hour, diminishing a potential impediment to participation.

4.3.1 Research participants

Students currently enrolled for undergraduate studies at Stellenbosch University in South Africa constituted the target population for this study. In line with prescriptions for focus group research (Morgan, 1996), five focus groups are conducted, each comprising between six and ten participants. Therefore, the intended sample size for this study is 24 participants as a minimum, and 40 as a maximum. Several different advertising mechanisms were used in order to recruit the participants for this study. These include:

1. A4 Posters placed in each academic building around the main campus of Stellenbosch University.
2. Announcements in 4 undergraduate classes³.

³An undergraduate service module for all first year Arts and Social Sciences students, Two second year modules and a third year module for students from a wide range of faculties

3. A radio interview on the campus-wide radio station, promoting the focus groups.
4. Participants were encouraged to bring along friends to the focus group.

As an incentive to increase the number of sign-ups for the focus groups the participants were offered a small financial reward⁴ for their participation in the focus group.

Following these calls for participation, 30 students responded, expressing a desire to participate in the focus group procedures. As all respondents met the inclusion criteria⁵ for the sample population, all respondents were included in the study. Upon expressing their interest in participating in the study, participants selected one out of five available focus-group sessions.

Each focus group was comprised of between six and nine participants. This number is also in line with prescriptions made by Morgan (1996). Morgan explains that focus groups must be small enough to provide each participant with an ample opportunity to provide input, while still being large enough to enable a diversity of views to be heard. Moreover, with a smaller group of participants the focus group risks losing the momentum and group dynamics that characterise it as a research methodology. All of the participants were undergraduate students at Stellenbosch University in either their first or their second year of study. The participants represented four faculties of the university: Education, Law, Arts and Social Sciences and Economic and Management Sciences. From these faculties, the participants represented ten different majors⁶.

4.3.2 Procedure

The primary researcher in this study moderated the focus groups. It is important to note that the moderator shared many socio-demographic characteristics including Arts and Social Sciences, Economic and Management Sciences and the Science Faculty.

⁴50 ZAR.

⁵Enrolled for undergraduate studies at Stellenbosch University

⁶International Studies, Management Sciences, Socio Informatics, Social Dynamics, Humanities, Management Accounting, Visual Communication, Language and Culture, Law and Education.

and experiences with the participants having been an undergraduate student at the same institution within 3 years of the time of this study. Ritchie *et al.* (2013) suggest that this is beneficial to the dynamic of the data collection. Furthermore, Ritchie *et al.* (2013) note that shared experiences between the researcher and the participants should improve the researcher's understanding of their reports.

Prior to the commencement of the focus groups each participant was provided with informed consent forms. Upon commencement of each focus group the researcher explained the purpose of the study, his role as a moderator, the use of the audio recording devices and the intended structure of the focus group. The discussion within each focus group was divided into two main sections. In the first section the discussion was centered around the participants' experiences in a structured academic environment. The second section focused on the participants' self-regulated academic environments. The topic guide outlined in Section 4.2.2.1 was then used to guide the discussion within each of these sections. At the close of each focus group the participants were asked if there were any issues within this area that they feel were important or relevant that had not come up in the course of the discussion.

4.4 Ethical considerations

Ethical and institutional clearance for this study were granted by the institution's relevant research boards. The research methods were deemed to present a low risk to the participants. This risk assessment is based on the fact that all participants provided informed consent to participate in the focus groups. Before commencing with the focus group process, the nature and purpose of the study was explained to the participants, as well as the strategy for analysing their inputs. Furthermore, before participation was agreed upon, it was thoroughly explained to the participants what their participation in the study entailed. Finally, informed consent was based on the understanding that participation in the focus groups was entirely voluntary and all data gathered would be presented in an anonymous and confidential manner.

4.5 Data Analysis

Following the completion of each focus group, the audio recordings were transcribed into a textual format. In addition to these transcriptions, the data consisted of field notes describing any nonverbal cues provided by the focus group participants as well as the demographic make up of the focus group. These transcripts and field notes were then analysed using a thematic analysis methodology. This section describes the precise method of how the data were processed and then analysed. This process begins by outlining several of the key characteristics of thematic analysis. Following this, the steps involved in the data analysis process are described in detail.

4.5.1 Thematic Analysis

Thematic analysis has emerged as a popular form of data analysis in qualitative research (Braun and Clarke, 2006). In contrast with other popular methods of data analysis such as grounded theory, conversation analysis or discourse analysis, thematic analysis is not bound to a particular theoretical or epistemological position (Braun and Clarke, 2006). Through adopting a thematic analysis approach, the focus is placed on identifying themes and patterns within the data — aiming to generate descriptions of strategies and behaviours described by the research participants (Hammersley and Atkinson, 2007). As Braun and Clarke (2006) explain, a theme describes important aspects of the data in relation to a particular research question or research objective, representing a level of patterned response within the data set.

Braun and Clarke (2006) explain that when employing a thematic analysis methodology, themes may either be identified in the data inductively or in a more theoretical, deductive manner. The inductive approach entails the coding of the data in a manner that is distinct from any pre-existing framework or theory, with the resultant themes being strongly linked to the actual data. As such, this method bears a strong resemblance to a grounded theory approach. In contrast, a deductive thematic analysis is directed by particular theoretic goals or research questions. Braun and Clarke (2006) note that the deductive approach is more suited to addressing explicit research aims, providing detailed

analysis of specific aspects of the data. In this study a deductive approach to thematic analysis is employed, with the identification and definition of themes being directed by the research questions, the research objectives as well as the outcomes of the literature review.

The approach to thematic analysis adopted in this study follows the guidelines outlined in Braun and Clarke (2006). In accordance with these prescriptions, the thematic analysis process consists of six phases. The initial phase of thematic analysis involves the transcription of the data into a textual format. Through transcription and familiarisation with the data, preliminary codes are produced.

The second phase of analysis involves the formal generation of codes for the data. This process requires the creation of an initial list of elements from the data set displaying recurring patterns. Because of the deductive nature of the analysis, the coding process is guided both by the nature of the data as well as the specific research objectives of the study. These codes are then refined through a focused process of combination, elimination and division, resulting in a final set of comprehensive codes describing the data. The full set of final codes is presented in Table 4.1.

The third phase of thematic analysis involves the identification of specific themes amongst the codes. This is carried out through examining patterns in how codes are related to each other as well as how these early themes relate to the initial themes and codes. This provides a number of candidate themes to be further analysed (Fereday and Muir-Cochrane, 2006).

The fourth phase involves the refinement of the candidate themes through reviewing the data. Braun and Clarke (2006) describe how this process is conducted at two levels. First, coded data extracts are reviewed to determine if these themes form coherent patterns. At the second level of analysis, the validity of the proposed themes is evaluated by assessing whether the proposed themes accurately reflect the research participants' accounts of their experiences described in the data.

The fifth phase involves the precise definition of each of the final themes. Analysis at this stage involves identifying which aspects of the data are being captured, what is interesting about the themes, and why these themes are of

Code	Description
Prior to use	
PR-CNTRL-HIN	Control Beliefs, hindering factor
PR-CNTRL-FAC	Control Beliefs, facilitating factor
PR-ATT-POS	Attitude toward use, positive attitude
PR-ATT-NEG	Attitude toward use, negative attitude
PR-ATTR-ALT	Media as an attractive alternative
PR-NORM-POS	Positive normative beliefs
PR-NORM-NEG	Negative normative beliefs
PR-MOT-BOR	Motivation For Use, boredom
PR-MOT-SELF	Motivation for use, self-motivated use
PR-MOT-NOT	Motivation for use, notification
PR-MOT-DISEN	Motivation for use, disengaged
PR-MOT-HAB	Motivation for use, habit
PR-MOT-FOMO	Motivation for use, missing out
Patterns of use	
PT-NON	Non use of media
PT-EXT-FRC	Extent of media presence, frequency
PT-EXT-SPFC	Extent of media presence, specific media
PT-EXT-ACT	Extent of media presence, specific activities
PT-EXT-NOMED	Extent of media presence, number of media
PT-MOD-SNGL	Mode of Use, single tasking
PT-MOD-MULTI	Mode of Use, multi tasking
PT-MOD-HOP	Mode of Use, hopping
PT-MOD-MULTI-SAM	Mode of Use, multitasking, same media
PT-MOD-MULTI-MULTI	Mode of Use, multitasking, Multiple media
PT-MOD-MULTI-SELF	Mode of Use, multitasking, media + self study
PT-MOD-MULTI-LEC	Mode of Use, multitasking, media + lecture
PT-NAT-ON	Nature of use, on task
PT-NAT-OFF	Nature of use, off task
Perceptions arising from use	
PERC-BEH-POS	Behavioural belief, positive consequences
PERC-BEH-NEG	Behavioural belief, negative consequences
PERC-BEH-MOD	Behavioural belief, modulate behaviour
PERC-BEH-MOD-STRAT	Strategies for modulating behaviour
PER-MOD-CLASS	Modulating factors, class size
PER-MOD-LEC	Modulating factors, lecturer
PER-MOD-NATWORK	Modulating factors, nature of work
PER-SUBNORM	Subjective norms

Table 4.1: Final codes used in analysis of the focus groups.

particular interest. This results in a comprehensive description of what each theme contributes towards understanding the data.

