A STUDY OF THE EFFECTS OF SOCIAL VARIABLES ON TECHNOLOGICAL CONCEPTUALISATION IN LIGHT OF THE DESKTOP METAPHOR

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DECLARATION

I declare that A Study of the Effects of Social Variables on Technological Conceptualisation in light of the Desktop Metaphor is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

__________________________________________  _________________________________
SIGNATURE                                    DATE
(Ms. S. Cross)
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ABSTRACT

In this dissertation, I investigate whether the conceptualisation of computerised technological phenomena is influenced by social variables, in particular exposure to the computer. The conceptualisation and behaviour of a group of students majoring in technology-related fields were studied. Through the application of Conceptual Blending Theory, the multi-modal desktop metaphorical blend (DMMB) (as an electronic representation of an actual office desktop) was focused on. The participants were provided with tasks with the aim of determining whether they conceptualise the electronic desktop as a literal ‘thing-in-itself’ or as an e-version of their actual desks. The intent was to examine to what extent social variables, especially exposure, motivate the nature of the conceptualisation. Therefore, it is hypothesised that exposure, regarded as the primary variable in this study, influences conceptualisation of the DMMB to the extent where the it either loses its metaphoric quality in participants, who maintain regular and prolonged exposure to the computer, or retains the metaphoric quality of the DMMB in participants, who are not exposed to the computer on a regular and prolonged basis. Two groups were distinguished based on the extent of the individual participants’ exposure to computer technology, namely a high-exposure group and a low-exposure group.

A mixed method approach was used to test and analyse data collected from individual participants, as well as from the high- and low-exposure groups. Methods used to test these hypotheses included questionnaires, word association (a conceptual task), controlled observation (a behavioural task), and interviews. The resulting data were analysed by means of a thematic interview analysis and non-parametric statistical tests.

Keywords: metaphorical blend; desktop metaphor; conceptual metaphor; conceptual blending; conceptualisation; computer desktop; prototype; categories; word association; controlled observation; thematic analysis; cognition; embodied cognition.
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Chapter 1

Introduction

1.1. Context of the Research Problem

1.1.1. Cognitive Linguistics

Cognitive Linguistics emerged from Linguistics and modern Cognitive Science in the 1960s and 1970s. More specifically, it was born from studies related to human categorisation in the field of Psychology. In its early years, very few scholars considered themselves to be ‘cognitive linguists’ (Janda 2010: 3). However, by the early 1990s the research output in the field increased. The growth of the field led to the establishment of the International Cognitive Linguistics Society in 1989/90 as well as the launch of a journal, namely *Cognitive Linguistics*.

Evans and Green (2006) refer to Cognitive Linguistics as a ‘movement’ or ‘enterprise’ as it is guided by a set of common principles and assumptions which have piloted the way for a number of diverse theories that complement, intersect with and at times compete with one another:

> Cognitive linguistics did not arise fully-formed from a single source, it has no central “guru” and no crystallised formalism. It is a concatenation of concepts proposed, tested, and tempered by a variety of researchers.

(Janda 2010: 4)

1.1.2. Commitments and Assumptions

Cognitive Linguistics abides by two commitments, according to Lakoff (1990). These commitments, namely the ‘Generalisation commitment’ and the ‘Cognitive commitment’ characterise the field in that they dictate the approach that cognitive linguists adhere to, and they further motivate the assumptions and methodologies employed by the two branches of Cognitive Linguistics, including cognitive semantics and cognitive approaches to grammar (Evans and Green 2006: 27).

The Generalisation commitment stipulates that there exist general principles which describe all aspects of human language. This commitment stands in stark contrast to the beliefs held by formal approaches to Linguistics. In the case of formal approaches, it is commonly agreed that the structuring principles differ for each
aspect of language that is studied, including phonology, semantics, pragmatics, morphology and syntax. While formalists tend to study these language aspects in isolation on the basis that each aspect of language is contained in a module of its own, cognitive linguists rather study language through commonplace principles that enforce the unification of the various aspects of language. They further make it a priority to identify these common principles in linguistic study.

Similarly, the Cognitive commitment denotes a set of general principles that can be applied in other disciplines within cognitive science (such as philosophy, psychology, neuroscience and artificial intelligence). This set of principles is not only applied to language and linguistic structure, but also to cognition. Lakoff (1991: 54) defines the Cognitive commitment as “the commitment to make one’s account of human language accord with what is generally known about the mind and brain from disciplines other than linguistics”. In other words, there should be some degree of convergence with cognate disciplines, and the findings in these disciplines should also inform linguistic inquiry. Thus, both commitments emphasise the importance of establishing general principles that can be studied across all linguistic structures and language aspects, as well as across all disciplines that fall in the realm of cognitive science.

