

An empirical study of the correlation between online media use and academic performance

by

Jean-Louis Leysens



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Supervisor: Dr D.B. le Roux

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Declaration

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Abstract

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J Leysens

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Modern online media has reached high levels of engagement amongst a particular group: the Millennials. This group display characteristically high levels of immersion with online media and have interspersed use with daily activities in such a way that some studies have identified *constant* use. Online media represent the possibility of many different activities for the user. Some activities may be described as relatively hedonic or utilitarian—an area of use intention which this study investigates. Due to the high levels of engagement amongst the Millennials (typically young adults or teenagers) the effects of use has attracted considerable amounts of research as documented in the literature reviewed. This research draws particularly from efforts by Assoc. Prof. Reynol Junco in this area. In this study, the task performance as indicated by academic performance is a core focal point. A significant, negative correlation was demonstrated for media use in the lecture context. It is conjectured, from the findings, that the best explanation for online media's effect on task performance is limited attentional resources which create a cognitive bottleneck.

Uittreksel

'n Empiriese studie van die verhouding tussen gebruiksvlakke van aanlyn media en akademiese prestasie

J. Leysens

Tesis: MA Socio-Informatics

Augustus 2016

Gebruiksvlakke van moderne media tussen lede van die *Millennial* groep het 'n nuwe hoogtepunt bereik. *Millennials*, as 'n groep, toon hoë vlakke van interaksie met moderne media terwyl hulle met daaglikse aktiwiteite omgaan. Sekere studies het al *konstante* gebruik van moderne media tussen lede van dié groep identifiseer. Moderne media stel die gebruiker aan 'n wêreld van moontlike *aanlyn* interaksies bloot. Die interaksies kan op 'n kontinuum van hedonies–utilitaris geplot word. Die hoë gebruiksvlakke het, ondermeer, baie navorsing, soos aangedui in die literatuur studie, gelok. Hierdie projek vind redelik op Prof. Reynol Junco se werk in die area steun. Dus is die verhouding tussen taak uitvoeringsvermoë en akademiese prestasie 'n fokus punt. 'n Negatiewe verhouding tussen media gebruik tydens lesings was in die data weerspieël. Die beste teoretiese verduideliking vir die verhouding is dat mens onderdanig is aan beperkte kognitiewe hulpbronne wat 'n kognitiewe bottelnek vorm.

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Chapter 1

Introduction

In his book *The Shallows*, Carr (2010) argues that online media is having a profound effect on humanity's critical thinking ability. He argues that this effect is due to the sporadic and superficial information consumption strategies that online media encourages. Carr (2010) states that the Internet and its associated technologies have so intimately been woven into users' lives that its constant presence has become a source of distraction and interruption unlike any other. Research efforts in the area of interaction with online media (Junco and Cotten, 2011*b*; Judd and Kennedy, 2011; Junco and Cotten, 2012, 2011*a*; Junco, 2012*a*) have discovered a significant relationship between task performance and online media use levels. The current research project has been prompted by such empirical evidence of the effects and correlations as mentioned above. Leaps in technological advancement (to be presented in section 1.1) and the constant evolution of theories regarding Human-Computer Interaction (HCI) (Davis, 1989) over the past two decades are indicative of an underlying change regarding the effects of media which warrant further investigation. Studies concerned with the correlation between online media use and task performance focussed on a particular demographic¹ which is prevalent amongst university students.

This project proceeds by first contextualising the research aim; reviewing and presenting relevant literature in chapter 2; discussing methodological considerations and, finally; analyzing and discussing findings from data. The project attempts to

¹Any individual who has grown up with access to online media.

address a gap in recent research regarding the effect of online media use on task performance by also considering use motivations as will be discussed in coming sections. This latter point forms a corollary argument to the overarching narrative which is concerned with use of online media and its effect on users.

1.1 Background

Economist Robert Solow theorised that technological advancement is a key enabler for sustainable growth in national output, which arguably enabled population growth witnessed over the past two centuries (Solow, 1957; Roser, 2015). The recent past has seen growth unlike any other time in human history. On this massive wave of growth technological advancement has introduced new dimensions to the everyday experience of the individual.

The everyday experience of the individual is understood as a conglomeration of meaningful phenomena one perceives and which, at the same time, is constructed and maintained in a symbiotic manner by the same individual. The conceptualisation as stated here leans on thinking regarding the individual's *life-world* as articulated by Husserl (1970). The use of some technology is not just “using it”, it is also making sense of it and identifying use cases for it. In this way, the growth and subtle, but powerful, permeation of various technologies have been interwoven into the *life-worlds* of its users. A subset of technologies which have affected individuals' *life-worlds* include:

1. The invention of the printing press enabled the mass production of books and manuscripts that facilitated the spread of information in an accurate and distributed fashion (Buringh and Van Zanden, 2009).
2. Industrialization and mass production pushed back the limits of what can be achieved with more or less the same amount of inputs by automating processes that would typically require human input. This also served to decrease human mortality rates and create an environment profitable for humans to survive, and thrive.

3. The progression from mechanical, to analogue and finally to digital computing leading to the ongoing process of miniaturisation of computing technology that made possible the personal (electronic) computer that replaced the “human computers” (Copeland, 2008) of the 1920s.
4. Networked computers and information. The basic foundation of the World Wide Web is the Internet which is an infrastructure of interlinked devices that communicate via certain protocols that can, and are employed, for varied purposes.

The modern individual, then, is one who enjoys the benefits and, as Carr (2010) would argue, the costs of the accumulation of technological advancement. Whilst technology at large refers to a wide range of phenomena, the focus here is on Information Technology (IT) in particular. Adams and McCrindle (2008) provide anecdotal evidence of the new questions IT have created in social, political and legal issues. The effects of certain IT have been manifest on a global scale due to worldwide computer networks, most notably the Internet. This research is prompted by the massive popularity of content distributed via the Internet and consumed by users via online media. The popularity of these media (and the content they convey) makes a compelling case for an investigation into the effects use (of the media) has on the user, as the following paragraphs argue.

Perrin (October 2015) show that 65% of American adults make use of online Social Networking media. Their findings are based on 27 surveys conducted over the course of 10 years (2005–2015). These surveys yielded 62 000 responses in total. The average age of respondents was a salient demographic variable: (young) adults between 18–29 years of age were more likely users of the Internet and Social Networking media. Of this age group, 90% were users of online media. This increased 78 points over the 10 year longitudinal study which reported initial use levels of online media for young adults at 12%. Clearly, significant changes in use patterns have occurred in the recent past. Social Networking media represents a group of online media that has received much attention in the literature for this reason (Kirschner and Karpinski, 2010; Burke *et al.*, 2011; Quan-Haase and Young, 2010). The age grouping (18–29) is also a significant group in this research project.

In the wake of these findings, speculation into the effects of online media use has indicated both negative and positive effects. For instance, Sparrow *et al.* (2011) explain that use of online search functionalities may be affecting users' memorisation strategies in non-trivial ways. With access to vast amounts of structured information "as an external memory system" (p. 776) *Google* is extending the individual's knowledge base. However, use of *Google* may, simultaneously, be removing the necessity to memorise information and instead encourage the learning of information retrieval strategies.

Students, typical members of the age grouping mentioned above, have displayed high use levels of online media on campus whilst studying and in lectures (Junco and Cotten, 2012; Junco *et al.*, 2011; Junco, 2012a; Aagaard, 2014). Junco has engaged in a large number of studies which examine online media users' task performance ability by examining academic achievement marks. An academic mark presents a unique, quantitative mechanism for measuring task performance. Junco's findings successfully demonstrated that online media use can be a negative predictor of academic performance, albeit to varying degrees across his studies.

Dahlstrom and Bichsel (2014) reviewed data of 75 306 students distributed across 216 institutions in 15 different countries. Their sample indicated that 99% of students own an Internet-enabled device. Of these 99%, 92% own additional or supplementary devices. 75% of respondents identified their laptop as an important aspect of their academic success. High usage levels of media were discovered amongst the population and that it is "embedded into students' lives" (p. 8). These statistics reinforce the need for investigations into the avid Internet user. This study seeks to extend this particular body of knowledge by conducting a survey-based study in the South African context.

The recent past has witnessed technological advancement which brought new forms of content distribution and media. The mass production of the written word changed the way information transferred and increased archival capacities: sharpening the accuracy of inter-generational information transfer. So, also, other forms of media such as the radio, the personal computer, television and the Internet have further extended capabilities with regards to communication, information transfer and sharing. Some older forms of media have not been lost with the introduction

of new media but have taken their places in a panoply of increasingly rich media. Documenting and studying the effects of online media use, then, should demonstrate the underlying changes that are perhaps not clearly visible at face-value.

1.2 Research Problem

As stated in the opening section of this chapter, this research project is primarily interested in the effects of online media use on the individual. The case made above indicates the profound effect of technological advancement on the every-day experience of the individual. Arguably, high levels of technological permeation have created an *always-on* society of users. Concerns regarding the effects of online media use have been studied in pedagogical settings where an academic mark is taken as an indicator of performance. As explained in the background section, online media offer channels of communication which display very high use levels. The concern indicated by Carr (2010) is that the gains of online media use tend to obfuscate subtle costs. Costs, in this context, may be expressed as the forgoing of tasks which have been automated away from human minds such as the aforementioned shift in memorisation strategies which forgo potentially valuable, thought-stimulating activities. Alternatively, the costs can be expressed as an intrusion on our ability to focus. The overarching question of this project, then, is: *does use of online media negatively affect task performance?* More specifically, is there a correlation between use of online media and task performance that point to an underlying causal mechanism².

1.2.1 Hypotheses

In light of this particular aspect the following hypotheses were formulated:

H₁ Online media use levels, in the general context, will correlate negatively with academic performance.

²The primary concern here is the mechanism of attentional control and how it is potentially affected by use of online media.

H₂ Online media use levels, in lectures, will correlate negatively with academic performance.

H₁ gives an indication of use in general, which would perhaps imply a more lasting or permanent effect of online media on how information is consumed by users. This potentially points to incompatibilities between modern pedagogical strategies and the way in which online media presents information. H₂ expresses an expectation directed toward *attentional control* (Van der Schuur, Baumgartner, Sumter and Valkenburg, 2015) and how online media use, through its effect on attention, may arguably be affecting task performance.

1.2.2 Research Design

The research project uses a survey as collection instrument. The survey, conducted electronically, was sent to invitees based on their current year of study. The reasoning behind this decision was that first year students would not be eligible for participation in this project because they are not in a position to give an indication of their academic performance for their past year of study. Non-final year and final year students were thus identified as potential participants.

After the data had been cleaned and necessary calculations for scale variables were conducted bi-correlational analyses were conducted to address the hypotheses. Descriptive statistics and correlational analyses are presented in chapter 4.

1.3 Layout of Chapters

A succinct review of recent history and economic theory grants insight into the powerful, transforming effect that technological advancements have had on individuals. The background of this project introduced the prevalent use levels of online media amongst young adults. With the focus on attention, task performance and media use the following chapters are presented as follows:

Chapter two covers relevant literature. The first aspect covered in the literature review is the phenomenon of technology use, particularly predictors of technology

use. The focus then shifts to relationships and attitudes that exist between users of technology and online media. In this way, literature regarding different *use intentions* are discussed. Finally, the latter, and largest part of the literature review presents findings and theories relevant to the effects of media use in the general and academic context.

Chapter three presents the research method and design. A survey method has been employed and therefore the arrangement and construction of the questionnaire is given special emphasis. This chapter draws from similar projects to inform design decisions³.

Chapters four and five are dedicated to analysis and discussion of findings. The final chapter presents implications of the research, limitations and future directions that have emerged from this project.

³Particularly the work of Reynol Junco in this area.

Chapter 2

Literature Review

This chapter presents literature addressing technology adoption and the effects of online media use. Valuable insights or frameworks profitable for understanding the relationship between online media use and its correlation with academic performance is given special consideration. Additionally, technology use strategies are also discussed where needed.

The second section is focussed on a general review of technology adoption literature and, in particular, technology adoption theories. These theories are based on evidences which describe the modern user and their interaction with ISs. The section thereafter reviews literature addressing user intention on the hedonic–utilitarian continuum. The sections which follow these presents literature that investigated the correlation between media use and task performance. Academic performance is considered a special case of task performance and the literature directly concerned with this phenomenon is discussed in the final section. However, some definitional considerations are presented first.

2.1 Technology, Information Systems and Media

Before unpacking the literature mentioned above, this section provides clarity for the following, recurring concepts: *Technology*, *Information Systems*, and *Media*. This is done in order to acknowledge ambiguities in the literature to be reviewed and to establish working definitions for the duration of this thesis.

2.1.1 Technology

As discussed in section 1.1, technological advancement has introduced many changes in the every-day life of the individual. Advances in this area potentially span from the production of books to the establishment of the Internet. This project, however, seeks to investigate a particular class of technology and it is therefore useful to establish the exact meaning of “technology” when it appears in this thesis. Wood *et al.* (2012) point to *digital* technologies as a class of technologies which communicate or convey information. A complement to this conceptualisation is that of “information technology” (Venkatesh *et al.*, 2003, p. 427). For the remainder of this thesis, the term technology always refers, unless otherwise specified, to digital, to information technology as used by the above cited authors.

2.1.2 Information Systems

Alter (1999, pp. 5–6) states that Information Systems are often entangled with organisational contexts. The measurement of value which an organisation gains from Information Systems is a topic which has received much attention the literature (Venkatesh *et al.*, 2003; Davis, 1989). Both Van der Heijden (2004) and Alter (1999) recognise that Information Technology is an inextricable component of an Information System which involves human-computer interaction to varying degrees. For instance, Ernst, Pfeiffer and Rothlauf (2013) consider *Facebook* to be an instance of an Information System. Although different papers may not share their definition of information system, the shift to the modern milieu has introduced aspects to the concept that are definitely beyond the office or organisational context. For the purposes of this discussion, and to avoid an area in the literature which would be beyond the scope of this project, an Information System is viewed more along the lines of Ernst *et al.* (2013). Thus, an Information System can include various technologies, and could even be construed as a form of technology itself. But the reliance on digital technologies for operation, as described above, is a central aspect of what is meant by Information System.

2.1.3 Media

Ophir, Nass and Wagner (2009) define media as “stream[s] of content” (p. 15583). This is the general definition of media which this project employs. This definition of media can, however, also refer to books and newspapers (Katz, Blumler and Gurevitch, 1974) which are distinguished, for this discussion, from *online media*. This term denotes streams of content which are delivered digitally and include media such as *Facebook*, *YouTube* and *Google*. Digital, here, also implies that these media are forms of technology. The fact that these media are also used to relay content (particularly of an informational nature) implies that these media also represent information systems. However, the specialised meaning for *online media* as described above is used unless a particular theory dictates otherwise for purposes of elucidation.

2.1.4 In Summary

The above concepts were identified as potential sources of ambiguity in the ensuing discussion. As was mentioned, *technology* can refer to a very broad range of phenomena and certainly encompasses both *ISs* and *media*. All of the *media* referenced in this study can also be considered a form of *IS*. As a point of clarification, therefore, when the term *online media* is used in the rest of this discussion it refers to web-based *ISs* such as *Facebook*, *YouTube* or similar. When *technology* or *ISs* are mentioned they are used faithfully to the theory or framework being discussed.

2.2 Theories of technology adoption

2.2.1 Introduction

The following literature is presented with particular considerations: what constructs can accurately (and meaningfully) predict media adoption; what are the implications these constructs may have on the development of media; and, ultimately, what are the consequences for users of online media. Modern users of online media display high levels of engagement and theories of technology adoption

(including online media) will clarify motivators for use reported in the literature. The current research project is concerned with users that are beyond the adoption phase, but it is contested that certain elements which contribute to user adoption also contribute to continued, habitual use. Thus, popular theories are first presented and discussed.

2.2.2 The Theory of Reasoned Action and the Theory of Planned Behaviour

The Theory of Reasoned Action (TRA) posits that only a few constructs can account for, predict and influence the behaviour of individuals (Becker, Randall and Riegel, 1995, p. 621). The theory states that intention directly precedes action or behaviour. Intention, from the individual's perspective, is determined by two sub-constructs: attitude toward action and perceived social (or subjective) norms regarding the behaviour (Becker *et al.*, 1995, p. 621). Sheppard *et al.* (1988) carry out a meta-analysis of Fishbein and Ajzen's model of reasoned action in which merits and limitations of the theory are unpacked. A key feature of the model is the enacting of, and determinants around, a single instance of behaviour where the actor operates in a *friction-less* environment (p. 326). Choice is subsumed within the intention formation process. This process involves the actor reflecting on his or her attitudes and social (or subjective) norms over each set of alternatives (Sheppard *et al.*, 1988, p. 327). An interesting divergence between "intention" and "estimation"(pp. 326–327) is explained in this theory. Intention to perform a given behaviour may exist, but the overall estimation of success (or failure factors) are such that the performed behaviour misaligns with the originally desired or intended behaviour.

Ajzen and Madden (1986, p. 455) identify the aforementioned assumption of full volitional control as the most salient limitation in TRA. This led to the formulation of the Theory of Planned Behaviour (TPB) (Ajzen and Madden, 1986; Sheppard *et al.*, 1988). One form of TPB focusses on motivational implication with the added construct of "perceived behavioural control", and how this interacts with intent. This allows for environmental or circumstantial variables to be encompassed in the model, making its predictions more robust.

The focus on intent and perception as a predictor of technology use has emerged from an experimental social psychology background that informed TRA and TPB. The following Information System (IS) oriented model is a direct descendent of TRA and TPB and is expanded upon in the following section.

2.2.3 The Technology Acceptance Model (TAM)

When Davis (1989) introduced the underpinnings of the TAM it was to address a particular, IS research issue by equipping researchers with variables that predict end-user IS¹ use. The ISs concerned were typically situated in the work environment and are employed as a means for the achievement of *extrinsic* task completion (Wu and Lu, 2013; Davis, 1989). In this context, greater perceived usefulness and the degree to which use is “[free] from difficulty or... effort” (Davis, 1989, p. 320) predicts higher use of a given IS. This response to the lack of better measurements for predicting system use was primarily focused on *utilitarian*² motivations of use. Adaptations and expansions to the model were prompted by this apparent oversimplification (Lee *et al.*, 2005; Venkatesh *et al.*, 2003). As opposed to TRA and TPB, the TAM was tailored for IS contexts but similarly focuses on user perceptions and intentions to predict use.