The final stage of a thematic analysis involves providing a thick description of the results. A thick description of human behavior is one that explains not just the behavior, but its context as well, such that the behavior becomes meaningful to an outsider (Ponterotto, 2006).

4.6 Summary

This chapter outlined the research methodology employed in the study. The research questions outlined in Section 1.3 guided the selection and design of the methodology. Accordingly, a focus group methodology was employed to gather the data necessary for addressing the research question posed in this study. This methodology was primarily employed due to the emergent nature of the insights and experiences generated through discussion amongst the research participants. This data was then analysed through a process of thematic analysis.

Chapter 5

Findings

This chapter presents the key findings emerging as a result of the thematic data analysis process discussed in Section 4.5. The findings are presented in three high-level sections, each corresponding to the research questions posed in Section 1.3. Accordingly, the findings relating to students' beliefs about their media multitasking behaviour are presented first, followed by findings relating to both intrinsic and extrinsic triggers initiating media use. Finally, findings specifically relating to students' behaviour with media in academic contexts are presented. Within each of these sections descriptions of the themes and sub-themes are provided. Each theme or sub-theme described in this chapter is accompanied by associated supporting quotes derived from the focus groups. At this stage it is important to note that while specific quotes are provided for each theme or sub-theme, they are by no means exhaustive, nor is their provision intended to exclusively support the related theme or sub-theme. Indeed, many of the supplied quotes do certainly apply to many other themes in the data.

5.1 Students' Beliefs

This section presents the findings from the focus groups associated with the beliefs students hold in relation to their media multitasking behaviour. These findings are presented in three sections, each representing different classes of belief present in the TPB, as outlined in Section 3.1.2. The first section focuses

on themes emerging from the data relating to behavioural beliefs, the second to normative beliefs, and the third to control beliefs.

5.1.1 Behavioural Beliefs

As outlined in the TPB, behavioural beliefs refer to an individual's beliefs about the consequences resulting from engaging in a particular behaviour (Ajzen, 1985). Within this focal area, behavioural beliefs refer to beliefs about either the positive, or the negative consequences arising from media multitasking behaviour. From the focus group discussions, three themes were observed relating to students' behavioural beliefs.

Students' believe that they cannot concentrate on a lecture when engaging in media multitasking behaviour. They feel that this behaviour shuts them off from outside stimuli, and, that it prevents them from remembering the content of the lecture. Through dividing their attention between media and the lecture, content is missed.

- P1-1: *When I am on my phone I do not hear or see anything, I literally shield myself, people are trying to talk to me and I don't hear her, because I am literally fixated on my phone.*
- P5-4: *I literally just [mimics focusing on a phone], and it's just everything going on around me [indicates hand going over head].*
- P1-1: *I hear nothing, nothing. The only time I'll look up is because everyone is getting up because the lecture is done.*
- P4-8: *Well I started out in the beginning of the year taking notes on my laptop, but then by the second semester I was so bored with all my classes, so I just record all my classes and then I just spend all my time on social media.*
- P4-4: *I feel like I miss chapters because I'm doing other things, and then when I try and study again, I go over this and I'm like: 'oh my word, did we go over this in class?' And then if I go back to my social media stuff, if I look back to the timeline and pinpoint the lecture in my timeline, I'll be able to tell why.*

- P5-3: *I think if you are on a device you definitely do not pay attention to the lecturer [laughs] - I don't.*

As a consequence of media use in a structured academic context students feel that they have to spend more time going over the work later. It is a conscious choice. Students are aware that by media multitasking when they are in a lecture, they are postponing their work. By not concentrating on the lecture, they have to put more effort into their self-regulated study outside of structured lecture situations.

- P1-1: *I know that if I need to stay up to four in the morning to finish this work, I will do it, because this is what I get for playing on my phone and not working.*
- P1-1: *I'd rather do it at like three in the morning than sit in class at like two in the afternoon and pretend to actually care and listen and focus and concentrate.*
- P1-4: *We're all pretty conscious of the fact that when we decide to postpone, we are postponing the work. Meaning, we're going to have to do it, we're going to regret it later that we didn't do at that point in time.*
- P1-1: *I think social media, it effects in the fact that we don't listen in class and all these things, but I know that I'm gonna do the work at the end of the day.*
- P1-4: *It happens, like every time almost exactly the same way. Like I could focus now, I could save myself the trouble later, but ah, I don't know, and then you check the phone and then, all hope is lost. And then, later on you're like okay, I've got a lot of work to do and are very stressed.*
- P1-1: *You'll discuss it in class, so you know you should be making notes, so that you don't have to study come exam time, but we kind of accept the fact that you know what, we'll deal with that later.*

Students are cognizant of the impact of their media multitasking behaviour on their cognitive functioning. Throughout the focus group discussions the

adverse consequences of engaging with media in academic contexts became apparent. When focusing on media in a structured lecture setting students shut themselves off from whatever is happening around them - missing the content of the lecture. Similarly when studying in a self-regulated context students describe how media use distracts them, increasing the amount of time they need to spend studying. Furthermore, media multitasking was said to contribute to a feeling of being cluttered, to a sense of being overwhelmed with information and stimulation.

- P2-3: *It just takes one alert and it just throws me off for the whole session, it just throws me off.*
- P4-9: *There's a lot of clutter in your brain as well. Cause you've got so many things open here. You're trying to focus on this one thing, but you're constantly switching back and forth between like all the things that's happening on your phone and on your screen. You're filled with a lot of clutter.*
- P2-1: *Once I look at my phone I completely shutdown on what's happening around me. Which is really bad, cause if there's a fire in the building or something's happening then I'm like well, you know - I was on 'Instagram'.*
- P1-3: *I've tried to stop 'Facebook' because there's just so much information there. I get so overwhelmed and then I get exhausted and then when I start studying again, my mind frame is already off.*
- P5-3: *It depends on what it is that you're busy with. But a cellphone, a cellphone is never good. It obviously [strong emphasis], makes your working time longer.*

5.1.2 Normative Beliefs

Normative beliefs describe students' beliefs or perceptions about social normative pressures to either engage in media multitasking behaviour or abstain from such behaviour. Two themes emerged from the data relating to this category of beliefs.

Students believe that their behaviour is shared by their peer group. They feel that the way that they behave with media is the normal way of functioning in such settings. Students reported feeling that they could use the group behaviour as an excuse - they can hide behind the behaviour of the whole class. Because the way they use media in class is shared by those around them, this gives them a sense that this is a legitimate and permissible manner of behaving.

- P2-3: *In a lecture room you can hide behind other people, not physically, but mentally. It's a group behaviour so you feel like it's okay to do it. It's not disrespect aimed at the lecturer, it's a group mentality. If everyone else is doing something then obviously more people are going to pick up on that behaviour.*
- P4-9: *It's scary when you look back and you see how many people are actually listening to the lecturer - everyone's like [indicates looking down at phone under desk], you see someone in front of you on 'Instagram'.*
- P4-1: *Everyone else is on their phone.*
- P4-4: *I think quite a lot of people probably look at what other people are doing; especially a laptop - it's just there, why can't I look.*
- P1-5: *It's actually interesting to see, everyone starts out the lecture with the intention of like, they all click on Sunlearn¹, like you always see that one Sunlearn tab, and then you see all the other tabs start opening. So you can see, people actually had the slides there, but then they get so bored that they end up opening everything else.*
- P4-6: *Sometimes I feel really bad actually, that I'm on my phone in class, and I'll stop and then I look around me, everyone else is on their phone.*
- P4-4: *If you sit in a class that is like down-sloping. In all my classes there are at least like 20 laptops out at any given point. I can count, there is at least like 90% of those people are not on the page of the slides or whatever.*

¹The learning management system employed at this institution.

Students use their media less when involved in group work in self-regulated settings. Students believe that using media in such settings is disrespectful. There is an increased level of interaction associated with group work. When involved in group work tasks students concentrate on interacting with their team mates, not on a media device. The level of interaction offered in group work settings is sufficient such that they do not feel the need to seek further entertainment or engagement with media.

- P5-4: *If I work in a group I definitely put my phone away.*
- P1-3: *I feel like out of respect when we are working together, you can't be on your phone cause it's just, respect.*
- P5-1: *In a group there is so much interaction, especially if you're dealing with a project that you're actively involved in.*
- P5-3: *Cause I might be okay with being on my phone the whole time, but maybe. Like I was in a group with Justin and maybe he isn't okay with it and gets irritated with me or something.*
- P5-2: *I just give attention to the group and when we have to do our own stuff, I'll maybe use, but it depends on the intensity of the task.*
- P2-4: *It's disrespectful. Unless it's work related, like you need to access something. Going on 'Instagram' and 'Whatsapp' while your group members are working is very disrespectful.*

5.1.3 Control Beliefs

Drawing from the TPB described by Ajzen (1985), in this context control beliefs relate to a student's beliefs about the presence of factors that either hinder or facilitate their media multitasking behaviour. Within this subsection two key themes emerge, one describing beliefs about factors hindering media multitasking, the other describing beliefs about factors that facilitate their media multitasking behaviour.