Additionally, the Cognitive Linguistics enterprise maintains a number of assumptions that arise from the two key commitments. Evans explains that the assumptions represent “default hypotheses” (Evans 2012: 3). These assumptions include:

1.1.2.1. The thesis of embodied cognition
1.1.2.2. The thesis of encyclopaedic semantics
1.1.2.3. The symbolic thesis
1.1.2.4. The thesis that meaning is conceptualisation
1.1.2.5. The usage-based thesis

Each assumption is briefly outlined below.

1.1.2.1. The thesis of embodied cognition

Embodied cognition has been the subject of discussion in several fields of cognitive science (Wilson 2002). These fields (such as philosophy, psychology,
neuroscience and artificial intelligence) acknowledge the central function of the body in influencing the mind. Clark (1998: 506 in Wilson 2002: 625), among others, maintains this view: “Biological brains are first and foremost the control systems for biological bodies. Biological bodies move and act in rich real-world surroundings.” Embodied cognition was first studied by linguists with regard to metaphors for physical notions (Lakoff and Johnson 1980). The notion that the mind must be viewed in the context of its relationship to a physical body that functions within the world has gained popularity in cognitive science. Humans have evolved to the extent where our cognitive activity is mainly immediate, online interaction with the environment. Consequently, human cognition is argued to be deeply rooted in sensorimotor processing, instead of being “centralised, abstract, and sharply distinct from peripheral input and output modules” (Wilson 2002: 625). In summary, as a result of the disposition of our bodies, we have a species-specific view of the world and our understanding of reality is mediated largely by the nature of our embodiment.

1.1.2.2. The thesis of encyclopaedic semantics

Evans (2012: 4) maintains that this assumption consists of two parts. Firstly, semantic representations in the linguistic system, known as semantic structure, link with representations in the conceptual system. The details related to the nature of the semantic-conceptual relationship differ depending on the cognitive linguistic theory in question. A theory that associates semantic structure with conceptual structure is the theory of Cognitive Grammar, as proposed by Langacker (1987). Secondly, conceptual structure, as it relates to semantics, is made up of an intricate network of structured knowledge. This phenomenon is known as semantic potential (Evans 2012: 4).

1.1.2.3. The symbolic thesis

This assumption maintains that the most basic unit of grammar is a form-meaning pairing or a symbolic unit, which Langacker calls a ‘symbolic assembly’ in his theory of Cognitive Grammar (1987) or what is known as a ‘construction’ in construction grammar approaches. Langacker states that the symbolic unit consists of two poles, namely the semantic pole and the phonological pole. The notion related to the symbolic function of language was first introduced in
Saussure’s theory of language (1916), where the linguistic expression, considered to be the ‘sign’, is made up of a mapping between a concept, which is the ‘signified’, and a sound, which is the ‘signifier’. Both the signified and signifier are considered to be psychological units. This assumption has adopted the Saussurean theory, but there exist differences, which will not be expanded upon in great detail in this dissertation. The symbolic thesis allows for meaning to achieve a central status in the cognitive model, which affects frameworks related to grammar.

1.1.2.4. The thesis that meaning is conceptualisation

The comprehension of language comprises the interaction between semantic structure and conceptual structure, as facilitated by several linguistic and conceptual devices and processes. Thus, Fregean compositionality, which maintains that “the meaning of a sentence is determined by the meanings of its meaningful components, plus their mode of composition” (Haugeland 1979: 622 in Pelettier 2001: 88), is not the sole constituent in linguistically arbitrated meaning construction. This assumption asserts that meaning involves conceptualisation. This means that meaning is conceptualised by “higher order cognitive processing” (Evans 2012: 6), which, at times, is non-linguistic in nature. According to Shuxian (2008: 2), higher-order cognitive processing stems from lower order cognitive processing, which includes fundamental cognitive abilities, such as perception and attention. Higher-order cognition involves solving problems, exploring new areas of learning and thinking creatively. It is a complex and multifaceted manner of thinking. Levine (1999) adds that higher order cognitive processing allows one to take on intellectually complex challenges, to combine many ideas into one, multifaceted idea and to problem-solve effectively by proposing creative solutions to difficult problems. In essence, it entails a more intricate way of thinking than lower order cognitive processing.