Revisions to the TAM are a response to criticisms regarding context-related limitations of the model. The TAM2 was specifically designed to deal with environmental idiosyncracies. In particular, where usage of an IS is non-voluntary (Venkatesh *et al.*, 2003, p. 428) and where cross-cultural applicability was inept (Straub *et al.*, 1997). Despite these limitations the TAM (pre the TAM2) has become a prevalent theory in IS use research (Wu and Lu, 2013; Burton-Jones and Straub Jr, 2006; Rosen and Sherman, 2006). A well documented addition to the TAM has been the constructs of perceived enjoyment (PE) and perceived ease of use (PEU). These additions introduced *hedonic* motivations of use and made the TAM more articulate. However, PE has generally been a lower predictor of actual system use than perceived usefulness (PU) or PEU. This was especially true of systems used in

¹Here IS is used to mean a form of technology but particularly one the involves Information Communication Technologies.

²This concept is explored further in section 2.3.

the workplace: showing that the predictive value of these measures are subject to contextual factors such as user perceptions of the IS. Interaction with ISs that operate outside (or beyond the workplace), such as browsing the World Wide Web, are, arguably, more orientated toward enjoyment than productivity and would, therefore, be more appropriately measurement by PE constructs (Van der Heijden, 2004, p. 696). Despite these efforts, Benbasat and Barki (2007) argue that the TAM, as a central theory in IS research, has become obtrusive and created lethargy in knowledge accumulation in the field. Arguably, this is due to an over-emphasis on certain aspects of IT acceptance behaviours at the cost of others; such as cognitive absorption, trust and enjoyment (Benbasat and Barki, 2007, p. 213). The critique regarding this misplacement of emphasis and lethargy in knowledge accumulation are worth further unpacking.

The (later) TAM stated that *behavioural intentions*, captured in PE and PEU, are important predictors system adoption. The TAM would, however, predict hedonic systems to be counter-productive due to the divorce in use purpose from office, utilitarian ISs (Rosen and Sherman, 2006, p. 1218). Rosen and Sherman (2006), posit a model that examined use of hedonic ISs; running counter to the TAM's traditional use cases. Their hypotheses included the following: "perceived number of users is positively associated with perceived enjoyment in hedonic information systems that include social aspects". This line of inquiry regarding system use indicates a shift in TAM-adapted models to the contemporary use context which features social elements. Their research project buttresses the relevance of PE and PEU as measures of IS adoption and use as well as equipping TAM with a more articulate way of predicting observed phenomena.

A survey study performed by Lee and Lehto (2013) applied the TAM to predict use of *YouTube* for satisfaction of procedural learning needs. In this context, focus on the user's intentions as the primary predictor of online media use provided insight into the relationship between user satisfaction with a technology and adoption. The study acknowledged the social elements present in YouTube and found their extended model to predict 43.8% of use intention variance (Lee and Lehto, 2013, p. 204). Additional variables were added to the TAM framework such as task-technology fit and *YouTube* self-efficacy (p. 194). In particular, user self-

perceptions and autonomy in selecting a tool that will most satisfy goals. Lee and Lehto (2013, p. 204) concluded that the TAM displayed moderate levels of overall applicability for the methodology. The current study being undertaken, as a corollary point, seeks to test the assumptions of user perception regarding use intention which Rosen and Sherman (2006) critiqued the TAM on. The system of assumptions underlying the TAM: use intention strongly predicting actual use and the primacy of goal satisfaction may not have been appropriately measured or adequately described the way in which online media users approach technologies such as *YouTube*.

Benbasat and Barki (2007, p. 213) argue, furthermore, that there are aspects of IS acceptance, such as design and implications of research, that have not been addressed by the TAM in more recent studies. Turner *et al.* (2010) performed a systematic literature review that investigated whether or not the TAM predicted *actual use*. Particular TAM variables: Behavioural Intention (BI) Perceived Usefulness (PU) and Perceived Ease of Use (PEU) were studied³. PEU is a construct that can be traced back to Innovation Diffusion Theory (IDT) stemming from a sociological background that was concerned with studying the spread of innovations (Venkatesh, Morris, Davis and Davis, 2003, p. 431). Throughout the adaptations of the TAM that made use of all of the aforementioned internal variables, the relationship with *actual use* was strongest with measures of BI (Turner *et al.*, 2010, p. 469). Turner *et al.* (2010) also presented the impact of using subjective as opposed to objective use measures when employing the TAM to study *actual use*. They concluded that, across all variations and extensions of the TAM, objective measures consistently revealed lower *actual use* than subjective measures (p. 469)⁴. The incentives behind self-reported usage are therefore important to consider when viewing results based on self-reported use frequency.

The primary direction in which various iterations of the TAM have moved is to-

³BI can be used as the dependent variable when measuring the relationship between PE\PEU and BI, or as the independent variable when measuring the relationship between PE\PEU\BI and *actual use*.

⁴Turner *et al.* (2010) found that self-reported, subjective elicitations showed TAM predictions to be 78% accurate while objective, logged measures revealed that they were only 53% accurate at predicting *actual* system use—however the number of studies using objective measures in their literature was far fewer than those making use of self-reported measures.

ward *actual use* mentioned above. Research projects such as Kubey *et al.* (2001) noted some challenges in measuring actual use. Their study investigated Internet use levels and how this correlates with academic performance.⁵ Their hypothesis predicted a negative correlation. By collecting data through a survey instrument, largely consisting of Likert-scale type questions, they measured frequency of Internet use as well as attitude toward use levels in light of academic failures. By asking questions such as "...if I had a few more friends here at school I would probably use the Internet less" (Kubey *et al.*, 2001, p. 374) they also attempted to measure levels of loneliness using pre-existing instruments. Their findings, despite challenges in measure actual use, suggested that more than half of self-reported "Internet-dependent" students indicated Internet use as source of academic impairment.

The above literature indicates that user intention and motivation do predict system use. However, the system of assumptions and focus of the TAM, even in later iterations, has resulted in moderate applicability to modern ISs such as YouTube. However, user intention (as a function of perception) remains a variable to be investigated further. The emphasis on measuring *actual use* was perhaps partly to blame for the misfit of the modern milieu. However, this project still seeks to measure user intention with regards to online media as well as user beliefs regarding online media in order to test their correlation with use frequency.

2.2.4 Uses & Gratification Theory

Uses & Gratifications theory (U&G) originated from theories of mass communication and asserts the centrality of the user in media use. The user dictates media use through self-determined motivations (Quan-Haase and Young, 2010, p. 351). Earlier conceptualisations of U&G were concerned with a special system of needs related to media: different kinds of media satisfy different needs. This conceptualisation ignored how different "[media] grammar" (Katz, Blumler and Gurevitch, 1974, p. 515)⁶ satisfy user needs. These studies were largely concerned with how different media forms and their content, such as television, radio, newspapers or

⁵To be unpacked in later sections.

⁶Different aesthetic and technological elements.

books, could satisfy similar or dissimilar needs based on their attributes. U&G was purposed to achieve the “bringing to light [of the] great variety of needs and interests that are encompassed by the [audience]” (Katz *et al.*, 1974, p. 520). An important assumption underpinning U&G is that audiences are not docile, myopic, unthinking consumers. Shao (2009, p. 12) indicate that *YouTube* acts as convergence point for traditional forms of media such as television, music and film. Thus a modernisation of U&G was undertaken to study online media and how they meet user needs (Sundar and Limperos, 2013).

Research in social media have indicated that users display versatility in their employment of communication tools⁷ (Quan-Haase and Young, 2010, pp. 350–351). Observations in the literature suggest that the modern user, when spending time at a computer with Internet access, spends the majority of his or her time engaging with multiple technologies, (apparently) concurrently (see section 2.5.3). Zhang and Zhang (2012) postulate that this behaviour can be explained by examining underlying *desires* and how they are gratified by engaging with online media. Zhang *et al.* argue that a U&G approach is relevant when studying this phenomenon because the user, when presented with different media, is free to choose, manage and navigate as they wish. This view of the user enforces the primacy of desires and interests as the underlying mechanism which directs the media selection process.

The focus on the self-determination of goals that underpins U&G theory can oversimplify other aspects of media consumption behaviour such as the tendency to consume media based merely on prior exposure and not as a means to achieve some premeditated set of goals (Lee and Ma, 2012). Lee and Ma (2012, p. 334) identify two prominent aspects of media use that are not within the ambit of U&G: effects of prior experience on the individuals’ media selection process and the habituation of media usage. For instance, they found that individuals who displayed higher information seeking tendencies were more likely to use the Internet thereby positively reinforcing the likelihood of future use. A poignant critique of U&G theory is, therefore, that it is unable to satisfactorily engage with the origin of motivations and whether motivations can be isolated in the way the theory assumes. Did the

⁷Modern online ISs have effectively distorted the boundaries between consumers and producers of online content, Quan-Haase and Young (2010) mention the term *prosumer*.

theorized intrinsic motivations inspire media usage or does media usage inculcate motivations?

The advent of U&G theory, with its roots in mass communication theory, has prompted a switch from the user as docile consumer to the user as an active agent seeking to gratify needs and interests. U&G theory addresses a relevant aspect of online media usage and engagement. The modern media user is a kind of *prosumer* who, through rich media, can gratify an array of needs and interests in a self-directed manner. Studies on media use employing U&G theory as a primary framework (Sundar and Limperos, 2013; Quan-Haase and Young, 2010; Zhang and Zhang, 2012; Whiting and Williams, 2013; Shao, 2009) have investigated hedonic motivating aspects of media use more successfully than, for example, the TAM. Overall, U&G centered research efforts have been well-adapted to studying modern media usage. This reveals that the media in this study are those which primarily empower users and give them a sense of accomplishment. It is thus concluded from the literature that fulfillment of media needs or desires form an important aspect of media use and perhaps even dictate objects of attention.

2.2.5 Social Capital and ISs

Social capital can be construed as the “complement to human capital” (Burt, 1999, p. 48). This implies that those who know more people are likely better connected and thus have greater human capital by virtue of their connectedness. Many online media include a social component and augment the individual’s circle of exposure and connections by overcoming (to a large extent) the physical limitations of time and space. Lin (1999, pp. 30-31) describes, and envisions, social capital as being resources “embedded” in “social networks”. These resources can be thought of as the personal resources of other individuals which one has the ability to mobilize as well as being a mechanism for providing “social credentials” that could be used to gain access to other socially embedded resources. In this sense, social capital accrues upon pre-existing social capital (Lin, 1999, pp. 30-31). The ability to mobilize or access said capital can, in traditional capital terms, be thought of as the returns that accumulate to the social capital investor.

As a corollary to the above research Ellison *et al.* (2007, p. 1145) investigated whether “offline social capital can be generated by online tools”. At the time of their data collection *Facebook* was only open to university students. They found that social capital formation measures predicted *Facebook* usage among college-aged survey respondents. Their investigation led to the discussion of added dimensions to the construct of social capital, particularly that of the “maintenance” of social capital (Ellison *et al.*, 2007, p. 1146). In an IS such as *Facebook*, social capital may benefit from the augmentation of the personal network, which may compensate for time spent not directly interacting (i.e., face to face) with people and, therefore, not forming what may be considered traditional “strong ties” (Ellison *et al.*, 2007; Granovetter, 1973). As of 2001 a large portion of the US population had access to the Internet with no clear pattern of effects on social capital becoming apparent, however the dual-natured effects that the introduction of the Internet could be having on communication had been documented (Wellman, Haase, Witte and Hampton, 2001, p. 437).

Table 2.1: Social Capital and the Internet in 2001

| Increase | Decrease | Supplement |
|---|--|---|
| 1. Augmenting offline social interaction with online interaction. | 1. Diversion from real world interaction. | 1. Online interaction extends offline interaction. |
| 2. Overcoming limitations of time and space. | 2. A large portion, if not most, of online activity is not social. | 2. Transforming the way we communicate, much like the telephone. |
| 3. Increases both online and offline interaction. | 3. Online communication is often asynchronous (i.e.lacking the flow of F2F communication). | 3. Useful for maintaining strong ties, rather than creating new ones. |
| 4. Fills in the gaps between face-to-face (F2F) meetings. | 4. Filtering the information we are exposed to and, thus, decreasing exposure to different perspectives. | 4. The Internet does actively change our interest (i.e. levels political participation will remain largely unaffected). |

Different perspectives on the effects of the Internet on Social Capital as presented by Wellman *et al.* (2001, pp. 438–440)

If social capital is taken as valuable to the individual then use and interaction with online media, with social elements, may be creating value in ways that were not possible in the past. This effect (or implication) of use may also contribute to continued use and investment in online media as a means of communication. This particular implication of online media use would not be captured in a theory

centered on measuring use perceptions such as ease of use or pleasure in use. Instead, the notion of social capital provides an instance of value that has undergone *transformation* in light of online media.

Table 2.1 ties in with some of the concerns raised by Carr (2010). Prevalent use of online media is creating more than a globally connected society, and not all of these effects are positive for users.

2.3 Hedonic and Utilitarian Use Intention

2.3.1 Introduction

Prominent technology adoption theories and research was discussed succinctly in section 2.2. Therein, the notion of hedonic and utilitarian use appeared as a growing theme in the modernisation of theories. This research project is interested in media use intention and motivators and how they predict for use frequency. The following section introduces the hedonic–utilitarian continuum.

For the purposes of this study special attention is given to the *intentions* behind use or the different kinds of user-satisfaction that these systems provide. Thus, use motivation can vary between degrees of hedonic use and utilitarian. The following discussion is directed at addressing definitional challenges in the aforementioned aspects of motivation. These are heavily employed in following sections.

2.3.2 Introducing the Hedonic-Utilitarian Continuum

Use intention is an important concept in theories of technology adoption. Hedonic and utilitarian use intentions can and, as the literature indicates (Wu and Lu, 2013), likely do co-exist in a single medium. These concepts, hedonic and utilitarian, therefore represent the extremes of a use intention continuum. Wu and Lu (2013) study motivators behind hedonic and utilitarian media use and explain that the classification of online media into these categories has not been thoroughly investigated and that a short-hand (or rule of thumb approach) may be most appropriate. They suggest that an effective short-hand method for classifying ISs in

terms of the utilitarian–hedonic–dual-purpose trichotomy is the “four-fifths rule of thumb” (p. 155). This rule states that if an IS is being used for either hedonic or utilitarian purposes at least 80% of the time then it can be classified as more hedonic or utilitarian. If that rule does not apply then the IS likely elicits duality in use motivation. This mechanism, however, is clearly not without complications and are not employed in this study for media classification. Rather, the point of mentioning the above mechanism for classification is to reveal something about the user if not only the system⁸.

Hedonic is here accepted as denoting affective, personal and (the primacy of) experiential dimensions while *utilitarian* refers to functional, instrumental dimensions largely concerned with usefulness (Wu and Lu, 2013; Byoungsoo Kim and Ingoo Han, 2011; Laplante and Downie, 2011; Pöyry *et al.*, 2013; Rosen and Sherman, 2006). This continuum is applied to online media use intentions for the purposes of this project. Ernst, Pfeiffer and Rothlauf (2013, pp. 3–4) apply the dual-purpose (i.e. both hedonic and utilitarian) continuum to social network sites (SNSs)⁹. They explain that SNSs have, in previous studies, resulted in mixed findings when utilitarian elements of these systems have been elicited from respondents and that this is due to definitional heterogeneity of the *Perceived Usefulness* construct commonly used by the TAM¹⁰. At this point it is worth emphasising that making the focus of this investigation a single application or online media interaction instance, or even a narrowly defined set of instances, will be to the detriment of findings, since this project endeavours to investigate use of online media not a particular medium.

To further understand what a user may experience when engaging with a technology Turel and Serenko (2012, p. 512) state that the enjoyment aspect of media is a double-edged sword: holding potential benefits from use as well as potential ramifications which they refer to as the “duality of enjoyment”. The negative aspects of enjoyment would be classified as enablers for bad habits which can transform into

⁸Although this may be a slight divergence from the main purpose of the review at this point, it must be made clear that a hard and fast dichotomy is not being proposed or enforced.

⁹This fits well with findings by Junco (2012b).

¹⁰See section 2.2.3 for a more in depth discussion of this model and its original application and subsequent adaptations.

addiction with a addictive behaviour manifesting in, for example, an over-reliance on online media (Turel and Serenko, 2012, pp. 513–514).

In a similar vein to the “duality of enjoyment”: the computer “productivity paradox”, as stated by Brynjolfsson and Yang (1996, p. 179), indicates the disparity that was discovered in statistical analyses between the productivity improvement predicted by the implementation of an IS as opposed to the productivity improvements that were realised by the IS.

Laplante and Downie (2011, p. 203) studied information-seeking behaviour of system users and explain that there has been a progression in research which modelled and articulated the motivational aspects of the user. These aspects informed system design. The aforementioned progression has moved from viewing the user as a logical, profit maximizing agent to a more complex entity who may experience *hedonic* as well as *utilitarian* aspects of a system concurrently. Borrowing a metaphor of the organization explicated by Langley *et al.* (1995, p. 263), the idea of the “vortex” as an anarchic and seemingly non-sequential decision making process could help in visualizing the interaction between hedonic and utilitarian user motivations. As a result, a more nuanced or, in certain instances, “undirected” (Laplante and Downie, 2011, p. 203) notion of goal acquisition emerges. This aspect of HCI is considered in the ultimate survey design of this research (see chapter 3).

As theories have grown in their ability to articulate how users actually interact with online media, and the question of user IS adoption has concurrently moved to the background, the focus has shifted toward the effect of use and the underlying nature of use as a combination of both utilitarian and hedonic motivators.

The following section presents a broad body of literature that has investigate popular, modern media platforms and consider the application of the above terminology to particular online media instances.

2.3.3 Modern media platforms

With some of the conceptual aspects of online media addressed it is instructive to review a set of these online media and their documented effects. The questions

that are being asked here are primarily^{11,12}:

1. What are the activities that are typically available and engaged with, by users, with media?
 - a) How are these activities generally classified?
2. What are some known motivations for engaging with\using the medium?
3. How often is the medium used in daily life and how accessible is it?

The rationale for conducting a literature review of past research on the interaction between users and specific media groups is as follows: (1) The literature on this topic is vast and a full review of past research in this area is beyond the scope of this project; (2) Certain media have very similar applications and target audiences introducing a non-trivial amount of redundancy in reviewing two, for instance, Social Networking media; (3) As a complement to the first point: by viewing a sub-set of media answering the research question can take precedent. Since this project is interested in more general use, abstracted media channels gleaned from the literature are used in the survey.

Technology adoption theories have indicated that use intention is an important aspect of actual use and theories of use intention have revealed a continuum of media use intention. *Facebook* is a much cited example of a highly successful media. A great portion of the success and popularity pertains to the social element that generates interest and hype¹³. A medium can be classified as *more* “hedonic” if the primary usage is driven by or related to enjoyment, perceived enjoyment or any other sense of pleasure. To further articulate this notion Wu and Lu (2013, p. 154, p. 156) contend that strongly hedonic medias’ motivating factors shift

¹¹The construction of this list was largely informed by Pöyry, Parvinen and Tuuli Malmivaara (2013).