Students believe that an increased level of lecture engagement is a moderating factor on media multitasking behaviour. This is often the case in smaller

classes, where students feel that they can engage more with the lecturer and the content being presented. In line with this assertion, students feel that they can get away with using media in larger classes. An increased level of engagement is associated with being more interested in the subject matter being presented. The students believe that when they are more engaged by the lecturer there is an increased level of interaction and participation, decreasing their desire to use media during the lecture. Conversely, a particularly compelling lecturer will decrease the likelihood of them using media within such a lecture.

- P2-1: *I think in the classes where I am 100% interested in what I am studying then I don't tend to go on my phone. So, my favourite classes for example are English and Philosophy. I am going to pay attention all the time. Because I want to know every single thing that the lecturer is saying. But if I go to History and we're learning Afrikaner nationalism in South Africa way back when. I might not be 100% interested. So, I am going to tend to focus on what's aesthetically pleasing on 'Instagram' rather than the lecture.*
- P5-1: *I think maybe the difference between inside of class and outside of class depends on the size of the class, because of your amount of respect you have for the lecturer and also how lenient you think that lecturer is.*
- P4-3: *During lectures or tutorials I would prefer to if I do get bored to use social media. But if a lecturer is compelling, I'll be like yes! That is wonderful, please don't ever stop talking.*
- P1-2: *You don't participate because you're scared that you're wrong and embarrassed in front of everyone. So then I'm like well I'm not gonna do anything, so I'm gonna play on my phone.*
- P2-2: *I sit in front in most of my classes, cause I know I get distracted easily. I just rather be there and not know what's going on behind me. Cause once I get distracted, I want to know the whole thing. You're more forced to engage.*
- P1-4: *It very much depends on the lecture, whether you're engrossed or not. Cause in some lectures it's just too big, so it either feels too awkward*

to answer a question where you think somebody else might disagree with you and you don't want conflict - it's just too much trouble. So, it's [use of media] dependent on the class, on whether you interact with the class or not.

- P2-4: *If the work, if I feel like it will value me, if I feel like it will help me, I won't go on my phone.*
- P5-1: *The bigger the class, the more inclined I was to take my phone out. It's almost like no one's going to pick up on it.*
- P4-3: *When it's big it's different. When it's a big lecture then the lecturers are just like whatever.*
- P1-4: *If there was a way for the lecturer to interact with you in the way that you're acting on your phone, that would be very interesting.*

*Students believe that if media is present in their study environment, they cannot resist using it. The pull to engage with media in some form is decidedly strong. Students' media use has been shaped by the purposes for which they are most commonly used, social and entertainment purposes (Rosen *et al.*, 2013). Because this off-task use is so ingrained in how they engage with media, they are aware that if they are attempting to work either with a particular medium or with various media present, they will tend to revert to their habitual manner of functioning with media, using it for off-task purposes.*

- P5-4: *I can't work from a computer. Otherwise I just go on 'Boredpanda', or whatever it might be.*
- P4-2: *When I'm studying I have to put away everything. I try to print out all my notes, because if I sit with a laptop I know I'm going to get distracted and go on 'Youtube' or 'Facebook' or whatever.*
- P3-2: *I keep wanting to go on 'Instagram' and 'Facebook' and stuff. If it's still in front of me and on, then the resistance is very low.*
- P2-3: *It doesn't matter what point I'm in my study. Just getting that one alert. It can be the phone vibrating or that ping sound, yeah, it throws me off.*

- P4-4: *I have to put it away, otherwise I'll check it every 2 seconds - I have to put it somewhere else.*
- P5-3: *If it's [mobile phone] next to me I'm going to like keep going on 'Instagram'.*
- P4-9: *It's also because it's unlimited. I think say for instance you have a newspaper, one article and you're done. But with 'Instagram', you look at one photo and then it's like there's still a million more, I can just continue scrolling.*
- P2-1: *I try to stay clear of all technology cause I know that as soon as I have a laptop in front of me then I'm going to go onto youtube and be like: 'oh maybe I can look what's relevant on 'Youtube' - but then I know that I'm just going to trail off and start watching something else.*
- P5-2: *If I do type my essay, I am not allowed to have my 'Facebook' or whatever open, not even my email. It's just like online sources. Because, otherwise I just get distracted too easily.*

5.2 Triggers Underlying Media Use

Within this section themes emerging from the focus groups relating to behavioural triggers are presented. The students reported that these triggers tend to initiate their media multitasking behaviour. Two forms of behavioural trigger have been identified: Intrinsic triggers and extrinsic triggers. Accordingly, these two classes of triggers, intrinsic and extrinsic, are used to group the presentation of the relevant themes emerging within this section.

5.2.1 Intrinsic Triggers

Intrinsic triggers refer to factors internal to the individual that initiate media multitasking behaviour. Within this section four themes are reported on.

Media use is triggered following a reasoned evaluation of the costs associated with such behaviour. For reporting purposes this theme is described by means

of two sub-themes, each describing particular aspects of the overall theme. Firstly, the negative implications of media multitasking behaviour are not sufficient to dissuade students from engaging in media multitasking when in a lecture environment because concentrating in a lecture is not seen to positively relate to academic performance. Secondly, because use is triggered by an internal evaluation of the implications of the behaviour, students in fact restrict their behaviour closer to a deadline. This second sub-theme, while not directly relating to a trigger for use, further supports the primary theme that media use is triggered by a reasoned evaluation of the costs associated with such behaviour.

Students evaluate the costs of using media whilst in a lecture. The choice to engage in media multitasking behaviour is as a result of a reasoned weighing up of the costs associated with this behaviour. A lecture is not seen to be a valuable use of their time. It is not viewed as something worth devoting their limited attentional capacity to. In all of the focus groups, in many different ways the participants made it evident that they feel that a lecture is not useful for their study. The students do not believe that the negative effects associated with media multitasking behaviour during a lecture will impact their academic performance, because they will make up the work they missed by studying longer, with less distractions in a self-regulated study environment. Media use is triggered by the perception that participating and concentrating in lectures does not contribute positively to their academic performance.

- P1-1: *I find a lot of lecturers will read the slides and I'm like: 'well I can also do that, so you reading them to me isn't going to do anything. So, I'm gonna be on my phone'.*
- P1-4: *In the majority of cases, at least in our faculty[Arts and Social Sciences], let me put it this way, you can do perfectly fine, if you just do the self study work. In that case, you feel your time is more sufficiently spent spending it on social media or chatting to your friends.*
- P3-1: *It depends on the lecture itself. If it's something that we've gone through or the lecturer themselves is just going off, I will absolutely not participate in the lesson.*

- P2-1: *In Political Science, with this lecturer that we have at the moment, I tend to think: 'Ok, this lecture, I'm going to listen all the time'. Then I find myself like halfway through thinking: 'this is not helping me' - let me go on 'Instagram', go on 'Facebook'.*
- P3-1: *In the beginning I get a feel for the lecturer to see if they are actually going to mention what we are supposed to learn. If they don't then I'm just going to use the WiFi basically.*
- P4-5: *When I play 'Candy Crush', it's like I'm at least doing something where I can progress. If I'm going to be sitting in this lecture I'm not gaining anything cause I'm not actually listening. So I might as well play 'Candy Crush'.*
- P2-4: *For me, like I have a very short attention span. So when I'm listening to the lecturer if I don't really find it useful, or they're just losing me. Then I'll go on my phone.*
- P1-4: *It's not like we don't know that we're doing the wrong thing. We're aware of the costs, but, at that point in time, that immediate satisfaction factor is just too high.*
- P1-1: *I know that if I need to stay up to four in the morning to finish this work, I will do it, because this is what I get for playing on my phone and not working.*
- P1-4: *We're all pretty conscious of the fact that when we decide to postpone, we are postponing the work. Meaning, we're going to have to do it, we're going to regret it later that we didn't do at at that point in time.*
- P2-3: *I lose concentration - you see where the lecture is going and you just decide, I'll do everything else in my own time.*

Media use is further restricted when there is a deadline. Students understand that there is a connection between the amount of effort and concentration that they put in to their work and the outcome that they achieve. The proximity of the deadline heightens this awareness. They display an increased level of discipline, further limiting the extent to which they use media for off-task purposes. This second sub-theme supports the primary theme that media

use is triggered by a reasoned evaluation of the costs associated with such behaviour.