Evans (2012: 6) explains that Cognitive Linguistics holds two noteworthy approaches to meaning construction. The first places its focus on the types of non-linguistic devices that are essential to meaning construction. This is known as ‘backstage cognition’. Theories which explore backstage cognition are Fauconnier’s Mental Spaces Theory (1985, 1994, 1997) and Fauconnier and
Turner’s Conceptual Blending Theory (1998), of which Conceptual Blending Theory makes up an essential part of this study and is discussed in later sections. Evans diverts his attention to the processes involved in what he calls “front-stage” cognition (Evans 2012: 6). He recently proposed LCCM Theory (Evans 2006, 2009). LCCM stands for ‘lexical concept and the cognitive model’. The theory determines the manner in which lexical concepts assist in providing access into non-linguistic knowledge (in this case non-linguistic knowledge is considered to be the cognitive model, as a main construct of this theory) during the process of language comprehension.

1.1.2.5. The usage-based thesis

The usage-based thesis asserts that knowledge of language and use of language are interdependent, as knowledge originates from use. Symbolic units are comprised of mental routines that are made up of “conventional pairings of form and meaning” (Evans 2012: 7). Furthermore, symbolic units show degrees of entrenchment, in other words a degree to which the unit is confirmed to be a cognitive routine in the language user’s mind. Entrenchment varies depending on the language user. Due to this consideration, the frequency with which certain words or various kinds of symbolic units are found by the speaker impacts the nature of the grammar, so that more frequently found symbolic units are more entrenched. The most entrenched symbolic units have the ability to mould the language system with regard to patterns of use, which allows the mental grammar to not only be derived from language use, but to also be influenced by it.

These commitments and assumptions, as they hold in Cognitive Linguistics, stand in opposition to the formal approaches of Linguistics. Scholars who have had a pivotal influence on the field of Cognitive Linguistics, including Brugman, Casad, Croft, Dąbrowska, Fauconnier, Goldberg, Johnson, Lakoff, Langacker, Lindner, Sweetser, Talmy, Taylor, Tomasello, Tuggy, and Turner (Janda 2010), among others, reject the more traditional approaches to Linguistics in favour of Cognitive/Functional approaches. Tomasello substantiates the reason for the distancing away from the formal approaches in a review of Pinker’s The Language Instinct (1994):
...the generative and Cognitive/Functional paradigms have fundamentally different goals. At heart, Chomskyan nativism is a philosophical endeavour to discern by means of logic what is uniquely and innately human. Cognitive and Functional approaches are scientific endeavours aimed at understanding how people learn and use natural languages.

(Tomasello 1995: 152-153)

The view shared by Tomasello (1995) and the abovementioned scholars is also the view that is upheld in this dissertation. Although, there is a purpose and a place for the generative and formal approaches to Linguistics (a view which is supported by Tomasello (1995) referred to above), this study seeks to employ empirical methods in scientific inquiry. Chapter 3 of the dissertation deals with this aspect of the study (and other methodologically-related considerations) in greater detail.

The commitments and assumptions discussed above are maintained and considered throughout the course of this study. The study itself is situated in the Cognitive Semantics branch of Cognitive Linguistics. Cognitive Semantics is discussed below.

1.1.3. Cognitive Semantics as a branch of Cognitive Linguistics

Before discussing Cognitive Semantics as a branch, it is worth mentioning the other branch of Cognitive Linguistics, known as Cognitive Approaches to Grammar. Several cognitive linguists have produced theories related to grammar that show the diverse views of what grammar is. Langacker's Cognitive Grammar (1987) studies the underlying cognitive principles that give rise to linguistic organisation. More recent research has aimed to give a descriptively detailed explanation of the units that a language consists of. In this regard, Fillmore (1988), Kay and Fillmore (1999), Lakoff (1987), Goldberg (1995), and others have done considerable work on this topic. This collection of research has been named "construction grammars". It is important to consider that the two branches of Cognitive Linguistics do not exist in isolation. In an attempt to successfully develop a cognitive model of grammar, it is first necessary to construct a model of meaning (or Cognitive Semantics) (Evans and Green 2006: 48).
Cognitive Semantics in Cognitive Linguistics studies conceptual structure and conceptualisation. Evans and Green (2006: 48) elaborate that conceptual structure is synonymous with “knowledge representation”, while conceptualisation resembles “meaning construction”. These features of the human mind are studied through the medium of language. In turn, language allows entry into the conceptual system and provides an opportunity to study complex cognitive features, such as perception, on-line thought processes and decision-making. Fauconnier (1999: 96) aptly sums up this branch:

[...] language is in the service of constructing and communicating meaning, and it is for the linguist and cognitive scientist a window into the mind. Seeing through that window, however, is not obvious. Deep features of our thinking, cognitive processes, and social communication need to be brought in, correlated, and associated with their linguistic manifestations.

In Cognitive Linguistics, and specifically in Cognitive Semantics, meaning construction and its dynamic features are the objects of study. The investigation of cognitive processes that enforce and surpass language, but are mirrored by language, and consequently prompt the dynamic nature of language have been dubbed ‘backstage cognition’ by Fauconnier (1999), as briefly referred to above.