¹²See also Quan-Haase and Young (2010, p. 351) for a discussion on the application of Uses & Gratification (U&G) theory as a framework for studying “how” and “why” individuals use technology rather than the effect of technology on individuals—although the reverse effect is also of interest here as stated in the numbered list.

¹³Social elements need not be present for an IS to be considered hedonic (Rosen and Sherman, 2006, p. 1218).

from the “extrinsic” to the “intrinsic”. The former are focused on the environment and achieving states that are separable from the action taken to achieve them, whilst the latter are focused on the satisfaction of internal desires and inherent enjoyment that can be gained from engaging with or performing an action or activity. It is not necessarily the case that a medium fall on either end of the aforementioned continuum as elements aimed at productivity and enjoyment could be present within the same media instance. For example, *LinkedIn* is aimed at both professional communication and networking and could have both utilitarian and hedonic implications (Wu and Lu, 2013, p. 155).

Table 2.2 follows the pattern of the list mentioned above: each question is considered for technologies that have been identified in the literature as a prominent medium. The selection of a particular subset of technologies has also been subject to considerations regarding the utilitarian–hedonic continuum discussed above. Each of the following media are intended to occupy a different space along the continuum. It is re-emphasised that the classification mechanism proposed by Wu and Lu (2013) was not employed here.

Table 2.2: Summary of Popular Media

| Specific Technology | What activities? | Motivations? | Use Frequency? | Media Channel |
|---------------------|---|---|---|-------------------|
| Facebook | <i>Socialisation</i> , particularly: 1. Maintaining relationships ^a . 2. Social status and portrayal of self ^b . | Largely <i>hedonic</i> ^c . | Frequent (sporadic) (2-5 sessions per day; with sessions lasting approx. 10 minutes) ^d . | Social Networking |
| Twitter | <i>Socialisation & Information Sharing Seeking</i> : 1. The “[People]-based RSS [feed]” Zhao and Rosson, 2009. 2. “[M]icro-blogging” ^e . 3. Staying up to date with current events ^f . | Largely <i>hedonic</i> , but there are definite utilitarian underpinnings with regards to immediacy of access to information ^g | Frequent, sporadic ^h . | Microblogging |

Summary of different web-based Information Systems as indicated by existing literature.

^aHew, 2011, p. 663

^bBachrach, Kosinski, Graepel, Kohli and Stillwell, 2012, p. 24

^cQuan-Haase and Young, 2010, p. 353, p. 356 & Sheldon, Abad and Hinsch, 2011

^dHew, 2011 & Quan-Haase and Young, 2010, p. 355.

^eZhao and Rosson, 2009, Kwak *et al.*, 2010 & Kwak *et al.*, 2010

^fKwak *et al.*, 2010, p. 597

^gZhao and Rosson (2009, p. 245) list five main motivations.

^hJohnson (2009, p. 13)

Table 2.3: Summary of Popular Technologies Cont.

| Specific Technology | What activities? | Motivations? | Use Frequency? | Media Channel |
|----------------------------------|--|--|---|-------------------|
| Google (searches) | <i>Information Seeking:</i> directed and undirected ^a . | Strong combination of <i>hedonic</i> and <i>utilitarian</i> ^b . | Searching is still one of the most common activities on the Web overall; many users use this technology at least daily ^c . | Search Engine |
| Wikipedia | <i>Information seeking & sharing</i> ^d | Largely <i>utilitarian</i> ^e . | 10% of users in the USA at least daily; with this number growing ^f . | Encyclopedia |
| Instant Messaging (IMing) | <i>Socialisation, Information Sharing & Seeking</i> ^g . | More <i>hedonic</i> than <i>utilitarian</i> ^h . | Multiple times per day ⁱ . | Instant Messaging |

Summary of different web-based Information Systems as indicated by existing literature.

^aWaller, 2011, p. 773

^bWaller, 2011; Jansen *et al.*, 2008; Weeks and Southwell, 2010

^cPurcell *et al.*, 2012.

^dHead and Eisenberg, 2010; Kuznetsov, 2006.

^eKuznetsov, 2006; Fallis, 2008

^fFallis, 2008, p. 1663

^gIsaacs, Walendowski, Whittaker, Schiano and Kamm, 2002

^hQuan-Haase and Young, 2010; Sahami Shirazi *et al.*, 2014; Church and de Oliveira, 2013; Timmis, 2012

ⁱTimmis, 2012; Church and de Oliveira, 2013

2.4 An Introduction to Millennials

Jones and Hosein (2010, p. 43) explain that criteria shared amongst Millennials are typically as follows:

1. High levels of technological aptitude and immersion.
2. High-speed access with immediate pay-off.
3. Increased capacity for non-linear thinking (with low tolerance for “linear thinking”).

The items listed above indicate that the Millennial group is defined by characteristic forms of digital technology usage and information consumption. Studies have suggested Millennials share a date of birth range which is typically between 1982–early 2000s (Jones and Hosein, 2010; Howe and Strauss, 2009). Considering these dates in parallel with computer networking history we see that it coincides with the introduction of the personal computer (late 1970s)(Adams and McCrindle, 2008, p. 32). This also marks the year in which the “TCP/IP suite that enables the Internet as we know it” (Hershatte and Epstein, 2010, p. 212) was established. This reveals an important consideration behind selecting the aforementioned time period as an indication of the Millennial generation. The Millennial, therefore, is one who, from a young age, has had access to or lived in close proximity with the Internet and its associated media.

Millennials represent the primary subjects of study in this project. Current students, who meet the typical age requirements, are surveyed for their media use patterns which, according to Millennial membership, should be characteristically high.

There are certain caveats that warrant consideration to further reinforce classification. The first of these comes from findings in neuroscience which, as Hershatte and Epstein (2010, p. 212) state, indicate a shift in the skill-set and manner of thinking with which Millennials are equipped as opposed to non-Millennials. Tapscott (2008) has taken a close look at the interaction between humans and digital

technology, particularly in organizations and among the *Net Generation* (Jones and Hosein, 2010, p. 43)¹⁴, his findings affirm the materialization of a new way of thinking that is, in essence, far more *multi-tasking* oriented. Thus, the definition of Millennials is not necessarily tied to a single generation, but is more accurately blanket term for a grouping of generations that share the traits highlighted above with the demographic of age as a loose but reliable guide to indicate membership.

Millennials represent some of the youngest entrants to the workforce that possess Information Behaviour (IB) through which meaning can be shared (or expressed) and constructed largely by way of online media (Read, Shah, S-O'Brien and Woolcott, 2012, p. 492, p. 495). Read *et al.* (2012) state that this new generation (often called "Generation Y", "*Millennials*" or the "Net Generation") have an intuitive understanding of modern communication technologies. Sub-groupings within Millennials have been identified in the literature: power-users, ordinary users, irregular users and basic users (Jones and Hosein, 2010, p. 44). The differences in usage behaviour manifests not only in frequency of online media use but also in the variety of media that are used, for what purpose they are used. For instance, age and gender have been demonstrated to correlate with certain usage tendencies (Jones and Hosein, 2010, p. 43).

To unpack some of the differences between Millennials and non-Millennials mentioned in the literature Hershatter and Epstein (2010, p. 213) go on to describe technology as a "sixth sense" for Millennials because they did not have to go through the initial, steep adoption learning curve that pre-Millennials faced. This is the basis for the appeal to age as an indication of Millennial membership. This is not to say that Millennial's online media use is without challenges for the user. Millennial use patterns are indicative of high levels of integration with everyday activities. As is discussed in the coming section, these use patterns may bring subtle, but prominent implications to bear.

Millennials, as presented in section 1.1, display extremely high levels of Internet-enabled device ownership and very high engagement levels with content distributed to such media. In certain cases, use levels have conformed with those of addic-

¹⁴Here taken as synonymous with the term Millennials.

tion (Block, 2008; Kuss *et al.*, 2013; LaRose *et al.*, 2003). An interesting observation made by (Read *et al.*, 2012, p. 2) is that the holistic addressal of “developmental and information behaviour” amongst adolescents in the group context is a phenomenon which lies at the intersect of disciplines that traditionally have been viewed as separate or exclusive modes of study, they list the following:

1. Psychology: sociological and experimental.
2. Information Science: information behaviour in the group context.
3. Social Media studies: as a prominent mechanism for communication amongst adolescents.

The above indicates the cross-disciplinary nature of studies concerning socio-technical interaction and how this represents an inherently multifaceted, complex system. A well-defined scope for an investigation is therefore vital. However, due to the cross-disciplinary nature: reviewing findings of studies different fields aid in the explaining and accounting for findings in this project.

2.4.1 The Net Divide and Neuroplasticity

Jones and Hosein (2010) attempt to demonstrate, by way of defining and profiling, who exactly Millennials are *vis-à-vis* other generations. They use the term “Net Divide” to emphasise that the Millennial generation is a distinct one. In light of this distinction, Carr (2010, p. 17–35) explains that neuroplasticity is that property of the brain which enables it to reorganize neural pathways based on complex interactions between neurons and environmental stimuli. Carr (2010) discusses the effect of environmental stimuli and how the technology that we use can, fundamentally, change the way in which we think. This reorganizing is not only possible in early-adolescent phases but well into adulthood-late-adulthood phases of maturity. Neuroplasticity was observed in an experiment conducted by Dr Michael M. Merzenich on adult monkeys regarding their cortical maps. In this experiment Dr Merzenich inadvertently discovered that these maps are “dynamically maintained” and that certain specialized areas of the brain, can as necessity dictates, be

employed to assimilate substructures in the brain from different regions in order to compensate for some lacking functionality (Williams, 2012, p. 630)¹⁵.

The above adds weight to what is meant by a “divide”. This divide is not based on demographic variables such as age or socio-economic status alone, but that the observed gap could be quite deeply ingrained in the very nature of our thinking. An illustration from Carr (2010) introduces his view on the effects of the online environment on our thinking:

“...when we go online, we enter an environment that promotes cursory reading, hurried and distracted thinking, and superficial learning.” (p. 115–116)

This quote introduces an important theme that serves to nuance the conclusions that are being worked towards: whether the online environment is an aid or a distraction to our thinking. Considering the university context, a claim such as this directs focus to how students are programming their brains to process information.

Carr (2010) argues that computer technology users are being affected in a non-trivial, yet subtle, way by ISs and this is drastically affecting the thoughts and behaviours of users. An often unnoticed aspect of the way in which we are conditioning our brains lies in the fact that “traditional” processes of knowledge formation are being challenged or replaced. In a study regarding the “Mental-attentional capacity” and mathematical literacy amongst children, Agostino, Johnson and Pascual-Leone (2010) consider the different important “executive functions” of the brain in addressing mathematical problems (i.e., mathematical reasoning) and discover that the ability to inhibit irrelevant information from working memory is of great importance for dealing with multi-stage, word-based, problems. Williams (2012, p. 627) show that there is indeed an increased level of struggle, resulting in poorer performance of children solving mathematical problems. The dimension added to the discussion is that of the unseen effects which online media usage instills.

¹⁵For a brief, but fascinating discussion on the anatomy and functioning of the brain see Williams (2012, p. 628–630) and Carr (2010, p. 17–35).

2.5 Media Use and Task Performance

From the above discussion it has become apparent that the subject of this study is a group of individuals who are frequent, avid users of online media. The following section introduces the context of use and how members of the Millennial group are affected by online media use in their task performance and, ultimately, their academic performance. Online media use is taken to encapsulate the *patterns of online media usage* and *various strategies of engagement with online media*. These patterns include tendencies to use online media as they occur within a particular context. The literature has established that online media use is prevalent amongst Millennials. A set of media was covered in 2.3.3 to this end. Because this section of the literature review deals with a core aspect of the thesis related concepts such as attention, multitasking and media switching are discussed. This section concludes with an overview of past findings on media use and academic performance.

2.5.1 Attention

The concept of attention in the context of engagement with media is used extensively in later analyses and carefully unpacking these terms would be profitable for how to understand and describe *multitasking* (in section 2.5.2). Thus attention and attentional strategies Millennials tend to employ are an important consideration for this project.

Wood, Zivcakova, Gentile, Archer, De Pasquale and Nosko (2012) employ a cognitive framework in which they view attention. In their study on the effects of using laptops in class-room settings they considered the model of the cognitive bottleneck presented by Welford (1967) as a theoretical explanatory mechanism. The theory that the brain cannot concurrently process simultaneous streams of input without either taking additional time to process said inputs or sacrificing overall performance quality of tasks has surfaced in many studies concerning the management of attention (Van der Schuur *et al.*, 2015; Leahy and Sweller, 2011). Here the discussion is limited to theories regarding attention itself.

Aagaard (2014, p. 887) states “the mind [conceived of as an information processing device] must govern the allocation of attention” in one of two ways:

1. *Endogenously*: In response to phenomena it identifies.
2. *Exogenously*: In response to phenomena that that trigger it to direct attention.

In this dichotomy, attention is a function of the brain that can be either voluntarily or involuntarily directed. For the purposes of this discussion these two aspects of attention are sufficient for understanding the mechanisms that prompt attention within the *limited cognition* framework of attention.

Attention conceived of in this way is a mental resource that must be allocated (Aagaard, 2014). An implication, then, is there are more and less efficient strategies for allocating attention (i.e., there is a notion of maximisation of output). If the output is taken to be completion or performance of some task then a mechanism by which to measure levels of efficiency in allocation may be constructed. Junco (2012a, p. 2241) adopt this very strategy in their study of how students perform academically in relation to their levels of in-class online media use (results of this study are discussed in more detail in section 2.5.5). The attentional framework they adopt is presented by Mayer and Moreno (2003) and is summarised as follows:

1. Essential processing: a cognitive process important for sense-making.
2. Incidental processing: a cognitive process that is non-essential for sense-making.
3. Representational holding: form of short-term “working memory” for recently viewed material\content.

Junco (2012a) argue that engaging with multiple streams of input can result in attentional capacities being overloaded due to limitations in representational holding in combination with the very directional nature of essential processing. Their study represents an instance of a framework undergirded by the notion of cognitive limitations employed to identify “cognitive bottleneck” (Wood *et al.*, 2012; Welford, 1967).

A danger in painting the individual’s attention management as a product of input tends to underplay agency. Therefore, an important aspect of how individuals

manage what tasks they are focused on is attentional control (Alloway and Alloway, 2012; Judd and Kennedy, 2011). A logical reflection on the mechanism of attentional control reveals that there are at least three distinct processes occurring while multitasking: task performance, task switching and some executive control that dictates when switching occurs (and that these operate in a parallel) (Williams, 2012). The theme of cognitive limitations does resurface with regards to these control mechanisms, but this added concept enables a richer understanding of the observed phenomena—students in lectures *want* to subject their attention to input from multiple sources and therefore may encounter limitations.

Aagaard (2014) propose an alternate framework for considering attention as it relates to technology use in general contexts. By viewing technology as an artefact through which the user constructs their reality the focus shifts from allocation of attentional resources to sense-making processes. This process is inherently symbiotic: the user perceives what the media imparts and then constructs his perception of the media accordingly. The boundedness of attention, rather than the quantitative limits determine what users identify as actionable sources of attention.

Attention in the context of online media use within varied situations can be understood as a mechanism which is either limited as the cognitive resources are limited, or bounded to realities constructed through the mediation of technology or media. In either framework attention can be understood as *directed*. However, this research project more readily adopts the framework of cognitive attention that lends itself to quantitative study.

2.5.2 Multitasking

Multitasking complements the above discussion of attention in two ways: (1) provides context for the operationalisation of concepts and (2) provides a richer understanding for the observations of attentional strategies.

Multitasking, in the context of online media use, can involve the use of multiple media simultaneously or the use of media whilst engaging with other activities (e.g., studying, attending lectures) (Zhang and Zhang, 2012). The distinction

enables the differentiation between media switching and engagement of sensory stimuli that may demand use of the same attention resources simultaneously.

A concept that forms part of this discussion on multitasking is *task performance*. This concept refers to overall delivery of tasks, in terms of quality, that are multitasked.

An instance of media identified in the literature as being extremely popular amongst its users for multitasking is Instant Messaging (IMing) (Bowman *et al.*, 2010; Fox *et al.*, 2008; Quan-Haase and Young, 2010). Bowman *et al.* (2010) investigated the use of IMing whilst engaged with a task which arguably consumes the same attentional resource: reading. Their results reflected that 62% of respondents IMed whilst busy at a computer or studying with responses ranging from “sometimes”, “often” or “very often”. IMing, as a task, has reportedly been heavily integrated with everyday activities of users and is often coupled with strong social elements that incur use. Arguably, IM does not allow users to choose when they receive messages and therefore may be a source of distraction for essential processing (Bowman *et al.*, 2010; Mayer and Moreno, 2003).

Wood *et al.* (2012, p. 366) consider two different multitasking strategies:¹⁶ divided attention and “Rapid Attention Switching”. The former refers to (imperfect) simultaneous consumption of input streams whilst the latter describes rapid full-attention switching from one input to another. The latter strategy could be considered *lossy* in the sense that information from the unattended input(s) at any given point in time may be missed. In their experiment-based study they consider the effects of multitasking learning activities and media use and how these affect overall task performance. Their findings indicate that the groups allowed to multitask (with *Facebook*) performed significantly worse (scoring a mean 10% lower) on multiple-choice questionnaires. These findings buttress both the explanatory power of the cognitive limitations framework and *lossy* multitasking strategies. An interesting corollary point discovered by Wood *et al.* (2012) is that there was no improvement gained by repeated performances of the experiment. This finding speaks to research that theorised performance improvement of multitasked activi-

¹⁶Even though they refer to these strategies as attentional, we refer them as multitasking for the purposes of this discussion.

ties by way of practice and membership to the Millennial grouping (Kennedy *et al.*, 2008, p. 4).

Judd and Kennedy (2011) investigate Australian students' propensity to multitask (and task switch) by looking at computer browsing logs. This method avoided some known biases of self-reported use (Junco, 2013). The findings of the study failed to prove high levels of *multitasking* but they did find evidence of students *task switching* between on-computer tasks every two minutes on average. This frequent switching could be facilitated by modern computer interfaces enabling the execution of applications in parallel. The study was characterised by “self-directed” learning strategies because the data reflects natural-state usage. Their distinction between (types of) *multitasking*¹⁷ and *task switching*¹⁸ enabled them to interpret their findings with added texture. The authors admit very high levels of interrelatedness between these concepts. Their ultimate finding is that *multitasking* is not as prevalent as previous literature on Millennials has suggested that task switching is. It is conjectured their distinction between the concepts as described above may pose serious challenges to comparison between research projects, but that their findings on this distinction are non-trivial.