- P2-4: *I have this thing, I call it the panic monster. That's the monster that scares me every single time I go on my phone. 'Remember why you're here, this is crunch time'. My phone can be right here next to me, but I won't even touch it. I feel like I'm just wasting time.*
- P4-8: *It depends what time. For example, this week I have a lot of things due, so I'm a bit more disciplined. I have to be more serious or else I'm not going to get this degree. Whereas like early in the semester I use social media and study in between.*
- P2-1: *If I have an Ancient Cultures essay for the 24th [later in the month], When I'm working on it, I'm not going to feel bad if I go on 'Facebook' for like 2 hours, but when it's due tomorrow I'm like this is real, I can't procrastinate now.*
- P2-3: *If it's crunch time I don't even have time to go on my phone, so it's non-existent to me. But if it's like two weeks before then ja I'll just like go on it, whatever, I have time.*
- P1-1: *I rather just chill on my phone and like watch series and stuff and then literally just before something is due I'm like okay, it's crunch time. I think it's the pressure of the due date that gets me to put my phone away.*

Students' use of media is triggered by habits. Students expressed that they feel that the way in which they use media has become a habit. Their behaviour is automatic. They reported often not consciously thinking about using media, but simply acting on habit, automatically using media in particular situations. In addition to media use resulting from ingrained habits, the students felt that in many cases they were addicted to using their media - that it has a hold on them.

- P1-3: *Sometimes, it happens, so often that you don't even think about it. You just go into class, sit down, immediately, phone out. It's a habit.*

Even on 'Instagram', don't think like you're there, you're literally just scrolling.

- P3-1: *I feel I choose to engage with these social medias. And for a class, obviously we chose to be here, but if it's not relevant at the time or we're not feeling like it. It's some sort of distraction, like we get addicted to just looking at our phones. It is a terrible habit*
- P1-3: *I've even sat myself down and said: 'no phone during when you have to work'. At times, where you just, aah, two minute break and I feel like it [media] has such a hold*
- P2-4: *I think if you see someone using their phone, it's just an automatic thing. I wonder what's going on, on my phone - let me just check quickly.*
- P4-3: *I'm extremely addicted to it. So whether or not I'm bored or I'm interested in the lecture I would still go check social media.*

Students' use of media is triggered by the central role that media fulfills in their lives. It is media's ubiquity, coupled with the ready available stream of distractions presented by media that triggers students' use behaviour. Through various forms of media students are presented with an unlimited stream of entertainment, information and interaction, pulling on their desire for satisfaction and stimulation. In addition to this, it is through portable media that they carry with them that students are capable of participating in fast-paced, in-the-moment communication. Students expressed the need to participate in conversations at the moment that they take place - something that their media allows them to do. Students use media, especially social media to help them shape, and share their self identity. In this way, portable media enables students to participate in the on-going process of shaping their social presence, wherever they may be.

- P4-5: *It's almost as if our phones are like our lives - without it I would feel lost. It's an extension of your body.*
- P1-6: *There's a lot of identity stuff in social media too, I noticed that. You almost lose your self definition when you go away for too long.*

- P1-1: *I think it is important to have a media presence. I think it's important that you're kind of on all social media. For you to socialise properly.*
- P1-2: *A lot of important news I gather from 'Twitter'. It's just an easier way then getting a newspaper or something. All the important things that I need to know I will find out through my social media.*
- P2-2: *If I need to know what's going on, I usually check all of my social media and see if there's a meeting or anything like that.*
- P1-4: *It's very much so that you want interaction, we get a kick out of it. And information is flowing so quickly at the moment, especially the fact that it's available on your phone. And if you're not part of that conversation, you come in, like after the lecture. Even just an hour later. You're like I could say something now, but it doesn't matter, the conversation has passed.*
- P3-2: *I do it to see what's going on with my friends' lives - I turn to 'Facebook' and see what their updates are.*
- P1-2: *Although they're teaching you, I'm not paying any attention. I may be writing down what you're saying. But I'm actually thinking 'I wonder what's happening on 'Facebook' and like 'Ohh I saw this was trending on twitter and I'm missing it because I'm doing this.'*

5.2.2 Extrinsic Triggers

Within this section three themes are discussed. These themes relate to the role played by external triggers in initiating students' media multitasking behaviour in academic contexts.

Disengagement with a lecture is a trigger for media multitasking behaviour. For the students, there is a clearly discernible link between disengagement and boredom. This boredom has been attributed to a number of possible causes, including: the enthusiasm of the lecturer, the nature of the work being presented, their level of familiarity with the work as well as the overall level of engagement between themselves and the lecturer. Because they are disengaged, and find

the lecture to be boring, students engage in media multitasking behaviour. Media are seen to provide more stimulation than their lectures. Their media use is directly triggered by being disengaged, by boredom.

- P1-3: *Most of the lectures are quite boring to say the least. It's stuff that you can read when you're at home. It's basically someone reading slides that you have. So, it's not engaging. So then I'm like, well I'm not going to do anything, so I'm gonna play on my phone.*
- P1-4: *In class, my phone is the appropriate method to use to avoid boredom.*
- P1-6: *It's another type of boredom, like a bad lecture. I find it's very intense when in a bad lecture, when it comes around, like I find even my phone is not enough to sort of entertain me. So it's like the back up websites that you rarely go to.*
- P1-2: *When I am excessively bored I go on Facebook a lot. I scroll a lot of 'Instagram' when I'm in class.*
- P2-2: *I always take my phone. And that's for when the lecture gets a bit boring. So that, then I check if I have any 'Whatsapp' messages and then I check what's going on on 'Twitter' and I also check what's going on on 'Facebook'.*
- P4-5: *It depends on the lecturer's enthusiasm. Because if the lecture is going to be boring, I'm not going to want to listen, and then I'll be 'Whatsapping'.*
- P4-2: *If it's a theoretical subject, I tend to take notes while the lecturer speaks on my laptop. But, as soon as it gets boring or I lose focus, I tend to go onto other sites that I've opened, so like 'Instagram' or 'Pinterest' on my phone or social communication like 'Whatsapp' or whatever.*
- P4-8: *Once you have a theory based subject, it's home time. Cause I get bored like this [snaps finger].*

The use of media by students' peers poses a distracting influence to them when they are attempting to concentrate on a lecture, triggering media use. They

struggle to resist watching media around them. Whatever media they observe their peers' engaging with is so enticing that they often feel compelled to watch this interaction. This reaction has become an automatic habit. When observing a peer use media students either want to watch and follow this media use, or it triggers them to use their own media.

- P4-4: *I think it's very distracting to see what everyone else is doing. You get like almost jealous, or like scared that people are, I don't know, I get nervous that I'm falling behind or something.*
- P2-4: *I think if you see someone using their phone, it's just an automatic thing. I wonder what's going on, on my phone - let me just check quickly.*
- P1-6: *If someone's like scrolling through their pictures. Even, like watching someone else's timeline, the way social media works now, everyone's timelines are very different and then you can see how they interact with it. I don't think I could stop watching. If someone is on their laptop in front of me and they're doing other shit, that's where my eyes are.*
- P2-1: *If there is a sound going off in class, then you're distracted from the lecture. But definitely if I have somebody sitting right next to me and they're on '9Gag', I want to see what meme that is. I don't want to listen to the lecture right now. I get distracted very easily.*
- P2-3: *I have a friend who is always on his phone in class, always, always, always. And I think sometimes it does disrupt me to a certain extent. He doesn't even have to say look, I just start looking at what he's doing. I think that disrupts me.*
- P4-5: *I kinda feel bad when that happens and I'm actually paying attention. It's like: 'should I not be paying attention? Why am I the only one enjoying this lecture?' And then I just end up going on 'Twitter' and browsing through that.*
- P2-4: *I find it also kinda disrupts the person sitting next to you. One thing I've noticed is that when I pick up my phone, my friend Richard, who I go to all my classes with, he'll pick up his phone.*

- P1-2: *You see someone else on ‘Youtube’ and then I’m like you know what, actually, thats a better idea. The people around you influence you and stuff. Also, in class if you see other people on their laptop or phones and then you’re like: ‘ooh that video!’*

Notifications trigger media multitasking behaviour. External notifications or alerts attracting students’ attention often trigger further off-task media use.

- P5-2: *Even if I don’t like reply to the message, I definitely get the buzz and go: “Okay let me just look at it and maybe put it away or like answer if it’s urgent”.*
- P3-1: *It’s some sort of distraction, like we get addicted to just looking at our phones. Or when we receive a notification it might be somebody I want to talk to now.*
- P2-1: *Most of the time, I open it. I mean, it’s like sitting right there, looking at me, I need to see what’s happening.*
- P3-2: *I look at what the notification is and then I put it back down. So I do get distracted I think.*
- P5-2: *When I get a message I would most definitely answer if I can.*
- P4-7: *You hear your phone go buzz and then you check you phone and you see, oh this person has a new profile picture, great. Hah, I haven’t spoken to this person in so long. I’m going to ask them how their day’s going?*

5.3 Media Use Behaviour

This section presents the findings relating to students’ behavioural patterns with media. The results are presented in three sections. The first section reports the themes describing students’ media usage behaviour in structured contexts. The second section presents the findings related to their media usage behaviour in self-regulated academic contexts. Finally, the last section presents a theme describing a general usage habit that arose in the data.

5.3.1 Structured Contexts

Media use in structured contexts is predominantly off-task. As is evident in the supporting quotes provided for this theme, as well as many other themes, students commonly described many off-task uses of media in class, rarely describing on-task activities. In-line with this aspect of this theme, it was made clear that it is difficult to use media in a manner that supports learning when in a lecture. Many frequently cited uses for media while in a lecture include: social communication, social media, gaming, information searching, microblogging, news reading and general browsing.

- P1-6: *It's kind of hard to use technology productively in class. I imagine if I used a laptop, it would be over.*
- P1-4: *You feel that your time is more sufficiently spent spending it on social media chatting to your friends.*
- P2-4: *I do go on 'Instagram' and 'Whatsapp' and stuff, just to keep in constant communication with friends and family - other than that I don't really use my devices in class.*
- P1-2: *When I am excessively bored I go on Facebook a lot. I scroll a lot of 'Instagram' when I'm in class.*
- P1-6: *I had a Psychology class in first year, every single time, there was WiFi and I could go on 'Tumblr' and just mess around, because I just felt like I had to be there, and not actually engage.*
- P1-1: *For our 'ecos' class, we have clickers that we have to do, and I think that's her way of getting us engaged. And, I mean I get what she wants, but I'm still trying to balance being on my phone. I'm like let me see how I can do this, oh my gosh that happened on 'Facebook', ja and then, oh wait, I missed the first part.*
- P4-6: *I would just go to class, and I don't know if you know the class called Entrepreneurship and Innovation Management, but I literally have never ever listened, I have no idea what's going on in Entrepreneurship. But I know everything about 'Candy Crush'.*

- P1-4: *Usually when I'm on my phone, I'm probably playing games, or 'Whatsapping'. I'm definitely not using it for lecture purposes. But, other devices such as a laptop or a tablet are in most cases used for lecture purposes, when I actually do use them, which is rare.*

5.3.2 Self-Regulated Contexts

When studying in a self-regulated context students restrict the possibility of media use. Strategies are adopted which restrict the ease with which various media can be accessed. Common strategies include studying in an environment where either media use is not permitted, connectivity is not possible or where there are other people present to observe behaviour. In addition to this, students create physical barriers to engaging with media by placing their media in a location other than their present location. Finally, if they are working on a particular media device, they attempt to restrict the functionality of the device by activating do-not-disturb modes or turning off WiFi connectivity.

- P5-3: *My phone needs to be on the other side of the room.*
- P1-6: *I have to change my environment. Because, rule number one is like phone in bag, or just out of view mostly.*
- P1-6: *I have to change my environment to somewhere that puts on pressure that someone's watching you, that you're not working. So then mostly coffee shops or the library.*
- P4-2: *Do not disturb mode is the only thing getting me through exams.*
- P4-4: *I have to put it away, otherwise I'll check it every 2 seconds - I have to put it somewhere else.*
- P2-3: *I keep my phone on silent because I usually realise that when I am working or in a lecture it just takes one alert and it just throws me off for the whole session, it just throws me off.*
- P3-1: *I typically have a piece of paper, a pen, a highlighter and my laptop and then everything switched off, like no WiFi, I switch my phone off otherwise I will get distracted.*

- P3-2: *I put my phone completely away, out of sight, because it's distracting.*

When studying in self-regulated contexts media are either used for task-related purposes, or, media use is used as a reward. This theme is reported using two sub-themes each describing particular aspects of the overall theme.

Media are generally used for task-related purposes when used in self-regulated study environments. Digital Media undoubtedly offer many features useful for completing academic work. When studying in self-regulated situations students do make use of many of these features to help facilitate their study. They use media to communicate with their peers about work related matters. Students often store information such as slides or notes on their media devices, looking them up when required. In addition to this, through Internet connectivity available through many of their media devices students can seek further information - helping them understand their work.

- P5-1: *If I'm writing an essay I can have the article I'm writing off at any one time open on the screen right next to me while I'm typing and it allows me to flip between the two. So I have quite a few sort of windows open. And you can highlight on it and stuff like that so I usually just work off pure electronically. Sometimes using an 'iPad'. If I've got a lot of stuff going on I'll transfer the reading to the iPad so that I can use that kind of as paper.*
- P1-5: *I have rules for myself when I study. Like, I'll still be on my phone but it will be like 99% of the time just to find out about the test or just to sort out the essay. And then like googling.*
- P4-7: *Whilst studying these notes I'll have my laptop open and then maybe like go back to a slide where I need something. I will also have 'Google' open, so if there is something to be 'Googled', I can.*
- P5-2: *If it's like an essay, I would have my notebook and cellphone and my computer there. So I would be typing and I would be reading and typing.*

Off-task media access is used as a reward when studying. Students use off-task media use as a break from studying. They break their work up into segments, separated by off-task media use. Being able to use media is a considerable incentive motivating them to abstain from distracted media use while studying. It motivates them to wait for the reward for concentrating on their work.

- P5-2: *I've tried doing it in like time increments, like concentration segments in the sense of like, if I'm writing something and if I have this idea, I follow through to the end. After that I can take a quick five minute break and just quickly catch up.*
- P2-2: *I'll tell myself to finish however many chapters and then I'll have the technology there as a break. For 30 minutes I can just be on 'Youtube'. I'll check all of my social media accounts.*
- P4-2: *It's quite sad, because you like reward yourself with your phone.*
- P1-3: *For me, lets say I'll do two chapters, and then there's a bit of a reward and I go on social media.*
- P4-2: *If you're studying and you take a 10 minute break and play 'Candy Crush' or 'Facebook'. You're so excited to go be on your phone.*

5.3.3 General Use Pattern

Students often spend longer than they planned with media, because of a 'snowball effect'. Their attention is attracted by other elements within the various media in use. It is common for many forms of media to supply a never-ending stream of content, following on one after the other. Similar to this, the engagement offered by media is such that an original intention to spend a small amount of time on the media gets forgotten and a significant amount of time passes by while using the media without realising or intending to do so.

- P2-1: *I try to stay clear of all technology cause I know that as soon as I have a laptop in front of me then I'm going to go onto youtube and be like: 'oh maybe I can look whats relevant on youtube', but then I know that I'm just going to trail off and start watching something else.*

- P4-7: *You hear your phone buzz and then you check your phone and you see, oh this person has a new profile picture, great, hah, I haven't spoken to this person in so long. I'm going to ask them how their days going - and then it goes like, well I'm on my phone, might as well Facebook.*
- P5-2: *It's just like you think: 'okay no, this is the last one', and then something else catches your eye. And then: 'in the next video we're gonna discuss this, and this episode really follows on.' So you're busy with that train of thought so you just wanna like finish it. And it's not like something that's fine. It really bothers me if I don't know what's in the next episode. I need to know.*
- P2-3: *I think one of the biggest challenges for me, like especially if you answer a Whatsapp, you anticipate the next message.*
- P2-3: *It's like a snowball effect, it's a conversation and next thing you know you've spent an hour talking to one person.*
- P4-9: *It's also because it's unlimited. I think say for instance you have a newspaper, one article and you're done. But with 'Instagram', you look at one photo and then it's like theres still a million more, I can just continue scrolling.*
- P4-1: *They slow down in the lecture or a discussion takes place. Then I'm like: "okay well, I'm just gonna quickly start writing a paragraph" and I get hooked on that and then I go to 'Google' and like search something and then I get distracted, and then maybe I get an email.*

5.4 Conclusion

In this chapter the findings derived from a thematic analysis of the focus groups were presented. The first section presented findings related to students' beliefs associated with their media multitasking behaviour. Within this initial section seven themes were described. The next section presented themes describing triggers initiating students media multitasking behaviour. Six primary themes emerged describing this aspect of the data. Finally, the third section covered themes relating to the actual media behaviour described by the students in the

focus groups. Because there is the possibility for contextual differences, this section was split into two, with each subsection covering the relevant themes and sub-themes. In addition to this, one theme emerged specifically relating to both structured as well as self-regulated contexts.

Chapter 6

Discussion

In this chapter the findings outlined in Chapter 5 are discussed. The purpose of this discussion is to address the research questions posed in Section 1.3. The findings discussed in this chapter substantiate the contributions of this study towards answering these research questions. In addition to addressing the research questions, interpretations of the implications of these findings for this field of research, and practice at large are explained. Through this process, the outcomes of this study are compared and combined with existing knowledge within this domain.

Extending the structure adopted in the previous chapter, the discussion of the findings are grouped according to the research questions put forward in Section 1.3. So it follows, that the first section focuses on findings that contribute to the determination of the beliefs held by students in relation to their use of media in academic situations. The second section concerns findings relating to triggers underlying students use of media in these contexts. Finally, the third section provides a discussion of the findings relating to the form of behaviour exhibited by students in these contexts. Within each section the relevant research question is addressed, with the implications and relations with prior research being discussed. Following the individual discussions, a conclusion summarising the core knowledge contributions is provided.