Van der Schuur *et al.* (2015, p. 206–208), in their review on multitasking research, distinguish between two, mutually exclusive views on the effects of media multitasking on cognition as being particularly prevalent amongst the youth; “scattered attention” and “trained attention”. These views indicate different underlying assumptions towards the outworking of multitasking. Arguably, it is these views that have prompted research into the phenomenon of HCI in the modern milieu. The trained attention hypothesis in particular challenges the ideas presented thus far on multitasking. However, little support for it has been found in the literature covered up to this point in the review. Judd and Kennedy (2011) actively object to the perception of inherent aptitude with online media Millennials have been said to have.

Literature, therefore, supports the notion that online media users tend to engage

¹⁷A function of the number of tasks engaged with, the time per task and the number of unique tasks.

¹⁸A function of time and the total number of tasks engaged with per session.

with different forms of media in various contexts (e.g., lectures). The following section discusses the phenomenon of switching between different media in particular.

2.5.3 Switching between media

Media-switching and multitasking are here taken to refer to largely the same phenomenon as strong elements of each are present in the other. Multitasking bears connotations of simultaneously performing multiple tasks. Section 2.5.1 and 2.5.2 have indicated use strategies more likely reflect a rapid switching strategy between a limited set of tasks (or media) [p. 1238](Kirschner and Karpinski, 2010). The following discussion considers literature aimed at the prominence and findings of online media related task switching.

Judd and Kennedy (2011, p. 626) explain that multitasking is use tendency that can be developed through engagement with modern media which can, ultimately, have a negative impact on overall task performance and learning capabilities due to the effects that these technologies can have on working memory, which is important in educational settings (Alloway and Alloway, 2012, p. 1749). A corollary point re-emerges: whether it is increasingly difficult for individuals with high levels of exposure to suppress superfluous inputs or identify inputs that are useful to the primary task on which their attention is trained (Alloway and Alloway, 2012, p. 1749). Conflicting findings around the formation\acquisition of skills, especially that of multi-tasking, due to high levels of exposure, richness and multiplicity of online media prevalent over the past decade and a half have been recorded¹⁹. Relatively poorer task performance by heavy multitaskers was discovered in these studies but signs of skill development have also been noted. Responding timeously to various inputs was better on the part of heavy concurrent users than that of light concurrent users. These investigations reveal a correlation between multi-tasking tendencies as measured on an index²⁰ and do not address the question of

¹⁹See Alzahabi and Becker (2013) and Ophir *et al.* (2009).

²⁰Media Multitasking Index (MMI) is used to assess the level of multi-tasking taking place in the context of media Usage (Alzahabi and Becker, 2013, p. 1486).

causation (i.e. does using different media simultaneously directly lead to poorer task performance).

Ophir *et al.* (2009) attempt to create a distinction between infrequent multitaskers and “chronic multitaskers”. Their classification system considered a standard deviation below or above the average MMI of all participants as indicative of light or heavy users, respectively. Ophir *et al.* (2009, p. 15584) found that the heavier users (i.e., chronic multitaskers) had greater difficulty in filtering irrelevant information from entering working memory and thus their task performance, regarding time required for task completion, suffered. This could be considered an instance where the disruptive elements of online media—and particularly quasi-simultaneous use of these technologies—could inundate users causing their overall task execution to diminish in terms of quality (as in section 2.5.1). As was mentioned above, such findings were opposed to those of Alzahabi and Becker (2013) who reported that when considering task switching (as a component of multitasking) the more frequent multitaskers could outperform infrequent multitaskers in terms of quality and time constraints. Common use of MMI and the stimulus-response methodologies used in the investigations support comparability of results. The apparent irreconcilability of the results may indicate the complexity of testing the underlying phenomena, which Alzahabi and Becker (2013) dedicate some reasoning to in their discussion (pp. 1491–1494). They explain that the nature of multitasking may have changed over the course of three to four years between the respective studies (i.e. as online media have rapidly grown in terms of popularity in that time). Further work building on this research would be of great value in clarifying these paradoxical findings. However, Rosen *et al.* (2013, p. 949) discuss the potential time impact that “task resumption” may hold for the user that switches between technologies. This lag results from the fact that regaining attention, once diverted, from a particular task results in a time lost due to the need to play cognitive catch-up with the previously abandoned task.

Judd and Kennedy (2011, p. 629) state that multitasking and its effects are not as prevalent as has been implied by previous literature regarding the Net Generation. Participants of their studies seemed to use multiple technologies concurrently more often in certain tasks such as *Google* searches and IMing.

In several studies regarding students, ICTs and patterns of media use (Junco and Cotten, 2012; Junco, 2013; Junco *et al.*, 2011; Junco, 2012b) Junco investigated correlations between “frequency of [technology usage]” and “academic performance as measured by overall college GPA” (Junco and Cotten, 2012, p. 507). Particular findings of this research are discussed in section 2.5.5, but the overall findings indicate a negative correlation between task performance and a tendency to frequently switch between tasks. This is distinct from specific instances of use where Junco found a positive correlation between certain Facebook activities and academic performance (Junco, 2012b)

2.5.4 Attention, Multitasking and Academic Performance

At the end of section 2.5.2 some of Junco’s findings regarding ICT use and media were discussed. This leads into the final element to be covered before considering findings in the area of media use and academic performance more closely.

Paul, Baker and Cochran (2012) discuss the effect of engaging with online media on academic performance. They cite a body of literature discussing the effects of “academic competency, time management skills [and] student characteristics” (p. 2118) as some of the variables that have been documented in past research efforts. They constructed a model to capture and test their various hypotheses which they addressed by way of a survey-based methodology. Results were analysed using structural equation modelling which demonstrated significant relationships between academic performance and attention deficits²¹. A similar relationship was found between time spent on social media and academic performance. In both cases a negative relationship existed with strength of attention deficit at $\rho=-0.352$ and social media use at $\rho=-0.119$. An indication of co-variance in the relationship existing between the constructs of attention deficits and academic performance was found in the data. Their data indicated a causal path between social media use and academic performance. Finally, they also demonstrate a significant, negative relationship between attention deficits and social media use levels. These findings, whilst not establishing causal mechanisms, reveal the intertwined nature

²¹In their model, the construct of *attention span* was renamed to *attention deficit* in order to make it clear that higher numbers indicated a lower attention span (pp. 2121–2122).

of attention, task switching and academic performance. Without doing umbrage to the various other factors that may affect academic performance, this project provides good grounds for this thesis and the use of academic performance as a variable is expected bear a significant relationship with online media use.

In another survey-based methodology, Kirschner and Karpinski (2010) investigated the correlation between use of the popular social networking website *Facebook* and academic performance. Their research is prompted by the Millennial group's prevalence. Their overall finding is that, despite comparable levels of use, *Facebook* users' academic performance was significantly poorer than non-users. The fact that the tendency to use *Facebook* may be indicative of a personality type that is more socially oriented was acknowledged as a potential causal mechanism. It is conjectured that if this study broadened its view on media usage it would be in stronger position to draw conclusion regarding use. Since the study is limited to Facebook use (and general Internet use) it is argued that the findings are somewhat impoverished.

As a core part of this literature review, Junco's research efforts cited above create a compelling case for research into the correlation, and causation, between academic performance and media usage. Studies investigating the effect of online media on academic performance are now be presented.

2.5.5 Findings from past studies on media use and academic performance

In the preceding sections a review of literature aimed at particular concepts was undertaken. It has become apparent in the review up to this point, however, that the majority of research projects have discovered a significant, negative correlation between academic performance and media use.

Reportedly, students frequently engage with online media during class, particularly with IMing (Bowman, Levine, Waite and Gendron, 2010). Bowman *et al.* (2010) appeal to the body of cognitive HCI literature as "clearly indicat[ing] competitive cognitive tasks affect[ing] performance" (p. 928). They suggest that in the classroom or lecture hall IMing may be in direct competition with an activity such as

writing or taking notes. Findings by Bowman *et al.* (2010) indicated slowed but not impoverished performance in their experiment-based study. The results of the above experiment, which involved students at simulated work stations, are interpreted as potentially being due to the respondents' ability to control the focus of their attention in such a way that the quality of task performance was unaffected. Fried (2008) consider the presence of online media in class situations (particularly the use of laptops in classes) and outline the shifting of general trends of encouragement or discouragement of use. Their survey-based study required participants to complete a series of surveys throughout the course providing longitudinal data for their analysis. The results indicated a strong, negative correlation with frequency of laptop use *vis-a-vis* student learning (Fried, 2008, p. 910). The prominent causes of decremented learning were reportedly own laptop use as well as that of other students in lectures perceived as sources of distraction. The latter source of distraction can be considered a proximity effect of online media use in lectures.

Research investigating academic performance and frequency of media multitasking (MM) during academic activities have typically expected a negative relationship between these variables for the following two, corollary reasons:

1. Time spent on MM derails or detracts time that could have been dedicated entirely to the academic activity.
2. Humans have cognitive limitations on the amount of information that we can concurrently process.

Of the 43 studies investigating these variables in the Van der Schuur *et al.* (2015) review, 11 were correlational and 8 of these presented negative relationships between frequency of MM and academic performance ranging, in strength, from small (3%) to moderate (30%) predictability. Experiments in which subjects have been studied whilst performing simultaneous, unrelated tasks will provide limited insight into the phenomenon of media multitasking and only be able to conclude that a "distraction is distracting" (Aagaard, 2014, p. 889). Furthermore, it is hard to give content to the underlying processes that lead toward apparent biases in simultaneous task-processing. Literature does suggest that multitasking leads to

degradation of task execution quality (Alloway and Alloway, 2012; Alzahabi and Becker, 2013).

As has been made clear, high levels of online media use in lectures by students has become commonplace (Wood *et al.*, 2012). This raised concerns regarding students' ability to excel academically given that their attention is frequently divided. Junco and Cotten (2012) study the tendencies of undergraduate students to use media technologies whilst studying or engaging in academic-orientated task. Their findings indicate that students who tend to make use of such technologies (such as *Facebook*) frequently, and whilst studying, were not performing as well as those whose intervals of online media use was less frequent. It was however, also noted that significant statistical correlations did not exist between students' GPA and their usage of technologies other than *Facebook*. Interestingly, they did not find support for the popularity of IMing whilst engaging in academic work. This activity was surpassed in multitasking (or task switching) tendencies by performing off-topic information searches (Junco and Cotten, 2012, pp. 512–513). This is an indication that self-reported data is subject to certain prestige biases, however the large sample size ($n=3866$) does mitigate this effect.

In a similar study, Junco (2012a, p. 2238) make use of a survey methodology which consisted of questions such as: "How often do you do the following. . ." This is followed by a list of different online media that they identified, as in this literature review, are popular amongst Millennials. In this way they were able to isolate a negative correlation between online media use and academic performance. They were able to generate further texture in their findings by collecting demographic data such as age and highest academic qualification attained by parents. These variables demonstrated correlations with academic achievement: the propensity to multi-task showed a negative correlation with academic performance with use of a certain subset of online media (Junco, 2012a, p. 2240). Paul *et al.* (2012) in a similar study investigate the correlation between "Online Social Networks" (OSN) (p. 2117) and academic performance and demonstrated a statistically significant correlation by way of a survey. Constructs such as frequency of use, time management and academic competence were fed into their purpose-built model to measure and demonstrate the reported correlations. Through appeal to anecdotal evidence as

well as their statistical findings a negative correlation was discovered between use frequency and academic performance. Their model indicates correlational strength as well as indirect correlations between constructs which enabled them to identify a negative correlation between attention deficits²² and academic performance. Their findings show that OSN usage correlates negatively with academic performance.

2.5.6 Comparability of results

A challenge for modern research into the phenomenon of media use is comparability of results (Grace-Martin and Gay, 2001, p. 98). It is therefore important to identify what aspects of the phenomena are of most value in addressing research questions. For instance, Kubey *et al.* (2001) discuss some of the psychological aspects of Internet use and whether there is self-reported evidence for, what they term, *Internet Dependency*. In their study they investigate the correlation between *Internet Dependency* and *Impaired Academic Performance* (Kubey *et al.*, 2001, p. 368, p. 373). Previous studies discussed in this review concerned with media use and academic performance have either opted for a survey driven approach (Junco and Cotten, 2012; Junco *et al.*, 2011; Van der Schuur *et al.*, 2015) or, as discussed above, analysed Internet usage logs. However, divergence tends to be most pronounced in how data is aggregated and analysed in order to draw conclusions. This reveals divergences in the research questions as well as the resources available to the researcher. With a stronger focus on cognitive limitations and the affect that multitasking has on task performance, one approach, employed by Alzahabi and Becker (2013), is to collect data and calculate an index in order to simplify analysis and inter-study comparison. In this research project, where the focus is on the correlation between media use, which involves motivations, beliefs and expectations about media usage at the individual level, the questions to be asked must draw from past research in online media adoption and usage. Frequency of usage, an important aspect of the research question, must be collected from participants in a way that avoids known biases such as preservation of self-image regarding online media usage patterns. The strongest strategy for this project is to identify an existing methodology in the literature which to follow and build upon. The

²²Here taken as the opposite of attention span (Paul *et al.*, 2012, p. 2123).

survey-based research approach employed by Junco and Cotten (2012) presents the most feasible solution given resource constraints. Replicating research efforts undertaken by Junco and Cotten (2012) increase the ability for comparability of results. The focus on a correlation between media use and academic performance, being analysed using appropriate statistical measures increases the ease with which this research can be replicated. Given the fact that this project is localized to a certain group of individuals in a certain area further insights can be gained being able to compare results across cultures in South Africa.

Junco *et al.* (2011) cite several studies which have demonstrated a correlation between media use *vis-à-vis* academic involvement. The Higher Education Research Institute (HERI) reported a positive correlation between student involvement from amongst 31000 first year collegiate students and social network usage (academic involvement is here taken to mean the level of active-learner-participation in course work which lead to betterment of academic performance). The research focus in this project is how can the interaction with online media, when taken as the independent variable, influence academic performance. Junco *et al.* (2011) also indicate that past research has not emphasised the causal mechanism by which academic involvement is influenced by online media use. In the current review, investigations regarding causation of media use to academic performance have not been abundant. Establishing chains of causation between media use and academic performance has proven difficult for a number of reasons: longitudinal studies are costly, common standards by which to compare results are sparsely employed and the myriad variables that affect academic performance are a challenge to isolate. However, research into the existence of correlations has established good grounds for much theorizing and research into the latter as made evident throughout this review.

Skoric *et al.* (2009) consider criteria by which technology addiction could be classified and distinguished from high engagement. Instances of high engagement are distinguished from pathological use. Pathological use are interpreted addictive usage in the context of their study. The criteria above were not readily used in the majority of studies here which can be interpreted as another indication of the independent, diverse research efforts undertaken in this area. Junco and Cotten

(2012) use a psychological dimension in their study of media usage when considering cognitive limitations. In this way they reinforce cognitive limitations as the underlying cause of multitasking leading to poorer task performance. Similar conclusions regarding interaction with media are reached without appeal to these mechanisms (Rosenberger, 2012; Aagaard, 2014). In a similar study by Rosen (Rosen *et al.*, 2013) this general finding is bolstered.

This review of different frameworks and modes of study employed in this area of research has revealed that most findings are in general agreement. Higher levels of interaction with online media lead to impoverished task performance (or academic performance in particular). The inherent complexity existing between factors that could influence academic performance, however, have led to different methods being employed that diminish comparability of results to that of a more general finding. Arguably, this has forestalled efforts to establish a chain of causation, but has succeeded in establishing strong theoretical grounds for suspecting the existence of an underlying mechanism. The project being undertaken here do not attempt to establish such a mechanism but seek to contribute to the general findings and, in particular, contribute to findings made by Junco's research efforts in the area of cognitive effects of media use. In this way, it is hoped that research efforts in this context are buttressed and spurred to efforts aimed at establishing causal mechanism can be aided. Documenting the effects of online media use in the context of a South African university would also form a unique contribution to the work carried out by Junco in this area.

2.5.7 Postphenomenology in HCI

A final framework to be reviewed is that of *post-phenomenology* in research on humans and computers. A review of this framework gives a richer view of the potential for qualitative research in this area. A review of this framework serves as an after thought, and complement, to an otherwise entirely positivist framework regarding online media use.

Aagaard (2014) provide a helpful distinction between cognitive studies of media multitasking as it relates to task performance and studies that take a post-

phenomenological approach grounded in the idea that interactions between humans and technologies jointly determine perception and usage. They quote the adage “to a man with a hammer, everything looks like nail”. This elucidates how the framing effect of HCIs impact perception and, thus, behaviour. The underlying mechanism can be described as a process of simultaneous perception (inflow) and construction (outflow). In a review on the effects of driving whilst engaging in technologically-mediated verbal communication (talking on a cellphone), Rosenberger (2012, p. 83) considers what an application of post-phenomenology could mean for the study of attention in technology²³ suffused contexts. They suggest that technology use actively incorporates said technology into our systems of perceptions. In this way technology extends perceptive faculties, and transforms it. The implications is also a boundedness in terms of our experience of the world that arises from engaging with technologies. This brings to light, for the researcher of attention, the following notion: identification of interaction with a technology as a task amongst multiple others may be missing a central feature of how technological interaction, as a process, functions. This interaction is a way of perceiving perhaps, also, a way of existing (Rosenberger, 2012, 83–84)²⁴. A post-phenomenological approach, therefore, avoids the difficulties of identifying tasks or characteristics of content and rather places emphasis on the media itself (from cognitive limitations to the actual media) rather than identifying HCI as a system of general *disruptive* media multitasking. The result of incorporating such media into our perceptive faculties places emphasis on experiential aspects at the cost others. These kinds of efforts would result only find that “distraction is distracting” (Aagaard, 2014) and not see the impact that web-based ISs are having on perception.

²³This reference is to digital technology.

²⁴Rosenberger (2012, pp. 84–85) also discusses four variables; *embodiment*, *transparency*, *field composition* and *sedimentation* that define individual instances of human-technology interaction.

2.6 Summary of Literature Review

The first section of the review presented theories of technology, IS and media use which described the relationship between modern users and media. The section thereafter investigated literature which discussed the hedonic–utilitarian continuum and its research implications for studies in modern media. The discussion of modern media linked to the modern media user: the Millennial. These individuals displayed a particular level of high engagement with modern media and were described as a new generation of media user. The latter, and dominant part of this review, was dedicated to literature discussing key concepts related to task performance and media use.