6.1 Beliefs

The first research question in this study sought to determine what beliefs students hold in relation to their use of media in both structured as well as self-regulated contexts. From the data gathered in the focus groups it is found that students' beliefs in this domain can be classified into one of three categories, relating to the beliefs described in the TPB. Students' beliefs are described as either behavioural, normative or control beliefs.

Within the first category, behavioural beliefs, in which students describe their beliefs about the consequences arising from their media multitasking behaviour, three prominent themes emerge in the data. However, the essence of these three themes can be distilled down to a single idea, students are cognisant of the impact that media multitasking has on their cognitive functioning and, therefore their academic performance. This is especially the case when in a structured lecture context. In this situation the students describe how engaging with media inhibits their ability to concentrate and remember the information provided in the lecture. This finding is in line with those of previous studies. For instance, in independent studies conducted by Fried (2008), McCoy (2013) and Annan-Coultas (2012), students characterise in-lecture media use as a distracting influence, inhibiting their ability to concentrate on the lecture. Similarly, this finding is consistent with earlier qualitative research conducted within this field. For instance, when interviewed, students describe the information retention penalty experienced due to social media (accessed through a medium) use (Flanigan and Babchuk, 2015).

The fact that students regard their media use as a hindrance to their learning suggests that they are aware of the cognitive costs it is causing them. However, as is discussed later in this chapter, this awareness does not imply that in all contexts they cease from engaging in media multitasking behaviour. One interesting implication of their awareness of the in-lecture costs of media multitasking behaviour is that students feel that it is necessary to spend more time out of class covering the material that they missed. Extending the self-regulated working period is deemed an acceptable trade-off for media use in the present. This outcome is in accordance with prior research conducted by Flanigan and Babchuk (2015), in which students primarily viewed the costs

arising from media use in terms of time, rather than quality of work. What is surprising is that they exhibit different behaviour in this self-regulated context in comparison with a structured lecture context¹.

The second section concerns students' normative beliefs. Two interesting findings emerge within this section. First, students hold the belief that the manner in which they use media in structured lecture contexts is shared by their peer group, that it is the normal way in which people behave in this setting. This idea of normative beliefs has received little prior attention in the literature within this research domain.

In terms of normative beliefs an interesting finding in the current study is the indication that students restrict their media multitasking behaviour when involved in group work. In these situations they feel that engaging in such behaviour is disrespectful to their group members. This feeling of disrespect is sufficient such that they allocate their attention to the group and not a medium. A possible explanation for this is that the level of engagement and interaction provided by a smaller group setting is sufficient enough to attract their interest. Another possible explanation for this behaviour might be that participating in group work is seen to have a greater impact on their academic performance than participating in a lecture. Both of these explanations, engagement and a reasoned evaluation of the implications of behaviour emerge as key trends within this study.

Focusing on control beliefs, this idea of engagement is further supported by the finding that an increased level of engagement is believed to decrease the desire to media multitask. This finding, that increased interest and engagement decrease media multitasking behaviour, is consistent with the observation made by Calderwood *et al.* (2014), that an increase in task motivation and self-efficacy lead to a decrease in the frequency and duration of such behaviour within their sample.

Another important finding within this study is the belief that if media is present, students struggle to resist engaging with it. The self-control required to abstain from such behaviour is such that students feel the need to remove the possibility of using media from their study environments. They do not

¹A further discussion on this finding follows later in this chapter.

feel that they are able to resist media multitasking if they have various media around them. This belief and behaviour in response to the belief is suggestive of the general theory of thinking proposed by Kahneman (2011). If media is present in their study environments, students automatically (System 1) engage with such media. It requires deliberate, System 2 thinking to create an environment where this behaviour cannot take place. Furthermore, the belief that media holds such an irresistible pull for engagement indicates that students are aware of their habits, and the patterns of use they typically fall into. This habitual explanation for media multitasking supports the embodied habits notion espoused by Aagaard (2014).

To conclude the discussion on students' beliefs relating to their media multitasking behaviour, this study shows that students are aware of the impact that this behaviour has on their cognitive functioning. Furthermore, this behaviour is seen as normal in a structured lecture setting. In this regard, students possess two beliefs about factors potentially moderating media use, increased lecturer engagement and respect for team-members in group-work situations.

6.2 Triggers

The second research question posed in this study aimed to determine what triggers underly students' use of media in structured and self-regulated academic contexts. Through analysis of the focus group data, this study finds that the behavioural triggers initiating students' media multitasking behaviour can be classified as either intrinsic or extrinsic. To follow, a brief discussion of the findings relating to both intrinsic and extrinsic triggers initiating students' media multitasking behaviour is provided .

6.2.1 Intrinsic Triggers

Students' use of media is triggered following a reasoned evaluation of the costs of engaging in such behaviour. This finding supports the notion of an attention economy proposed by Simon (1971) and extended by Davenport and Beck (2013). Students view their attention as a scarce resource, allocating it to

the stimuli deemed most worthy of their attention. The findings from this study suggest that students do not regard concentrating on a lecture to be integral to their academic success. Rather, engaging with media is seen as a more worthwhile allocation of their limited attentional capacity when in a lecture. One possible explanation for this decision is that the information received through various media might hold a greater subjective value than the information conveyed by the lecturer. This explanation draws on the results of Atchley and Lane (2014), who suggest that information with a social aspect to it generally possess a greater subjective value. Another explanation emerging from the findings in this study is that students would rather concentrate on their academic work when in a self-regulated environment than in a structured lecture context. They view concentrating in self-regulated contexts as more important to their academic success, than focusing in lectures. This suggestion is further supported by the finding that students restrict their media use in self-regulated contexts even further when close to a deadline.

Another important finding relating to intrinsic triggers for media use is that media has come to play such a central role in students' lives, that engaging with media in academic contexts has become a habit. For students, the medium offers them an escape from their present 'reality'. Through their ubiquitous media, they can be distracted from their current experience of reality. Whatever interaction they experience through a medium, seems to be as 'real' to them, as the lecturer in front of the class. This argument is consistent with the argument put forward by Kennedy (2006), suggesting that individuals' offline experiences have become entangled with their online experiences of reality and vice versa. In this way, the medium does not simply augment their reality, it has become so seamlessly interwoven into their ongoing perceptual streams, that the distinction is lost. This outcome speaks to McLuhan (1964) who suggests that reality is mediated by the tools, the media with which individuals actively engage with.

Through various forms of media students are presented with an unlimited stream of entertainment, information and interaction, pulling on their desire for satisfaction and stimulation. This behaviour has become automatic, habitual. As found in Blackburn *et al.* (2013) and Weber and Mitchell (2008), the desire to maintain and construct identities, as well as social relationships

triggers frequent media multitasking behaviour. These findings in this study further support the idea of generational distinctions proposed by Tapscott (1998) and Prensky (2001).

6.2.2 Extrinsic Triggers

For students, being disengaged with the lecture precipitates their media multitasking behaviour. There is a clearly discernible connection between being disengaged and being bored. In addition to the finding that students do not perceive lectures to be useful for their academic success, the findings in this study suggest that students find lectures to be boring and not stimulating. Media are seen to provide more stimulation than their lectures, a finding in agreement with Leysens *et al.* (2016). Their media use is directly triggered by being disengaged, by boredom. A prominent example provided at this stage is the use of a mobile phone as a medium to alleviate the boredom that they experience in class. As mentioned in the literature review, this idea of boredom as a trigger for media use has received some prior attention. For instance, in an interview based study Blackburn *et al.* (2013) determine that for many students media are used as a coping mechanism for boredom within lectures. Similarly, the findings from earlier focus groups conducted by Annan-Coultas (2012) also suggest that in-lecture media use is as a consequence of boredom and disengagement with lectures. Finally, Flanigan and Babchuk (2015) show that use of social media, a form of media, is commonly used as a method to combat boredom in a lecture. This finding within this study, as well as the findings of these previous studies raises the possibility that the manner in which students' attention is engaged in lectures is not sufficient to compete with the level of engagement offered by media.

In addition to disengagement, students' peers present an extrinsic trigger initiating media use on their part. Prior studies have shown the role played by the surrounding peer group in a structured lecture setting in facilitating media multitasking behaviour (Fried, 2008; Blackburn *et al.*, 2013; Sana *et al.*, 2013; Williams and Cox, 2011; Kay and Lauricella, 2011). The findings obtained in the current study further support this idea. This behaviour manifests in two ways: either students feel compelled to observe the media use of those

around them, or, the use of others initiates their own personal use of media in a lecture.

Another form in which the use of media by others prompts their own use is notifications. External notifications or alerts attracting students' attention trigger further off-task media use. Over and above the personal and social incentives previously discussed for engaging with media, the finding that frequent media multitaskers have a greater proclivity for bottom-up attentional control (Ophir *et al.*, 2009), could account for the extrinsic triggering of their media multitasking behaviour.