Chapter 3

Research Design

As evidenced by the preceding chapter, this project's research aim builds on a body of literature which has established good grounds for theorisation in this area. A specific group of users have demonstrated high levels of affinity with modern, online media. Current undergraduate students typically fall within this grouping due to the prerequisites of computer literacy levels and general demographics. In the literature, this grouping has been termed the Millennials. Additionally, students' academic mark affords a measure against which correlation of online media use can be tested to establish a correlation with online media use. This chapter focuses on the design and implementation of strategies used to address the research questions outlined in chapter 1. First, the research design is presented. In this, consideration is given to each aspect of the research method starting with an overview of the survey followed by a discussion of important variables and ending with a section regarding hypotheses.

3.1 Design

Design decisions regarding independent variables (general media use, in-lecture media use and use intention) and the dependent variable (academic performance) are discussed in this section.

The data collection tool was a survey consisting of three sections. In order of appearance they were: (1) use frequency and use intention, (2) demographic variables

and (3) academic performance. Subjects were prompted to report on their personal use levels and use intentions for different media groups. The rationale was that reporting on groups of media would extract a larger, more accurate picture of overall media use frequency and overall use intention. Therefore a cross-sectional, survey study was conducted to establish the existence (or non-existence) of a correlation between online media use and academic performance.

A primary consideration when creating the survey was that two constructs of primary importance be adequately addressed. The first was that of *frequency of use*. It is important to gauge the degree to which respondents engage with online systems, relative to one another, in order that classification in terms of heaviness of use be obtained. The next construct is *use intention* of the respondent. This indicated the kind of online media use motivation on a scale from hedonic to utilitarian.

Table 3.1: Sample research survey questions

| Construct | Sample Question |
|--------------------------|--|
| Use Frequency (U_f): | How often do you make use of Social Networking? |
| Use Intention (U_i): | Is Social Networking a good way to relax/enjoy yourself or is it useful for completing study-related work? |

Table 3.1 paraphrases some of the questions that were posed to respondents. Respondents were presented with a 5-point Likert-type scale. In this way responses to various questions of usage could be converted into a numeric, scale value. Calculation of scale values was sensitive to the meaning of each question. The normalisation of coded responses took into consideration the fact that “constant” use of a media should be weighted more heavily than “every few minutes” for a given set of responses.

There are five abstracted groups of online media that were gleaned from the liter-

ature, based on popularity amongst Millennials:

1. Social Networking.
2. Microblogging.
3. Online Encyclopaedia (or Structured Information).
4. Online Searching.
5. Instant Messaging.

The above list represents broad groupings that are not exhaustive of all online media. The compromise to be made was between getting an accurate picture of actual use whilst not inundating respondents with too many different media formats. Therefore, particular instances, such as Facebook and similar were not explicitly mentioned. Subjects were asked to report on their usage of the above by answering attitudinal and belief-based questions (De Vaus, 2013, pp. 81–82).

Questions were designed to capture aspects of belief, attitude and behaviour (or actual system usage).¹ Two concerns in constructing survey questions raised by De Vaus (2013, p. 84) were that of accessing sensitive information from respondents and the potential for *Prestige Bias* when inquiring about past academic marks achieved.

The manifest variables for use intention were:

1. Belief about a particular media.
2. Motivation to use a particular media (an indicator for actual use).

Studies such as Dholakia *et al.* (2004, p. 252, p. 254) were also referenced in the constructing of the questionnaire even though their research question is not entirely congruent with this project. Their use of the latent and manifest variables

¹With De Vaus (2013, p. 81) as guide for design.

are similar in terms of methodology. Their construct of enjoyment or “entertainment value” (p. 254) was of particular interest in eliciting hedonic–utilitarian motivations behind technology use.

The survey was disseminated electronically to invitees with an incentive to participate, and complete the questionnaire. Participants all attended a residence university and so it was assumed they attend lectures on a regular basis. The following sections discuss the variables elicited by the survey and how they contribute to addressing the research aim. Demographic variables are discussed first.

3.1.1 Demographic Variables

The following variables elicited by the survey all pertain to specific demographic aspects of respondents—either directly or indirectly. Where indirect, the reasoning for their use in the survey is explained.

Date of birth was extracted by the survey as a loose indication of whether respondents are within the Millennial’s age demarcation and to group use frequency in terms of age. The literature has indicated that Millennial membership is primarily indicated by media use frequency. *Gender* was used to identify any significant trends regarding use of particular media groups amongst genders. It was expected that no significant difference between genders will emerge from the data. *Parents’ highest academic qualification* was used as a proxy for socio-economic status. The literature reviewed indicated that higher qualification by parents often correlated with higher levels of student academic performance. Finally, *first language* was taken as an indication of culture.

Demographic variables are used to introduce groupings that may indicate correlation with use frequency—perhaps certain cultures use certain media more than others. However, it is expected that only moderate correlations will emerge from demographic variables as in other studies discussed in the literature review.

3.1.2 Independent Variables

Independent variables in this study will emerge between academic performance and use intention since use intention for a given medium (or set of media) can display a hedonic–utilitarian mix.

Use intention is, as discussed in the literature, that aspect of media use which entails user motivations. It is expected that certain media groups (e.g., Social Networking) will be used with more hedonic intention, whilst media more explicitly aimed at structured information traversal (Search and Encyclopedia) will be more utilitarian.

The variables in the survey which extract use intention pertain to use *motivation* and use *belief*. These were accepted as measures of very similar aspects of use intention. For instance: “I believe that using Social Networking media channels is more for enjoyment purposes” or “I use Social Networking media more for enjoyment purposes”. Both responses communicate that use of the given media is perceived as *more* recreational. Thus the assumption was that user perception of a media indicates use intention (as indicated in section 2.2.3). Use intention, then, was taken as an indication of actual use. As in section 2.3.3, a single media can have both hedonic and utilitarian elements present simultaneously. Both of these variables were elicited from users in order to prompt reflection on how they perceived a given media group and what they actually used it for. The expectation is that respondents’ use intention will be congruent with findings in the literature for each media group. Furthermore, motivation for use and use belief are expected to display strong levels of correlation in the final analysis and so allow for summation into a single, scale value. This scale value is referred to as *use intention* and comprise a score out of 50 for each respondent.

Two use contexts were recorded by the survey: general and in-lecture. Because these contexts refer to different time-frames (i.e., lectures are fixed 50 minute periods whereas the general context has no such limitation) they were not subject to direct statistical comparisons. Instead, they provide ordinal indications of which media are more popular for either context. Each context also provided an opportunity for bi-variate correlational analysis with academic performance. Thus

use frequency consists of two scale values for the general and in-lecture contexts respectively.

3.1.3 Dependent Variable

The dependent measure in the analysis is academic performance. In the pedagogical context, this is reflected by academic marks which are taken as a direct measure of academic performance. The literature reviewed indicates that this measure of task performance has displayed significant levels of correlation with various measures of online media use frequency. Use intention is also tested against academic performance for correlation, although this serves more as supplementary findings to the explicit hypotheses.

3.1.4 Hypotheses

The first hypothesis (H_1) predicted a negative correlation between general media use and academic performance. The independent variable, general use, is tested for correlation (ρ) with use levels in the general context. It is theorised that a correlation in this context would indicate a deeper change in how Millennials consume information that is perhaps incompatible with pedagogical methods employed at the university.

The second hypothesis (H_2) predicts a negative correlation between general media use and academic performance. In-lecture use of online media is theorised to be linked to academic performance through attention—particularly attentional control. Individuals, it was assumed, cannot simultaneously concentrate on two inputs.

3.1.5 Interpretation of correlations

A key aspect of this project was comprehensively assessing the existence of correlations between online media use and academic performance. Ultimately there were three scale values to be analysed for bi-variate correlations with academic performance:

1. General Use Frequency (H_1).
2. In-Lecture Use Frequency (H_2).
3. Use Intention.

The first item indicates whether general use of media has any correlation or effect on users' academic task performance. Arguably, if there is a correlation in the general context, online media may be either a learning inhibitor or enabler. This item provides the strongest evidence for the effect media may be having on the human brain regarding learning capabilities.

The second item, is restricted to the lecture context. In section 2.5.1 literature regarding attention was presented. The theorised link between academic performance and media use in lectures would be based on attention and attention management. If a correlation were to emerge here it would be indicative of online media's effect on attention and respondents' ability to participate in lectures.

Should a strong correlation emerge in between use frequency and use motivations then it could be argued that users are either extending their knowledge base (utilitarian) or it could be indicative of an escapism or lack of interest regarding present surroundings being inculcated by use (hedonic).

It was expected that use frequency would correlate with hedonic use motivations in the general and lecture context. Finally, it was expected more hedonic use will correlate positively with lower academic performance because higher levels of use were expected to result in poorer performance.

3.1.6 Data Collection

The data collection tool for the survey methodology was a questionnaire consisting largely of multiple choice questions. Each multiple choice question provided the respondent with an exhaustive list of options from which they could choose the response most appropriate for describing their situation.

Invitees were specifically identified as students who had completed at least one year of study. This prerequisite for participation in the research was put in place

to ensure that respondents would be able to glean their average academic performance from past modules. Students in the Department of Information Science were contacted by email and presented with the research questionnaire and an incentive to participate in the research (a R1000 shopping voucher).

In order to address prestige bias in self-reported (academic) data the respondents were informed that their submission would be kept completely anonymous. This precaution also formed part of the broader ethical considerations of the methodology.

Permission to conduct this research was conferred after the process for attaining ethical clearance was successfully completed. The ethical considerations were largely around the anonymisation and guarantee of confidentiality built into the data collection process. The nature of the data (academic data and online browsing data) were largely the source of these considerations.

Emails were sent from a built-in university mailing mechanism. In this way invitees were presented with a trusted email source.

Chapter 4

Data Analysis

4.1 Introduction

Following collection, data was scrubbed for missing values. In total, 196 completed responses were recorded of the 760 invitations that were sent out—resulting in a 25.79% response rate.

The primary goal for this section is to investigate the hypotheses as stated in chapter 1:

H₁ Online media use levels, in the general context, will correlate negatively with academic performance.

H₂ Online media use levels, in lectures, will correlate negatively with academic performance.

The layout for this chapter is as follows: Firstly an overview of the data is presented wherein descriptive statistics such as mean responses and general distribution of values for variables are presented. The following section presents the independent variables and discusses the considerations and methods for calculating scale variables for use frequency and use intention. The final section of this chapter investigates the correlations which directly address the hypotheses as discussed.

4.2 Descriptive Analysis

4.2.1 Demographics

Of the 196 respondents: 42.9% (86) were males, 56.6% (111) were females and 0.5% (1) indicated other. First languages included Afrikaans (33.2%), English (54.6%), isiXhosa (4.1%), Zulu (1%), Sepedi (1%), Other African Language (4.6%) and Other European Language (1.5%). The demographics as listed above were accepted as largely representative of the campus population.

Highest academic qualification attained by parents (taken as an indicator of socio-economic status) was distributed as follows: None (0.5%), Primary School (2%), High School (37.8%), Bachelors Degree (31.1%), Honours or Masters Degree (22.4%) and Doctoral Degree (6.1%). As with gender and first (home) language, this distribution was taken as representative of campus population.

The mean age of the sample was between 19 and 20 years of age at the time of writing. In light of the discussions regarding Millennials, in both chapter 1 & 2, this places the sample comfortably within the loose membership indicator of age (i.e., individuals who have been raised in a technologically saturated environment). Figure 4.1 indicates a normal mark distribution.

4.2.2 Use Frequency

To analyse use frequency two measures were employed in the survey: use of media in general and use of media during lectures. These two measures were elicited using different response sets. A normalised, scale value indicating use frequency for each respondent was calculated. First, the general case is presented.

General use was measured by prompting respondents to complete the following statement: "I use *Social Networking* channels:", where *Social Networking* can be replaced with any of the five media groups tested for. The possible responses were: (1) "Not at all", (2) "Sometimes (at least once per month)", (3) "Often (at least once per week)", (4) "At most once a day" and (5) "Multiple times per day". These were coded onto a 5-point scale as indicated. Descriptive analysis reveals that, on average, 2.6 of the media groups tested for are used multiple times per day.

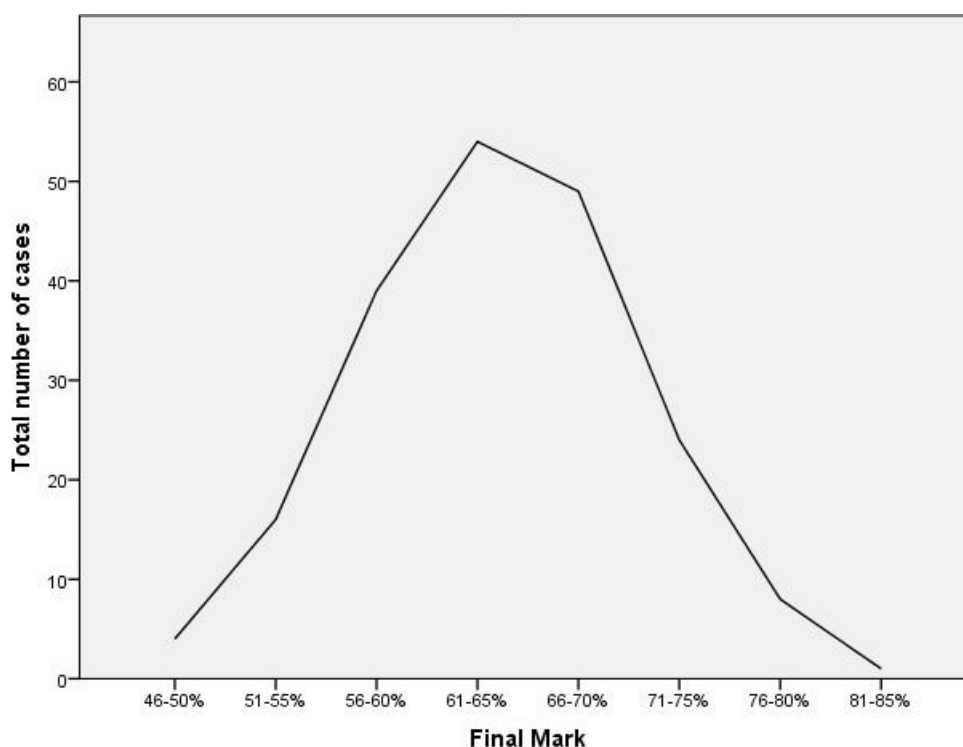


Figure 4.1: Final mark for modules in general

This bodes well for use levels as predicted by Millennial membership. Figure 4.2 gives an indication of respondents' mean use of the five media tested for. Social Networking, Instant Messaging and Search activities stood out as the most frequently used media in general contexts. The former two were, however, dominant in this regard. The data presents an instance where a media with social elements (Microblogging) was ranked lower in terms of use than another media void of such elements (Search). Arguably, functionalities shared between Microblogging and other media may be better served by other media (Social Networking or IMing). Social Networking media could be satisfying the user's desire of staying-up-to-date, which is reportedly a core function of Microblogging media. 138 (70.4%) of respondents stated that Social Networking media was used multiple times per day and 190 (96.6%) of respondents reported using IM media multiple times per day. Finally, 143 (73%) respondents reported making use of search (engine) media multiple times per day.

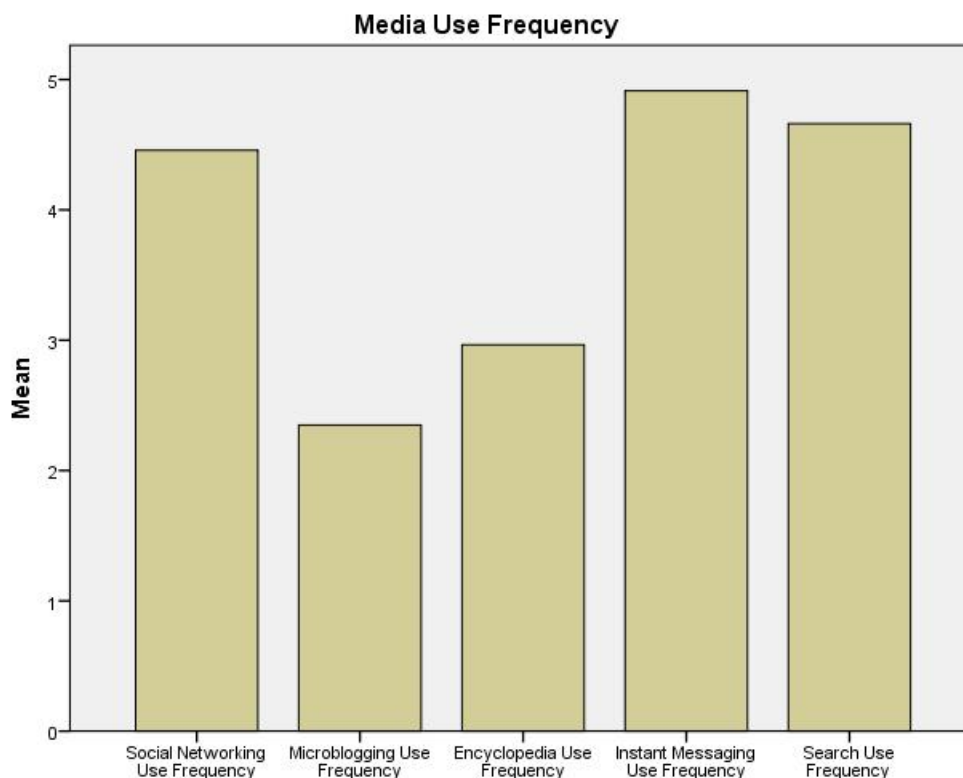


Figure 4.2: Use frequency of media in general contexts

General use frequency clustered by gender revealed similar use levels across gender groups. Instant Messaging and Search activities displayed the most notable differences by gender, as in Figure 4.3. Overall, a similar usage pattern emerged when considering the different media by first language (as an indicator of culture) and highest qualification attained by parents (as a proxy for socio-economic status). These findings indicate that usage of media tested does not correlate with the parents' qualification or culture very strongly. Females were more frequent users of Microblogging, Social Networking and search media in the general context.

However, a significant (at the 0.05 level) Pearson correlation between final mark and highest qualification by parents was discovered. The relationship indicated, with 0.156 strength, that higher qualifications attained by parents correlated with higher academic marks.