To conclude the discussion on triggers initiating media multitasking behaviour, two forms of triggers were found to precipitate this behaviour: intrinsic and extrinsic triggers. In line with the notion of an attention economy, students' media behaviour is initiated by a reasoned evaluation of the implications of such behaviour. In addition to this, media use is so central to their lives, that in many cases, using media has become a habit. In terms of extrinsic triggers, it is shown that, typically, university lectures do not provide sufficient engagement. In addition to this lectures are not seen as a necessity to achieving academic success. Both of these factors prompt media use. Finally, media use in structured lecture contexts is frequently as a result of the behaviour of the surrounding peer group.

6.3 Behaviour

The third research question presented in this study sought to determine what form of behaviour students exhibit when using media in both structured and self-regulated academic contexts. Through analysis of the data gathered in the focus groups this study finds that substantial contextual differences exist in terms of students' media behaviour. Students' media multitasking behaviour in a structured lecture context differs considerably to that of a self-regulated context. In the following section three key findings are discussed, one relating to their behaviour in structured contexts, one to self-regulated contexts, and, one a general behavioural pattern across both contexts.

In structured academic contexts students' use of media is predominantly off-task. This finding should come as no surprise, following the previously discussed findings in this study. Students do not feel that concentrating in a lecture is necessary to succeed academically. Because students are disengaged and bored with their lectures, they use their media for purposes unrelated to the lecture. Frequently described uses for media in a lecture include: social communication, social media, gaming, information searching, microblogging, news reading and general browsing. This finding relating to specific activities is consistent with those obtained in many other studies within this domain (e.g. Fried, 2008; Junco, 2012; Burak, 2012; Junco and Cotten, 2011; Leysens *et al.*, 2016). Another finding in this regard is the indication that students find it difficult to use media in a structured lecture setting in a manner that supports their learning.

Students view self-regulated study as far more beneficial to their academic success than concentrating in a lecture. For this reason, the media multitasking behaviour exhibited by students in self-regulated contexts differs to that displayed in a structured lecture context. In self-regulated contexts students limit the possibility of being distracted by media in their environment. They actively attempt to remove media from their vicinity, so as not to be tempted to engage with these media. This finding again relates to an awareness of the implications of media use, and, to a reasoned evaluation of the costs associated with such use. This finding, is congruous with those of David *et al.* (2015), who find that a majority of self-regulated study time is spent on academically related tasks. A possible explanation for these findings draws upon the research of Calderwood *et al.* (2014). In an experimental study Calderwood *et al.* (2014) determine that a decrease in the frequency and duration of media multitasking is as a result of higher task motivation and self-efficacy. Because students understand the value of self-regulated study, they possess a greater level of task motivation and self-efficacy, decreasing their desire to engage in off-task, media multitasking behaviour. This behaviour is once again an example of the more deliberate, System 2 thinking described by Kahneman (2011). In addition to this finding, the data obtained in this study indicate that if media are present in students' study environments, they are generally either used for task-related purposes, or, used as a reward for staying on-task for a particular period of time. Off-task media access is used by students as an

incentive when studying to motivate them to concentrate on their work.

Finally, the current study found that students often spend longer than they intend to engaging with media. This is due to a ‘snowball effect’. Media provide such a stimulating reality that their attention is constantly being attracted by other elements within this mediated reality. An original intention to only spend a limited amount of time using media is forgotten, and, for students a significant amount of time passes by while using media without realising or intending to do so. The snowball effect of media use occurs across contexts. The mediated experience of reality is so captivating, so stimulating that removing oneself from this reality requires a substantial degree of self-control. When immersed in a mediated reality, students revert to System 1 thinking (Kahneman, 2011), automatically hopping from one stimulus to the next. This snowball effect, has not been described previously in the literature.

Within this section focusing on students’ media use behaviour in academic contexts three key findings were discussed. From these findings, it has been observed that there is a difference in behaviour between structured lecture contexts and self-regulated contexts. In structured contexts students primarily use media for off-task purposes. However, in self-regulated environments, deemed more valuable to academic success, media use is restricted. In these contexts media are primarily used for task-related purposes or as rewards for focused study. Finally, this study indicates that media are often used for a greater period of time than originally intended.

6.4 Conclusion

From all of the findings uncovered relating to beliefs, triggers and behaviour, the principle implication of the findings is, that students’ use of media is based on a reasoned evaluation of the impact of their media multitasking behaviour. In this way, it is clear that they are aware of any cognitive and academic costs arising from such behaviour. This finding is the primary reason why contextual differences in behaviour were reported between structured lecture contexts and self-regulated contexts. Students attach a different level of academic signifi-

cance to each of these environments. The following narrative summarises this finding:

Students value their academic performance. In addition to this, they have come to crave engagement and stimulation. Typically, students feel that university lectures are not necessary for succeeding academically. Furthermore, lectures do not provide a sufficient level of active engagement and academic value to dissuade them from engaging in media multitasking behaviour. For these reasons, students turn to the most readily available, ubiquitous, attractive and accessible alternative — media. When they are engaging in media multitasking behaviour they are not taking in what is happening around them in the lecture. Media use impacts their ability to concentrate and retain information provided in a lecture. In self-regulated contexts, however, concentrating on academic study is seen to contribute significantly to academic success. Therefore, students place a much greater level of emphasis on restricting their access to media when engaged in self-study.

This finding has important implications for the understanding of students' mediated study experiences. For instance, it is not simply the case that media are blindly chosen over concentrating on a lecture. This decision is rationally taken — the benefits and drawbacks associated with this decision are carefully considered. Furthermore, the finding supports the existing knowledge that students are aware of the cognitive and academic consequences of media multitasking. Another important issue raised by this finding is the value of lectures in comparison with that of self-regulated study. It is not simply aspects inherent in the medium that contribute to media engagement, there are important contextual factors instrumental in precipitating media multitasking behaviour in academic situations.

In addition to the above primary finding, this study identifies the existence of a snowball effect, occurring across all use environments with media. While the previously discussed finding highlighted the importance of contextual factors in contributing to media use, this finding casts attention towards the medium. While it may be the case that contextual factors are primarily responsible for initiating use instances, this finding indicates that it is factors inherent in the medium that facilitate ongoing engagement with media, prolonging use instances.

These two primary findings build on the existing body of knowledge within this domain, further strengthening the understanding of the impact digital media plays in shaping the cognitive, behavioural and social reality experienced by students in today's digitally mediated world.

6.4.1 Proposed Model

In order to describe students' media multitasking behaviour in structured and self-regulated contexts, a model representing the relationships observed in the data is proposed. Within the model determinants are classified into two categories: contextual properties and subjective properties. Subjective properties refer to properties of the subject, in this case, the student. Similarly, contextual properties refer to properties of the context or environment in which the subject is present.

Within contextual properties three constructs are represented: peers' MM, referring to the media multitasking behaviour of the surrounding peer group; lecture quality, referring to the engagement offered by the lecturer and the lecture; finally, media presence refers to the extent to which personal media are present in the particular environment. Within the subjective properties category the five constructs represent: students' behavioural beliefs about the specific nature of the media multitasking behaviour they engage in, the degree of social media involvement in their lives, their beliefs about the academic value of the lecture, their satisfaction gained from media use, and, the social norms present in the environment. Within this model the four dependent variables describe the two types of media use observed in this study, for each context: structured on-task use, structured off-task use, self-regulated off-task use, and, self-regulated on-task use. It is also shown that structured off-task use is a determinant of self-regulated on-task use.