In-lecture media use was measured using a similar collection instrument to that of

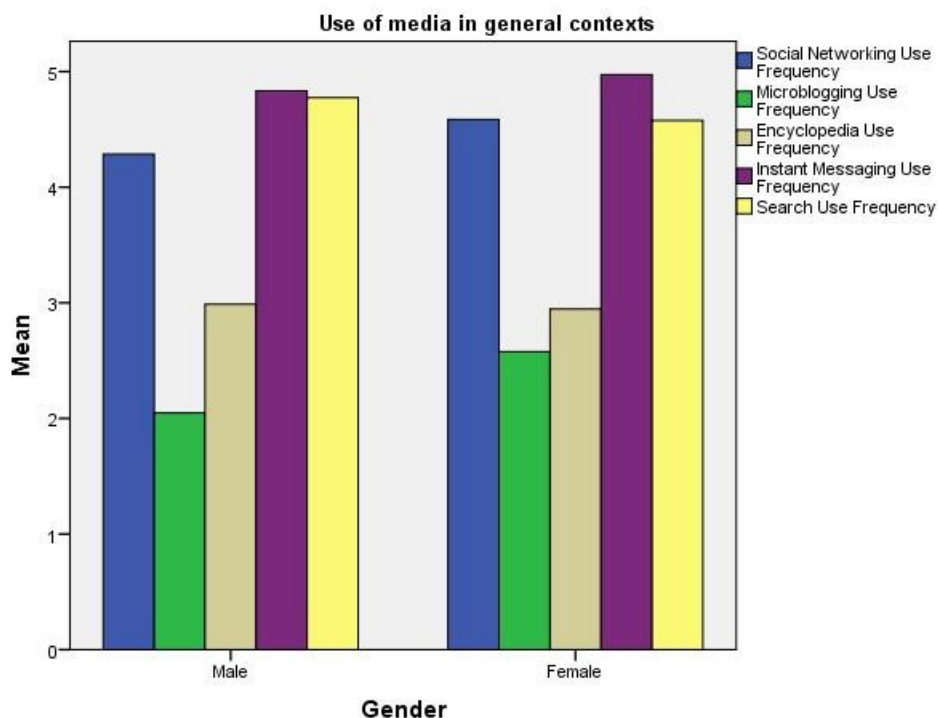


Figure 4.3: Use frequency of media in general contexts by gender

general use. Respondents were asked to complete the following sentence: “When I’m in lectures I use *Social Networking* channels”, where *Social Networking* can be replaced with any of the media groups tested for. The possible responses were (1) “Not at all”, (2) “Once or Twice”, (3) “Every 10 minutes”, (4) “Every 5 minutes”, (5) “Constantly”. These responses were coded onto a 5-point scale as indicated. Figure 4.4 shows the mean frequency respondents indicated for each media. IMing was the only media where 18.9% of users reported constant use in lectures. All other media tested scored 1.5%–9.7% for constant in-lecture use. Social Networking was at the upper bound of this range, but this is still roughly half of IMing’s reported “constant” use levels. This fits well with findings in literature. The data clearly indicate IMing is highly integrated with everyday tasks, even those which demand higher levels of attention such as lectures relative to other media groups.

Similar media preferences were found for in-lecture use. It is not possible to directly compare the results between general and in-lecture use due to different time-frames

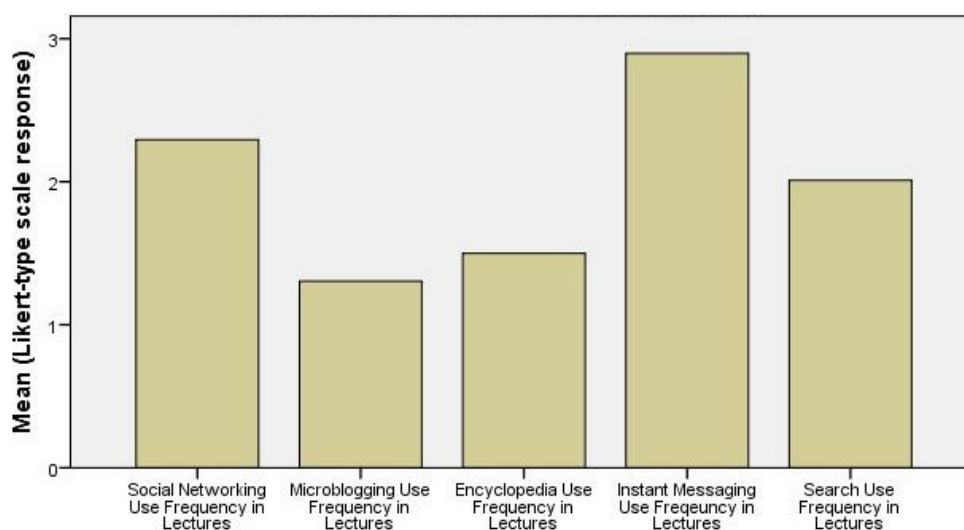


Figure 4.4: Use of media in lecture contexts

which forgo this ability, however an ordinal comparison regarding use frequency indicated that respondents' choice in terms of media use are maintained in and out of the lecture hall. Females tended to use IMing more frequently than males in lectures.

Finally, results of use belief and use motivation are presented. Together these values are combined to form the *use intention* variables set. Use belief was elicited by prompting respondents to complete the following sentence: “*Social Networking* channels provide a way to:”, where *Social Networking* can be replaced with any of the media groups tested for. Possible responses were captured by presenting respondents with a 5-point Likert-type scale. A value of 1 on the scale corresponded with a purely entertainment or pleasure driven (i.e., intrinsic) use belief. On the other end of the scale: a value of 5 corresponded with a purely work-oriented (i.e., extrinsic) use belief.

Use motivation was elicited from respondents by prompting completion of the following sentence: “I most often use *Social Networking* channels for:”, where *Social Networking* can be replaced with any of the media groups tested for. A 5-point Likert-type scale was presented with a value of 1 corresponding to purely entertainment related use and 5 corresponding with purely study or work related use. These

values are summed for each participant to give a final score out of 50¹ representing the use intention.

Section 2.3 investigated the distinctions between hedonic and utilitarian elements online media. This project also investigated correlations between use intention and academic performance and has hypothesised a significant negative correlation between hedonic use intention and academic performance. Table 4.1 summarises respondents' view of the media groups tested for in terms of the hedonic–utilitarian continuum. As was expected, bivariate correlation analysis revealed significant, and strong linear correlations between use belief and use motivation variables across all of the media (with a ρ value ranging from .693–.806).

Table 4.1: Mean belief and actual use of media on the hedonic(1)–utilitarian(5) continuum

| Media | Belief | Actual |
|-------------------|---------------|---------------|
| Social Networking | 2.25 | 2.14 |
| Microblogging | 2.14 | 2.01 |
| Encyclopedia | 4.32 | 4.19 |
| Instant Messaging | 2.57 | 2.49 |
| Search | 3.61 | 3.64 |

The descriptive analysis also revealed that all 196 responses were usable for the analysis of *use intention* and academic performance. Reporting on both of the values collected demonstrates that they measured very similar aspects regarding use. Thus these variables are treated as one scale value for the remainder of the discussion: use intention.

¹Two, five-point scales for the five media groups tested.

4.3 Use Intention and Use Frequency

Use Intention is an indication of what respondents felt a given media group is most used for along the hedonic–utilitarian continuum. As explained in section 3.1.2, along with use frequency measures these represent the set of calculated scale variables which are the independent variables in this analysis. Because the data represents usage frequency in two different contexts (general and in-lecture) scale variables are computed for each of these contexts in terms of use frequency.

Firstly, the calculation of use in the general context is presented. The task of calculating a *use frequency score* takes careful consideration of what each number on the 5-point scale represents. In this way, respondents are classified in terms of their overall use as *high*, *moderate (high–low)* or *light* users.

If a respondent indicated using all five media multiple times per day they are considered *high* frequency users. Since “multiple times per day” can only imply two or more use sessions per day, 10 or more use sessions per day are indicative of high frequency use levels. In order to calculate a scale variable responses coded as 5 were scored 20; 4 scored 10; 3 scored 5; 2 scored 1; and 1 scored 0. In this way, if a respondent indicated that he or she used three of the media groups tested for multiple times per day, they are guaranteed to score 60 or above. Whereas, if a respondent indicated using 5 media, at least once per day (i.e., five use sessions), they were scored 40. This weighting strategy enabled the dataset to occupy a wider range of the scale and created natural clusters for classification. A descriptive analysis of the scale variable calculated for general use frequency revealed an average value of 60 with 14.98 standard deviation. This fits with the finding that on average participants used 2.6 of the media tested for.

General use frequency scale values were then classified into high, moderate-high, moderate-low and low. High values were between 80–100; moderate-high between 60–79, moderate-low 40–59, and low 0–39. Figure 4.5 displays the distribution for the general use classification. This figure reveals that most of the participants (roughly 50%) used up to three media multiple times per day in the general context.

For the in-lecture use context a different summing strategy is employed. A scale

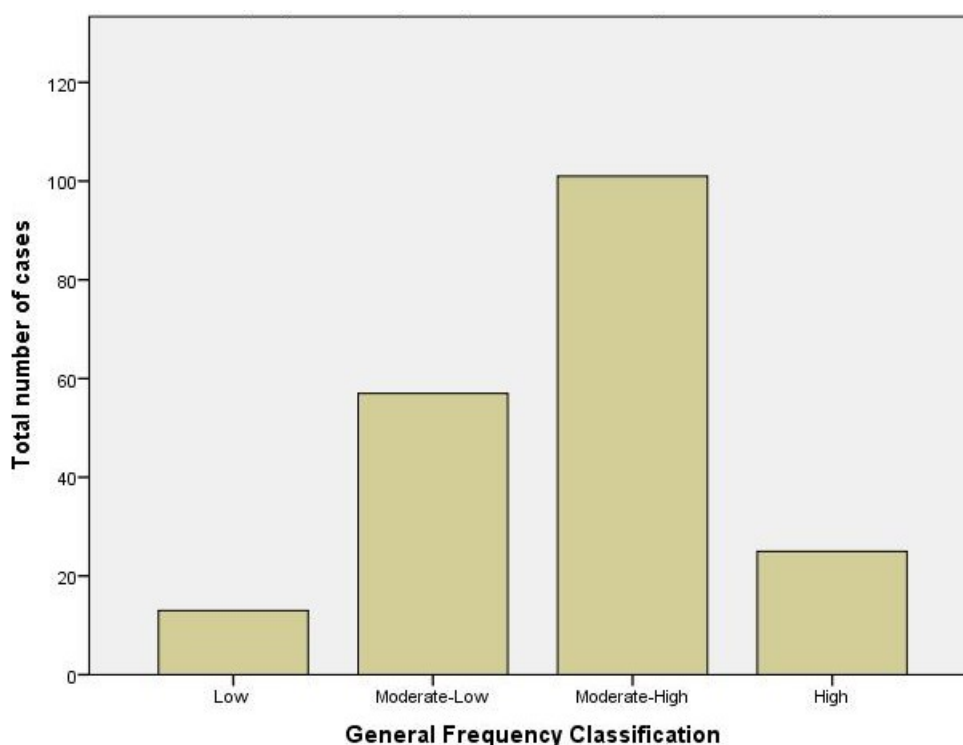


Figure 4.5: General Use Classification from computed scale variable

variable is also calculated, but is not directly comparable to the general context. For in-lecture use, a response of 5 implies constant use of a media. Thus, constant use guarantees a score of 80 or above. If a respondent indicated using all five media every 5 minutes, then they should were also scored 80—this use case was taken as equivalent to “constant” use. The reasoning is that “constant” use of a single media group already implies high use levels. Using a second media group constantly does not increase use frequency considerably. However, using multiple media groups constantly is indicative of rapid switching strategies as discussed in section 2.5.3. Descriptive analysis reveals that the average score on this scale was 63.54 with 16.13 standard deviation.

In-lecture use frequency scale values were also classified into the same, four groups as general use frequency. Scores between 80–100 were classified high frequency; 65–79 were classified moderate-high; 53–64 were classified moderate-low; and 0–52 were classified as low. From Figure 4.6 can be seen that the majority of cases did

not report constant use during lectures. However, use of at least one media group “every 5 minutes” seemed more uncommon than expected. Arguably, roughly one fifth of respondents indicating constant use of IMing could be considered relatively high levels of constant use in the sample. The graph seems to indicate two relatively large groupings in the sample. Users and non-users, with moderate frequency appearing to be more the exception.

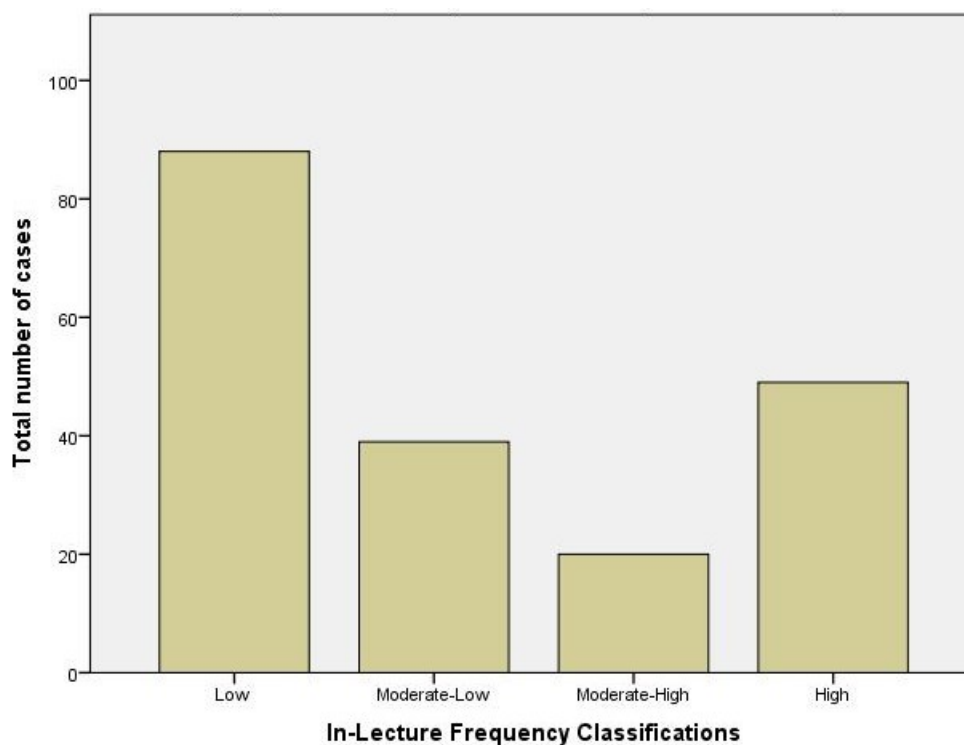


Figure 4.6: In-Lecture Use Classification from computed scale variable

In chapter 2, rapid switching was identified as a multitasking strategy that was employed by individuals who tend to “multitask” with media. For in-lecture use, roughly 12.2% (24 respondents) were identified as potentially employing rapid switching strategies in their use sessions. These cases would include respondents who reported using two or more media “constantly” or who made use of 4 or more media groups “every 5 minutes”.

Table 4.2: Bi-variate correlations between use intention and general use frequency of all five media

| | | Browsing tendency (Hedonic / Utilitarian) | Social Networking Use Frequency | Microblogging Use Frequency | Encyclopedia Use Frequency | Instant Messaging Use Frequency | Search Use Frequency |
|---|---------------------|---|---------------------------------|-----------------------------|----------------------------|---------------------------------|----------------------|
| Browsing tendency (Hedonic / Utilitarian) | Pearson Correlation | 1 | -.055 | .059 | .094 | .045 | .088 |
| | Sig. (2-tailed) | | .446 | .414 | .188 | .533 | .220 |
| | N | 196 | 196 | 196 | 196 | 196 | 195 |
| Social Networking Use Frequency | Pearson Correlation | -.055 | 1 | .261** | -.024 | .271** | .084 |
| | Sig. (2-tailed) | .446 | | .000 | .742 | .000 | .244 |
| | N | 196 | 196 | 196 | 196 | 196 | 195 |
| Microblogging Use Frequency | Pearson Correlation | .059 | .261** | 1 | .027 | .107 | -.032 |
| | Sig. (2-tailed) | .414 | .000 | | .710 | .135 | .654 |
| | N | 196 | 196 | 196 | 196 | 196 | 195 |
| Encyclopedia Use Frequency | Pearson Correlation | .094 | -.024 | .027 | 1 | -.052 | .228** |
| | Sig. (2-tailed) | .188 | .742 | .710 | | .465 | .001 |
| | N | 196 | 196 | 196 | 196 | 196 | 195 |
| Instant Messaging Use Frequency | Pearson Correlation | .045 | .271** | .107 | -.052 | 1 | .208** |
| | Sig. (2-tailed) | .533 | .000 | .135 | .465 | | .003 |
| | N | 196 | 196 | 196 | 196 | 196 | 195 |
| Search Use Frequency | Pearson Correlation | .088 | .084 | -.032 | .228** | .208** | 1 |
| | Sig. (2-tailed) | .220 | .244 | .654 | .001 | .003 | |
| | N | 195 | 195 | 195 | 195 | 195 | 195 |

** Correlation is significant at the 0.01 level (2-tailed).

Table 4.2 shows that no significant correlation exists between general use frequency of media and *use intention*. However, significant bi-variate correlations in the positive direction exist between general use frequency of Social Networking and Microblogging; Social Networking and IMing; Encyclopedia and Search; and IMing and Search. These, positive relationships are perhaps indicative of the shared or complementary attributes of different media. For example, the correlation between Search and Encyclopedia media use in the general context can be interpreted as combined use of complementary media: searching for information may lead to use of structured information sources such as Encyclopedia media. It would appear that the 5-point Likert-type scale instrument has not detected sufficient variation in use intention for this aspect of the browsing profile to yield significant correlations with academic performance either (see section 4.4).