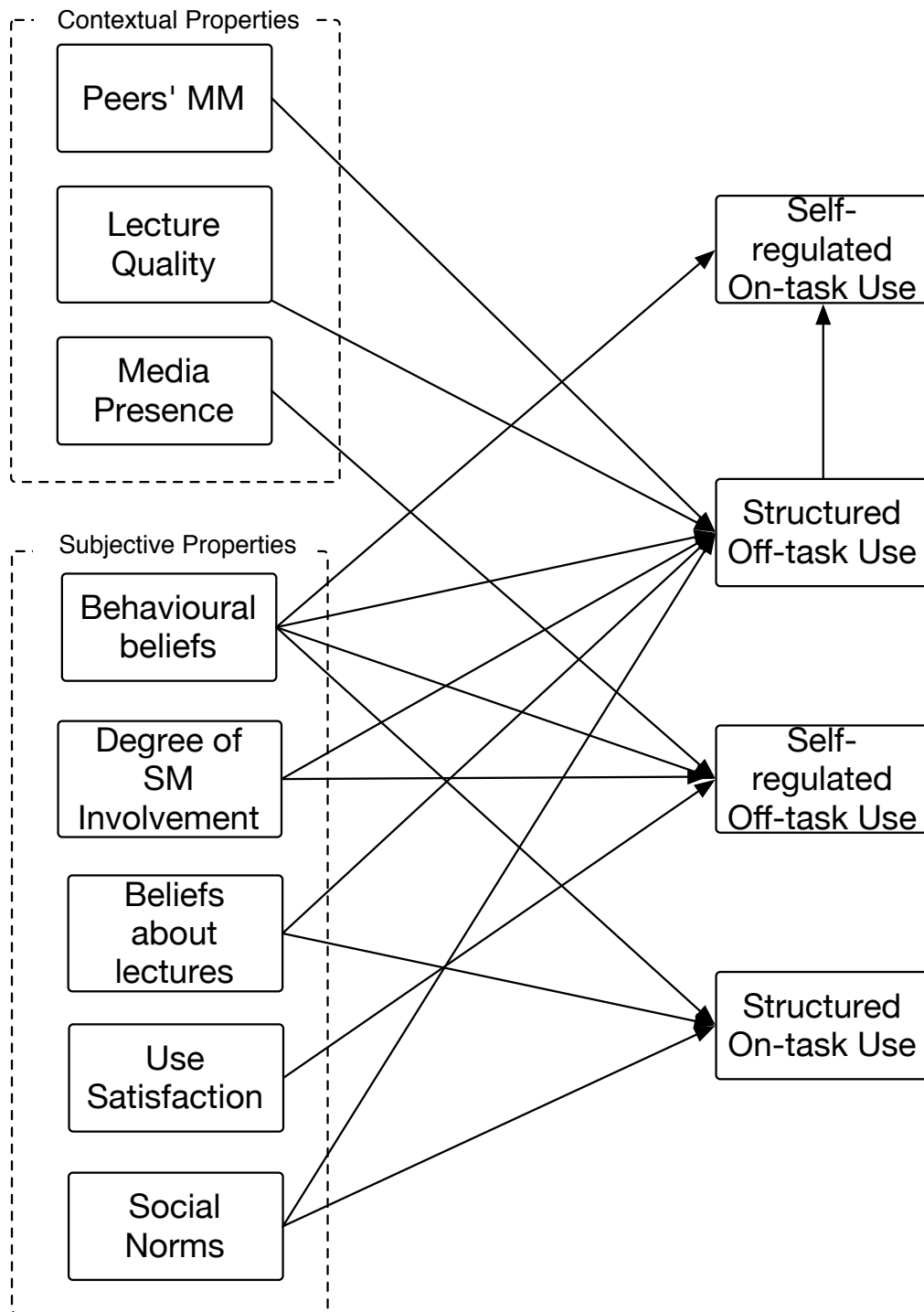


Figure 6.1: Proposed model describing the relationships observed in the data.

Chapter 7

Conclusion

The purpose of this study is to explore undergraduate students new media usage patterns whilst in academic contexts. This is conducted with the aim of contributing to the growing body of knowledge within this domain focusing on media multitasking and cognition. Through a review of the available literature in this area it was determined that there is a strong understanding of certain aspects within this field. However, there has been little focus on understanding students' mediated study experiences. For this reason, an empirical, qualitative study was conducted, focusing on three key areas relating to students' use of media in academic situations, namely: students' beliefs, behavioural triggers, and behaviour itself.

In order to investigate these three components of undergraduate students' new media usage patterns a qualitative, interpretivist approach was adopted. This study consisted of two phases. In the first phase a narrative was constructed through reviewing literature relevant to the study of students' media behaviours. This narrative served to provide a theoretical justification for the study as well as to aid in structuring the search for gaps in the current understanding of this research problem. Following this phase of research, the second phase involved an empirical, qualitative investigation of undergraduate students' new media usage habits in various academic contexts. A focus group methodology was employed in order to gather the necessary data to address the three primary research questions outlined in Section 1.3. This methodology was not found to be common within this domain of research, therefore, there existed the potential for novel insights to be generated. The data gathered in

the focus groups was analysed using a thematic analysis approach.

The findings emerging from the thematic analysis were grouped into a number of key themes, each describing various aspects of the data relating to students' beliefs, behavioural triggers, and behaviour. Through these findings, the primary research questions were addressed.

Synthesizing all of the various themes and findings within this study, two primary findings are put forward in this study. First, students' use of media is based on a reasoned evaluation of the impact of their media multitasking behaviour. This finding holds significant implications for the current understanding of students' mediated study experiences and media multitasking behaviour, providing novel explanations for contextual differences in media behaviour. Second, this study identified the existence of a snowball effect for prolonged media consumption behaviour.

The first primary finding describes contextual factors primarily responsible for *initiating* media multitasking behaviour. The second primary finding demonstrates that it is the characteristics of, and factors inherent in the medium itself that facilitate ongoing, *extended* engagement with media. Finally, a model describing the observed determinants present in the data is proposed. This model seeks to provide a description of students' media multitasking behaviour across structured and self-regulated academic contexts.

7.1 Recommendations

Extending from the research discussed in this study, a number of recommendations for practice as well as future research exist. In this section, these suggestions are briefly described. First, normative suggestions for pedagogical practice are put forward. Subsequently, recommendations for future research directions within this domain are outlined.

7.1.1 Recommendations for Practice

The findings in this study provide sufficient grounds for a number of normative suggestions for pedagogical practice within a university setting to be made. As

has been shown in this study and much of the literature reviewed, engaging in media multitasking behaviour comes with a cognitive cost. Students are aware of this cost. When designing university lectures this notion needs to be taken into account. Lecturers need to be aware that they are existing in an attention economy, competing for the allocation of a scarce resource. At present, students do not see the value of attending to a lecture. This raises two options. Either, the concept of a lecture needs to be re-evaluated. Or, how a lecture is structured and how students attention is attracted needs be adjusted. In terms of option one, the breakdown of content between self-study and lecture material needs to be considered. In terms of option two, the experience and engagement provided in a lecture needs to be drastically overhauled.

Lectures need to be designed in such a way as to engage and stimulate students attention, reducing their desire to switch off and drift to media as an alternative to boredom. Students do not media multitask simply out of a desire to use media. They rationally evaluate the impact of their decision, considering the costs and benefits involved. If a lecture were deemed as important as self-regulated study, the findings of this study suggestion that the frequency and desire to media multitask would decrease.

7.1.2 Recommendations for Research

This study addressed a number of issues existing within this research domain. However, there still exist a multitude of future research possibilities within this area. Within this section a number of suggestions for future research are outlined. This is achieved by first acknowledging limitations inherent in the current study. Following this recommendations for future research are provided.

7.1.2.1 Limitations of the Study

In any academic research endeavour certain limitations exist. Limitations exist with respect to the research design. In Section 4.2.1 the suitability and

limitations inherent in the chosen focus group research methodology are acknowledged. However, at this stage it must be noted that this methodology holds several limitations particularly impacting the generalisability of the findings. To follow, a brief discussion of limitations existing within this study is provided.

1. The generalisability of the findings produced in this study is limited owing to the small sample size, as well as the characteristics of the sample. For instance, only four faculties and ten majors were represented in the sample. Similarly, the sample were relatively homogenous, limiting the scope for dissenting or unexpected opinions and experiences to become apparent.
2. All data analysed in this study is self-reported data, provided live, in the presence of the primary researcher. In this regard, while it is certainly valuable to understand students' opinions, expectations, and rationalisations about their experiences and behaviour, there exists the opportunity for various biases (selective memory, telescoping, attribution, and exaggeration) to taint their recollections and narratives.
3. To a certain extent, there exists the possibility of a degree of moderator bias owing to the structure of how the focus group discussions were guided - potentially directing discussion towards certain topics. This same limitation carries through to the analysis and interpretation of the data. There exists the possibility for personal and cultural biases to impact upon the interpretation of the focus group data, steering analysis in a particular direction.

7.1.2.2 Suggestions for Future Research

Extending from this study, a number of future research directions exist, for instance:

1. Future research should aim to determine the specific factors inherent in media that attract and engage students' attention. Through adopting an experimental approach, this line of research could isolate and further

understand the particular elements or characteristics in media creating the pull for use expressed by students.

2. Further research should be undertaken to investigate the finding that students' media multitasking behaviour is as a consequence of a process of reasoned evaluation. A study employing an interview methodology would be able to delve deeper into the motivations, and rationalisations possessed by students.
3. To develop a complete understanding of the triggers underlying media multitasking behaviour, additional studies employing an experimental methodology are necessary.
4. The model proposed in Section 6.4.1 should be tested in future research. At this stage, it is accepted that a specific instrument suitable for testing this proposed model still requires development and testing itself.

7.1.3 Conclusion

The pervasive ubiquity, and extensive media use within educational institutions continues to raise profoundly important questions about the impact of such media within these contexts. This study is but one step in the push to understand the impact of a digitally mediated experience of educational reality. The findings put forward in this study build on the existing body of knowledge within this domain, further strengthening the understanding of the impact digital media plays in shaping the cognitive, behavioural and social reality experienced by students in today's digitally mediated world. However, much work is still required in order to fully comprehend the consequences of a digitally mediated existence.

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