Table 4.3: Bi-variate correlations between use intention and in-lecture use frequency of all five media

| | | Browsing tendency (Hedonic / Utilitarian) | Social Networking Use Frequency in Lectures | Microblogging Use Frequency in Lectures | Encyclopedia Use Frequency in Lectures | Instant Messaging Use Frequency in Lectures | Search Use Frequency in Lectures |
|---|---------------------|---|---|---|--|---|----------------------------------|
| Browsing tendency (Hedonic / Utilitarian) | Pearson Correlation | 1 | -.165* | -.042 | .161* | -.110 | .189** |
| | Sig. (2-tailed) | | .021 | .558 | .024 | .126 | .008 |
| | N | 196 | 196 | 195 | 196 | 195 | 196 |
| Social Networking Use Frequency in Lectures | Pearson Correlation | -.165* | 1 | .255** | -.016 | .652** | .289** |
| | Sig. (2-tailed) | .021 | | .000 | .828 | .000 | .000 |
| | N | 196 | 196 | 195 | 196 | 195 | 196 |
| Microblogging Use Frequency in Lectures | Pearson Correlation | -.042 | .255** | 1 | .065 | .305** | .205** |
| | Sig. (2-tailed) | .558 | .000 | | .364 | .000 | .004 |
| | N | 195 | 195 | 195 | 195 | 194 | 195 |
| Encyclopedia Use Frequency in Lectures | Pearson Correlation | .161* | -.016 | .065 | 1 | .020 | .490** |
| | Sig. (2-tailed) | .024 | .828 | .364 | | .783 | .000 |
| | N | 196 | 196 | 195 | 196 | 195 | 196 |
| Instant Messaging Use Frequency in Lectures | Pearson Correlation | -.110 | .652** | .305** | .020 | 1 | .229** |
| | Sig. (2-tailed) | .126 | .000 | .000 | .783 | | .001 |
| | N | 195 | 195 | 194 | 195 | 195 | 195 |
| Search Use Frequency in Lectures | Pearson Correlation | .189** | .289** | .205** | .490** | .229** | 1 |
| | Sig. (2-tailed) | .008 | .000 | .004 | .000 | .001 | |
| | N | 196 | 196 | 195 | 196 | 195 | 196 |

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

For the in-lecture data use intention and media display a similar pattern. However, a more high risk (0.05) rejection of the null hypothesis for the bi-variate correlation emerges between use intention and Social Networking (in the negative, hedonic direction). The same is true of use intention and Encyclopedia use, but in the positive direction. This indicates that respondents probably felt using social media in the lecture setting was more likely for pleasure, whilst encyclopedia media was more task-oriented. This divergence between contexts leads to a more dynamic view of how technology is perceived by users as dependent on the context.

Finally, use intention showed no correlation with academic performance. This finding indicates that respondents who tended to view their use of media as more utilitarian, did not necessarily perform better than those who engaged in more hedonic usage. This finding is counter to the expected finding of utilitarian use intention. Utilitarian use is expected to benefit users' task performance, but the data does not reflect such a support from utilitarian use intention.

4.4 Use Frequency and Academic Performance

Correlations between use frequency and academic performance are presented in this section. In particular, bi-variate correlations between use frequency and academic performance are presented.

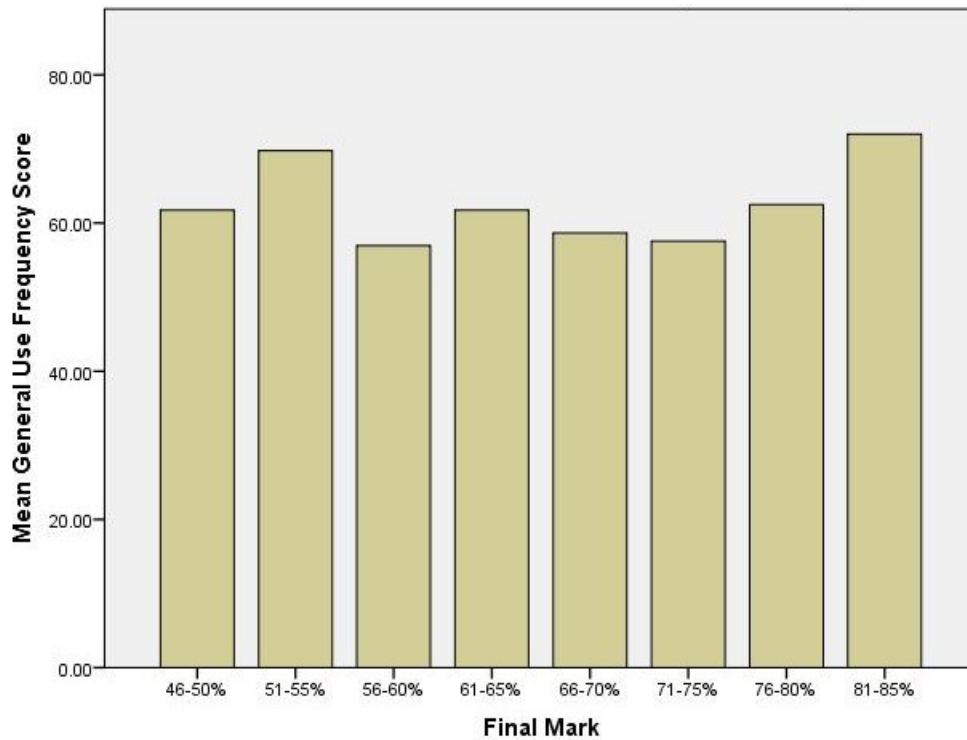


Figure 4.7: General Use and Final Mark

Figure 4.7 reveals no bi-variate correlation. Overall general context use reflected no indication that use, as such, correlated (and thereby potentially affected) academic performance. Figure 4.8 shows a breakdown of the different media and how they contribute to the findings in Figure 4.7. Figure 4.8 also reveals that IMing and Social Networking were the most likely candidates for being used multiple times per day. These are followed closely by Search media use. This fits with findings covered in chapter 2 regarding Social Networking, IMing and Search media. Interestingly, Microblogging use seems to spike at the top end of academic achievers for this group. However, on the whole, Microblogging was the least popular technology in

terms of use frequency with a mean response of 2.35 recorded by the survey. This is a somewhat interesting finding as the social elements inherent in Microblogging created the expectation that it would achieve higher use rates amongst the sample population. Clearly, the social media elements seek are better served by Social Networking and (or) IMing. In fact, the media (Search) identified as the second most “utilitarian” by the sample achieved a mean use rate of 4.66 for the general use context. Search media do not feature any social elements regarding use yet are used very frequently by the sample.

Engagement with social media can also be an indication of community involvement. Junco found that certain Facebook activities correlate positively with academic performance whereas Bachrach *et al.* (2012) found that certain personality types were prone to higher levels of social media use. What can be surmised from the data as presented here is a general inconclusiveness regarding the effects of media engagement levels and academic performance in the general context due to a lack in significant correlations.

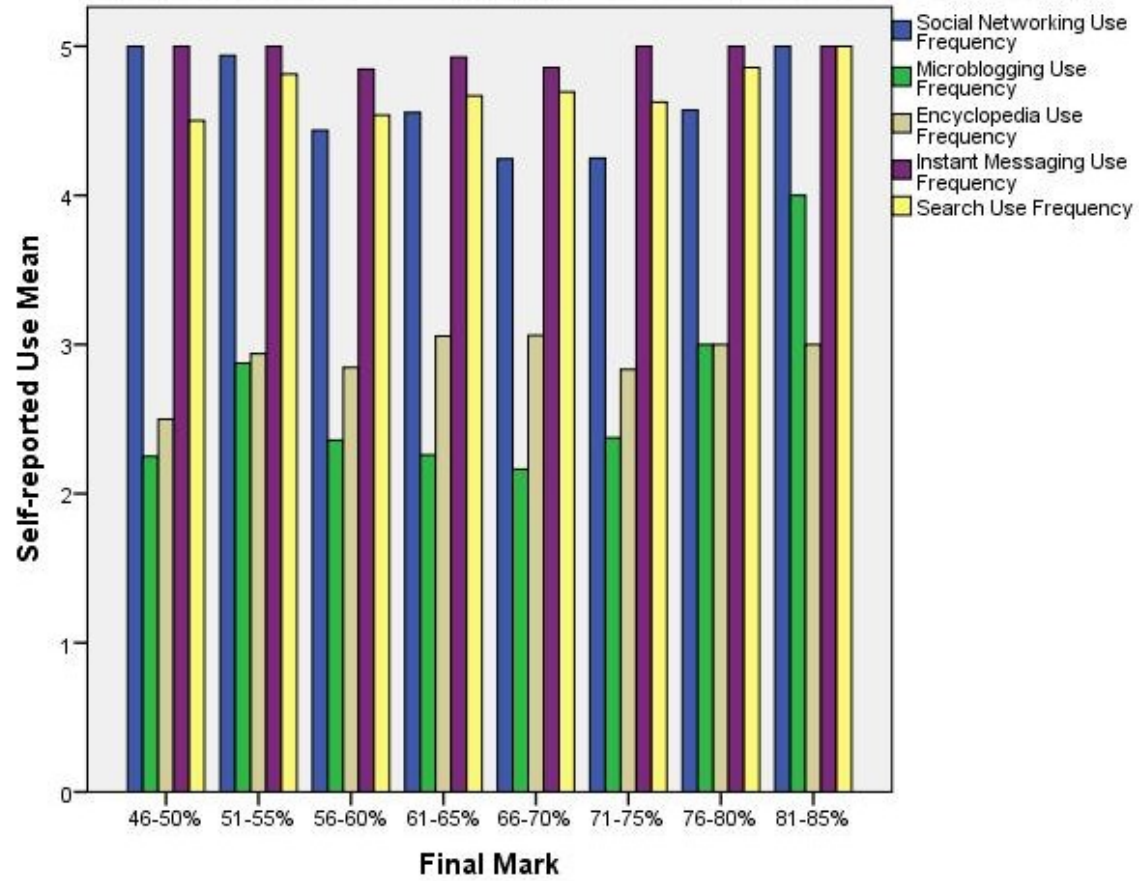


Figure 4.8: Breakdown of different media vis-a-vis Final Mark (General)

Figure 4.9 reveals the overall performance of the scale for in-lecture use and academic performance. A clearer pattern is depicted in Figure 4.9 regarding a correlation between academic performance and self-reported in-lecture use of the media tested for. With regards to use frequency, certain media stand out: IMing and Social Networking. A similar spike to that of Microblogging in the general context can be seen for Encyclopedia media for the in-lecture context.

Significant bi-variate correlation at the 0.001 level in a negative ($\rho=0.218$) direction was discovered. In particular, Social Media and IMing were strongly correlated with a decrease the measure of academic performance used here. Social Networking displayed a significant correlation at the 0.001 level and a Pearson correlation of $\rho=-0.226$. IMing displayed the same correlation but with a strength of $\rho=-0.256$. The use of Encyclopedia media was displayed strength but the positive direction but no correlation. Use of IMing and Social Networking stand out amongst the media for negative correlation with academic performance.

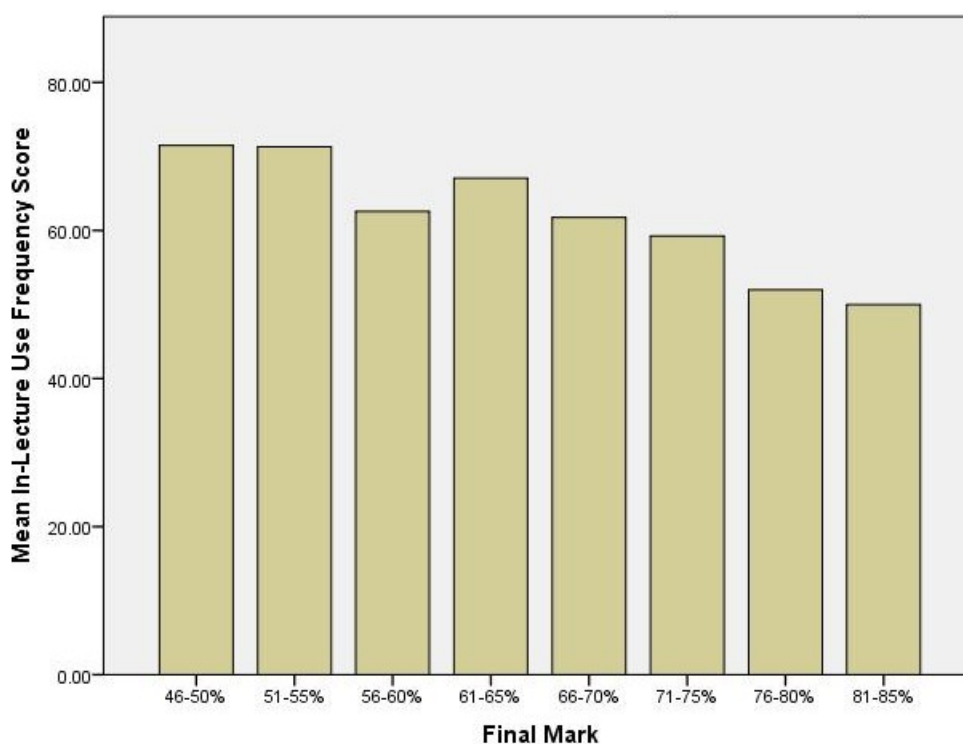


Figure 4.9: In-Lecture use and Final Mark

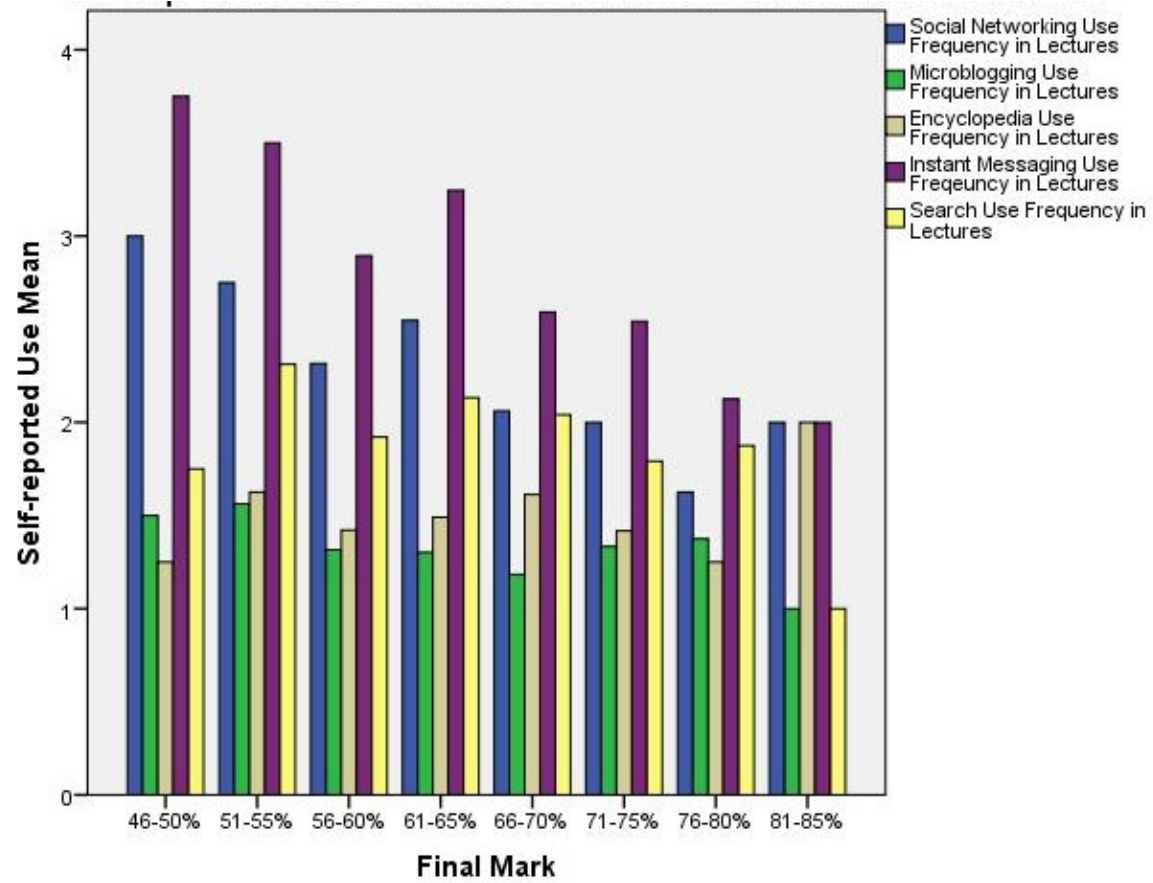


Figure 4.10: Breakdown of different media vis-a-vis Final Mark (In-Lecture)

4.5 Summary of Data Analysis

This section was dedicated to an analysis of data of 196 survey respondents. This sample was found to be largely representative of campus demographics. The mark distribution was also found to be normal. Use data were classified into two groups based on context: general and in-lecture. The data in these two groups are not directly comparable due to differences in the collection process. It was found on average, 2.6 of the five media tested for were used multiple times per day by respondents. Of these media, Social Networking and IMing were the most popular in terms of use frequency for both in-lecture and general contexts. Respondents indicated that Search and Encyclopedia media are mostly viewed as utilitarian in their use intention, whilst Microblogging, IMing and Social Networking were viewed as moderately hedonic. None of the five media groups were viewed as purely hedonic or purely utilitarian by respondents. *Use intention* and *use frequency* were the independent variables. Each of these, for both contexts, were considered in relation to academic performance. No significant correlation was found to exist between the general context or use intention, but a significant negative correlation was found between in-lecture use frequency and academic performance.

Chapter 5

Discussion

The current project investigates the effects of online media on users' task performance. Thus, the correlation between academic performance and media use is of primary importance. Chapter 4 presented and briefly discussed results from the dataset. In this chapter the implications of the data and how they relate to findings and theories presented in chapter 2 are considered.

The general findings section present responses for each media group and whether they are congruent with past findings. Thereafter, consideration is given to the hypotheses. This chapter concludes with a discussion of key findings in section 5.4.

5.1 General Findings

As indicated in the early sections of chapter 4, participants generally fell within the age demarcation of the theorised Millennial generation. In this sample, female respondents displayed higher use of IMing and Social Networking in the lecture hall, although use of these were prominent across genders. These media are considered largely hedonic in the literature due to their strong social elements. Of the media groups tested for, Social Networking was the second most hedonic on the hedonic–utilitarian continuum. However, respondents indicated moderate levels of hedonic use intention across media groups.

The following list presents a general overview of each of the media groups tested for with regards to their relative hedonic–utilitarian scores and use frequency for both contexts:

Social Networking: *Second most hedonic with high use frequency across contexts.*

Microblogging: *Most hedonic with the lowest use frequency across contexts.*

Search: *Second most utilitarian with high use frequency across contexts.*

Encyclopedia: *Most utilitarian with low use frequency across contexts.*

IMing: *Third most hedonic with the highest use frequency across contexts.*

The data indicate that general context use does not significantly correlate with academic performance, but that in-lecture use does. This finding indicates that context of use is a contributing factor and that users are not simply “reprogrammed” in terms of their information consumption strategies in a radical manner¹. However, this relationship is unpacked further in section 5.3. First the results for each media group are presented.

Social Networking was found to be highly popular amongst users in the literature (students in particular) (Junco, 2012b). This finding is strongly supported by the data collected (70.4% of respondents indicated use of Social Networking media multiple times per day). As indicated by Junco (2012b), high frequency users of Social Networking media, such as Facebook, may even display a positive correlation with academic performance (i.e., use of Social Networking media as such is not a negative predictor of performance). In light of this project’s data, the discovery of a negative correlation for in-lecture use and not general use is supported by Junco et al. (2012). Literature regarding social media use has discussed the *dual nature of interaction* hypotheses (Aagaard, 2014; Zhang and Zhang, 2012; Wu and Lu, 2013) which indicates both performance costs and gains associated with use of a particular media. This body of literature asserted that both hedonic

¹This interpretation was explained in section 3.1.5.

and utilitarian elements can be present simultaneously in one medium. Despite Social Networking media's overall hedonic appeal, the data indicate that use may serve work or study-related purposes for respondents, as shown in Table 4.1. Literature suggests that use of Social Networking in a way that does not disrupt (or serves to enhance) academic performance may be indicative of a particular personality type rather than successfully managing the effects of interaction with (relatively) hedonic online media (Bachrach *et al.*, 2012). Thus overall findings regarding Social Networking media use for the general context did not bear on the individual's academic performance. In-lecture use, however, displayed a strong, significant negative prediction of academic performance.

Use of IMing and Social Networking stood out as the most frequently used media groups for both the in-lecture and general context. Frequent use of IMing amongst students is congruent with findings in the literature (Bowman *et al.*, 2010; Fox *et al.*, 2008). The data also support the findings that use of IMing is highly interspersed with daily activities. Fox *et al.* (2008) show that IMing may be a major source of distraction for modern students in the collegiate context. This could especially be true with IMing media due to the nature of a given set of interactions prompting further interactions. Despite its asynchronous nature, the immediacy of send-and-receive activity encourages continual use. The data indicate that females, in particular, were high frequency users of IMing during lectures. This was the only salient demographic finding in terms of media use. IMing, in the general context displayed high levels of use (96.6% indicated use of IMing multiple times per day). However, no significant correlation was found between IMing and academic performance in the general context. Only the in-lecture context revealed a negative correlation with academic performance. Similar to Social Networking, both hedonic and utilitarian purposes were served for respondents with regards to IMing, but it would appear that high use levels during lectures, correlated with poorer performance.

Microblogging, as a group of media, was less popular amongst the sample than expected. Microblogging provides forms of social interaction and information consumption that were expected to have high appeal amongst Millennials. Overall, this form of media was used the least in the sample group. This could be an in-

dication that Microblogging has been usurped in its social functionality by other online media such as Social Networking and IMing. Use selection may be a function of user goal-satisfaction, for instance: “I use Social Networking rather than Microblogging because it is a more effective communication channel”. This finding could also be an indication that Microblogging has not penetrated to a critical level of prevalence amongst the respondents and the bandwagon effect has not been prominent enough to encourage more frequent use.

Purcell, Brenner and Rainie (2012) indicate that Search Engines are highly popular online media. General context data regarding use support this finding. In-lecture use of Encyclopedia media was not as prevalent in either context tested for. However, use of Encyclopedia media did demonstrate a spike amongst the high academic performance group. The use of Encyclopedia media correlated significantly with the use of Search media supporting their complementary nature. However, Search use frequency also lowered for the upper academic performers. Encyclopedia media was indicated by respondents as pertaining to the highest utilitarian use intention out of the media groups.

A small group of respondents (24 respondents) were identified as rapid switchers with regards to their media use. These were particular to the in-lecture context. According to Wood *et al.* (2012), engagement with multiple streams of input exhausts attentional resources in such a way that umbrage is done to the quality of tasks that are engaged with. The data reflected that no relationship existed between rapid switchers and academic performance. The implication of this finding is that rapid switching does not necessarily lead to a significant drop in performance, as may have been expected from the literature.

The above discussion gives an indication that the media groups tested for were generally used frequently amongst the sample group in general contexts. Respondents were also willing to indicate their in-lecture use and general academic performance levels in such a way that a significant correlation could be discovered for the in-lecture use context and task performance. The discussion now narrows to the hypotheses which address the research aim: general use frequency and academic performance (H_1) and in-lecture use frequency academic performance (H_2), however consideration is given to an earlier, corollary conjecture first.

5.2 Use Intention and Use Frequency

This correlation does not form part of the hypothesised correlations stated in chapter 1, but it is expected that hedonic use intention would correlate with higher use levels in the general and in-lecture context. This expectation is informed by the assumption that enjoyable tasks will be engaged with more frequently. The literature reviewed indicated that media can have both hedonic and utilitarian elements present simultaneously. The following discussion presents what the collected data reveals about *use intention and use frequency*.

In the general use context, respondents indicated that IMing, Search and Social Networking media were the most frequently used media. *No significant correlation was discovered between the calculated scale variables of use intention and use frequency for the general context.* It is conjectured that this was perhaps due to the nature of the collection instrument. Respondents were asked to indicate whether they believed their use intention of a particular media was more hedonic or utilitarian on a five point scale. This resulted in a moderate use intention scores for most respondents across the media groups tested for. Table 4.1 indicates the mean scores for the popular media groups. From Figures 4.4 and 4.2 the most popular media displayed moderate hedonic–utilitarian belief and use motivations excluding Search media which displayed a stronger utilitarian use intention as indicated in Table 4.1 (with mean responses of 3.61 and 3.64 for belief and motivation respectively).

The in-lecture context, however, did reveal correlations between *use intention* and use frequency of certain media. Table 4.3 presents the findings from the data regarding in-lecture use frequency of the media groups tested for. Search media were viewed as largely utilitarian and were used often during lectures. As a complement to search media, Encyclopedia media were also viewed as utilitarian and tended to be used more frequently during lectures. Social Networking media were viewed as *more* hedonic and displayed high frequency use levels in lectures. Thus, the data indicate that both hedonic and utilitarian media displayed high frequency use in lectures. Interestingly, IMing, which was the most frequently used media in lectures displayed moderate mean use intention despite it's strong social under-

girding. Thus, overall *the conjecture is not supported that hedonic use correlates with higher frequency use.*

Plotting media on the hedonic–utilitarian continuum did not reveal a pattern that was *particular to hedonic* use motivations in either the general or in-lecture contexts. The implication is that respondents selected media to use based on different criteria (i.e., respondents’ use motivations were not solely, or even strongly hedonic overall). The literature reviewed in section 2.2.4 suggest that users of online media employ a desire-based selection process. Relatively utilitarian media, such as Search media, displayed high levels of use as indicated by the literature. The findings, then, tend to nullify the conjecture that *particularly hedonic* use correlates with *higher use frequency*. The data collection instrument was also not designed to isolate particular aspects of the media tested for which could lead to further clarification with regards to what exactly respondents do on a given media and why they do it. Past research into user interaction with media such as Facebook and IMing both indicate the prevalence of social elements and indicated “staying connected” as one of the reasons for use amongst other social motivations. It could be conjectured that social motivations behind use are indicative of hedonic motivations, which could be true of Social Networking media, but not of Search media which are generally void of strong social elements. The data, however, indicated that Social Networking media was *not* perceived as a purely hedonic form of media. The findings, then, do not provide support for the hypothesis. The absence of data indicating the correlation between hedonic use intention and high use frequency is interpreted as supportive of the null hypothesis. *Thus, Hedonic use elements of online media are not strong predictors of use frequency.*

A non-trivial conclusion from the above discussion is that academic performance does not depend on the *kind* of media use intention. From the dataset, *use intention* is inconsequential for levels of academic performance. The data has clarified that the important correlations between use of media lies in the fact the respondents used online media as such. Their perceived motivation for using media did not correlate with how their media use affected academic performance. Literature indicated that viewing users as myopic and docile consumers leads to a misunderstanding of how and why they use media (Whiting and Williams, 2013). The

data support this assertion in that users displayed a more complex media selection criteria than conjectured (i.e., hedonic use intention did not result in media groups being used more per say). The conjecture issued above rested on the assumption that users would prefer to use media that caters more for hedonic whims than goal-oriented utilitarian ones in terms of use frequency. The survey's results demonstrate respondents generally felt that most of the media could serve a combination of motivations.

5.3 Discussion of Hypotheses

In the following sections, consideration is given to each of the hypotheses and whether the data buttressed them or their respective null hypotheses. First the general context is discussed, and then the in-lecture context. The merits of measuring both contexts is also discussed.

The hypothesized correlation between use frequency and academic performance directly addresses the research question presented in chapter 1. Literature reviewed in section 2.5 investigated this correlation extensively. This project draws especially from the research efforts of Junco's myriad research projects in this area.

The data revealed that *general use contexts do not have any significant correlation with academic performance*. In fact, use of certain media in the general context appear to increase with academic performance (such as the spike in Microblogging media in Figure 4.8). This demonstrates that most of the respondents do make use of the media groups tested for but that use of relatively hedonic media "multiple times per day" did not bear any significant correlation with academic performance.

The in-lecture context, however, did reveal a significant, negative correlation between academic performance and use frequency. The most popular media in this context was IMing by a fairly large margin. One fifth of the respondents reported "constant" IMing during lectures. Roughly a tenth of the respondents reported similar levels of use for Social Networking media. Figure 4.10 clearly indicates the negative correlation that exists between in-lecture media use and academic performance. These findings provide bolster findings from Wood *et al.* (2012) and Junco

and Cotten (2011b). The data indicate that frequent users of media are very likely having difficulty managing attentional resources which forestalls effective learning in the lecture hall. This phenomenon is known as the “cognitive bottleneck” based on the limited cognitive resources theory. More specifically, cognitive resources dedicated to visual and auditory processing are simultaneously employed for competing tasks which result in the theorised “bottleneck”. The data also indicate that paying attention during lectures forms an aspect of improved academic performance. It is re-emphasised that causation is merely speculated at this point based on the discovery of a correlation. Further investigation amongst the population must occur for such theories to be confirmed. However, the literature does seem to be in agreement with regards to the effects of (pseudo²) multitasking.

Employing the postphenomenological framework, Rosenberger (2012) assert that media play the role of transformational artifacts between the user and the world. They refer to *sedimentation*, *embodiment* and *field composition* (pp. 84–85) as those aspects of technology interaction which over time make the technology more transparent to the user and so allow for greater immersion. The focus here is on experiential dimensions of media use. To wit, habitual use is creating a constant awareness in the user of the wealth of information and functionalities available via online media. This is not an application of the hedonic–utilitarian framework of use intention, but rather that interaction with online media may be imparting the view that there is always something more interesting or stimulating to engage with (even during lectures). Frequent users of online media intersperse their use with daily activities. Thus, users are not, for instance, confined to just standing in queues at the bank but can constantly and actively engage their minds with that which they deem more engaging. Therefore, the postphenomenologist’s view would be that field composition of lecture attendance and media use are incompatible. Even though lecture attendance is not an artifact as the media is, it is a state in which students at residential university often find themselves. Arguably, this state has certain fixed attributes such as the student being seated and having to engage with visual and auditory stimulation. The presence of media, such as were tested for, compose an aspect of the field in such a way that it results in a

²Based on the literature reviewed in section 2.5.3, using two media simultaneously is not possible, but rapid switching strategies can afford such an appearance.

competitive environment for directed attention. The lecture (and or the lecturer) must compete with rich media that promise stimulation. The question is then, can the lecture environment meet the experiential demands of the habituated online media user?

The danger with this view is that user cannot help but be drawn to media when interest in a lecture is waning, but it does indicate a dimension that lecturers may have to consider in how the present or conduct lectures. Is online media use actively disallowed or encouraged? The findings from this project suggest that frequent use of media are detrimental to academic performance, even if use originates from work-based intentions. From the data it appears that use of media, even Encyclopedia media, does not extend users' ability to gain from lecture attendance but disrupts it.

Finally, it is interesting to note that Figure 4.5 and 4.6 display relatively inverted pictures of use. Despite the fact that results cannot be directly compared, the classification systems employed indicate that the general context had few moderate-high frequency users, while the in-lecture context had many moderate-high frequency users and few high frequency users. This could be an indication of the *prestige bias* De Vaus (2013) warned against when using survey instruments. Respondents may have displayed hesitance to report their actual use levels due to a intention to preserve aspects of their self-image. Junco (2013) indicates that self-reported use strongly correlates with actual use levels, but is not 100% accurate. This is identified by Junco (2013) as a challenge due to accurate recall of actual time used in combination with certain aspects of self-perception. In-lecture use arguably bears a certain stigma that general use does. This could have influenced respondents' willingness to reveal their actual in-lecture use. Use of online media in general contexts may even be perceived as the norm by respondents which reinforces their use of online media (see TRA in section 2.2.2) and willingness to report use in this context.

Regardless of the potential for *prestige bias*, respondents indicated their use levels in lectures in such a way that a significant, negative correlation emerged between use frequency and academic performance. Based on this, the hypothesis that *there use frequency of online media and academic performance are negatively correlated*

is buttressed. It is re-emphasised that this correlation is particular to the data collected for the *in-lecture context*.

5.4 Key Findings

There are two key findings which this project contributes to existant knowledge in the area of media's effects on users. These findings were with regards to in-lecture use frequency and academic performance as well as use motivation and academic performance.

The *first key finding* is that the absence of significant correlation between *use intention* and academic performance indicated that user motivation (on the hedonic–utilitarian continuum) was not a strong predictor of performance. It is conjectured that users' attentional resources were being exhausted regardless of the reason (or motivation) for them engaging with the media. Assuming the bottleneck theory of attention (Wood *et al.*, 2012), whether users are reading a Wikipedia entry or reading through the latest stream of status updates on Facebook whilst “simultaneously” tending to lecture content, the net effect on attention (resources) would be the same: limited cognitive capacities dictate that task performance suffers under these circumstances (Bowman *et al.*, 2010; Fried, 2008). The postphenomenological view asserts that incompatible *field compositions* are causing confusion between the lecture environment and media use.

Lecturers must, in these environments, compete against rich user-relevant media for limited attentional resources. Users may increasingly find themselves having “better” things with which to occupy their time by way of online media. Structured resources such as Wikipedia offer a plethora of linked information that offer opportunities for user enrichment. Users will no longer wish to simply sit and listen to a lecture, or stand in queue but occupy their minds and thoughts with some form of online media.

It was conjectured that hedonic use intention would correlate with higher use frequency levels for a given media. This conjecture was based on the reasoning that use of online media for hedonic purposes would present a more appealing

activity to users and so correlate with higher levels of use. This project, therefore demonstrated to the research community that use intention is not a factor which inhibits use of online media, but the effect that media have on attention is the link between media use and academic performance.

The data indicate that extension of faculties (i.e., complementing task performance) is not a realistic picture of the potential effects of using online media during lectures. The data indicate that use of online media during lectures, as such, is detrimental to academic performance. Thus, *the second key finding* relates to the best explanation for the significant negative correlation as demonstrated. As found in the literature this explanation is that use of online media during lectures exhausts limited attentional resources and so impacts academic performance. The implications of this is that future research must investigate more closely what effect online media are having on attention management and field composition of it's users.

5.5 Summary of Discussion

A general review of the media groups tested for revealed high use levels among the sample. A particular group of rapid-switchers was also identified, but no significant correlation emerged between membership and academic performance. Hedonic–utilitarian ratings for the different media groups were fairly moderate despite certain media's strong social elements (Social Networking and IMing). In view of this, hedonic use motivation and use frequency also did not have any significant correlation due to hedonic use motivations' non-significant correlation with media use patterns. The strongest and only significant correlation was between use frequency of online media during lectures and academic performance. The hypotheses, then, were addressed by the data as follows:

General Use Frequency and Academic Performance No significant correlation in the general context.

In-Lecture Use Frequency and Academic Performance Significant, negative correlation.

An inference drawn from the data was that users of online media display decrements in their academic performance possibly due to exhaustion of attentional resources and the field composition that online media constitute. This extends findings in existant literature by demonstrating that the correlation between academic performance and frequency of online media use is not affected by use motivations of the end-user but that the correlation is with use as such. The concerned correlation was particular to the in-lecture context. This indicates that media users, arguably, face cognitive limitations with regards to their attentional resources.

Another important finding from the data is that use of utilitarian media also did not serve to extend or improve academic performance. In fact, the most popular utilitarian media displayed a negative correlation on academic performance. Thus, the primacy of use of online media as such as asserted by the data with regards to academic performance.

Chapter 6

Conclusion

This, final, chapter is dedicated to a review of the research's overall findings, implications and a reflection on potential avenues for future research. Consideration is also given to the contributions made to existant research, particularly from section 6.1.

6.1 Implications

The hypothesis that was buttressed by the data is that of in-lecture use frequency and academic performance. Academic performance correlated with use of media as such. This finding supports what much of the literature has found regarding attention management (see section 2.5.1). Users of online media were identified as using IMing or Social Networking frequently during lectures which stands in agreement with literature reviewed in chapter 2.

Junco's body of work in the area of online media use and its effects on academic performance have generally uncovered significant, negative correlations. Thus, the findings in this project serve to buttress and extend his findings by demonstrating that online media use not only correlates with decrements in academic performance, but that media use, whether for work or pleasure, is correlates with such a drop in performance.

Because what has been studied here is primarily a correlation between two vari-

ables, no causal mechanism has been asserted. Literature does indicate that such a mechanism may exist and it would appear that the theorised cognitive bottleneck adequately links attention (and the management thereof) to task performance. Thus, online media are a powerful distractive or disruptive force within the classroom. The literature, and findings from the dataset, testify to the general ubiquity of Internet-enabled computing technology. The proliferation of technology, thus, exacerbates the element of disruptiveness.

6.2 Limitations

Four, key limitations of the project were identified:

Sample Size: The sample size of the research project consisted of 196 university students. The strength of the correlation that was discovered is thus limited to the predictive power of this sample.

Self-reported data: All use data used for analysis was reported by respondents. Despite anonymity of the collection process, respondents could still, either by mal-intent or error, report data that is not entirely accurate. In fact, Junco (2013) researched this very discrepancy and indicated that self-reported use data is, at best, a strong indication of actual use.

Correlation: From the beginning of this project, it has been stated that the research aims to discover or disprove the existence of a correlation between human-computer interaction and task performance. While the findings have remained within this ambit, the discovery of a correlation beckons further study to establish or propose a causal mechanism.

Use sessions The survey did not undertake to study particular use sessions, and what users actually do in those sessions. Therefore, the average length of a use session was not extracted either. This could have given a clearer indication of what respondents did in their time on, for instance Encyclopedia or Social Networking media instead of the bare fact that they used it a certain number of times per day or in-lectures.

6.3 Future Research

This project replicated findings from research projects discussed in the literature. The impact of media use on attention, and thus on task performance has been demonstrated in the data as presented. Future projects should seek to establish, or refute, the theorised mechanism of attentional control and attentional resources. The manner in which resources are allocated is clearly a function of context and availability of media to engage with. The literature has indicated that the media groups tested for are very available and easy to use. The aspect which requires further investigation is that of how individuals choose to manage their attention. An ethnographic study of how media users interact with online media would be beneficial for enriching understanding in this area.

Philosophical, qualitative studies as opposed to empirical, positivist studies would definitely address an aspect of online media use which was not covered in this study. The postphenomenological framework provides a framework for investigation to this end.

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