The focus in this case relates to the study of metaphor as a conceptual process, which is a constituent of backstage cognition and has been researched by cognitive linguists, like Lakoff and Johnson (1980), with the introduction of Conceptual Metaphor Theory, and Fauconnier and Turner (1998), with the establishment of Conceptual Blending Theory. Although there is much more research on metaphor in cognition, these theoretical frameworks are regarded as the bases of this study, with Conceptual Blending Theory as the key theory of focus (which is covered in Chapter 2). In Fauconnier and Turner’s research, Fauconnier (1999) reports that they witnessed a generalisation that the principles of conceptual blending can be applied to framing, metaphor, action and design, and grammatical constructions, which motivates why this study calls for a framework such as conceptual blending. As Fauconnier (1999: 98) states:

This is not an internal generalisation about language, it is an external one relating linguistic phenomena to non-linguistic ones. Such generalisations seem primordial to the understanding of how language relates to general cognition [...].
So too, is it argued that the methodology with which language is studied should allow the researcher to study language use taking into account contextual features as well as non-linguistic cognition. The study of language use in everyday life will bring us closer to accurately examining the above aspects than the study of introspection and intuition alone. Context allows the researcher to witness the scope of creative on-line meaning construction. Radden, Köpke, Berg and Siemund (2008: 3) explain that meaning construction is an “on-line mental activity whereby speech participants create meanings in every communicative act on the basis of underspecified linguistic units”. Meaning construction is “on-line” and “creative” because this activity occurs immediately and uniquely in the minds of individuals.

In this study, the construction of meaning is studied by considering prototypes. Prototypes are central members of a particular category that contain the most attributes of a category. For example, the category BIRD has various category members, including ‘robin’ and ‘ostrich’. ‘Robin’ is a prototypical member as it contains more attributes of the category BIRD (such as it has wings and can fly, it has a beak, it has feathers, etc.), than ‘ostrich’ does, as a result making ‘robin’ a prototype of BIRD. This study examines conceptualisation on the basis of individual conceptualisations as well as contextualised behaviour. Therefore, Prototype Theory, as put forth by Rosch (1973, 1978), is employed to account for the study of cognitive processes related to conceptualisation, which makes up a part of the data collection process in this study.

The present study falls under the branch of Cognitive Semantics in Cognitive Linguistics and applies the theoretical and methodological frameworks that constitute this branch, as explained above. The theoretical and methodological aspects of the study are discussed in further detail in Chapters 2 and 3 respectively.

1.1.4. The focus on metaphor

As mentioned above, metaphor makes up a part of Cognitive Semantics and the work done with regard to metaphor guides this particular study. Some of the theories related to metaphor and the prominent scholars in this field are singled out above, but Lakoff and Johnson initiated research into metaphoric phenomena
with their book *Metaphors We Live By* (1980), which speaks of a metaphor as being conceptual in nature. Their view is that “metaphorical language appears to relate to an underlying metaphor system, a ‘system of thought’” (Evans and Green 2006: 294):

> Our conceptual system thus plays a central role in defining our everyday realities. If we are right in suggesting that our conceptual system is largely metaphorical, then the way we think, what we experience, and what we do every day is very much a matter of metaphor.

(Lakoff and Johnson 2003: 4)

This study assumes that Lakoff and Johnson’s premise regarding metaphor as a product of our everyday thought processes is accurate. Thus, Fauconnier and Turner’s Conceptual Blending Theory (1998) acts as this study’s main theoretical framework due to the fact that it provides a means for studying conceptual metaphor and the cognitive process that occurs with it in the subject’s mind. In Conceptual Blending Theory, metaphor is understood as a type of blend. Conceptual Blending Theory in this case has explanatory power given the postulate of three input spaces. The connections between elements in the two input spaces are called ‘counterpart connectors’, and the projection from these spaces to the blended space is referred to as the ‘mapping’ process; the terms ‘projection’ and ‘mapping’ are used interchangeably in this regard, and is discussed in more detail in Chapter 2. Note, however, that within the context of Conceptual Metaphor Theory, the term ‘mapping’ is used to refer exclusively to the transfer of information from a source to a target domain.

Scholars, like Terkourafi and Petrakis (2010), argue that the desktop metaphor is evolving due to the increase of functions and purposes that the desktop computer needs to fulfil and due to the fact that the computer user market has grown exponentially from the past, where the desktop was created to cater to professionals in the workforce. In order to account for this evolution, the virtual desktop of today has been introduced. Terkourafi and Petrakis (2010: 158) postulate the notion that the desktop metaphor is at the core of today’s virtual desktop. It is argued in Chapter 2, that the conceptualisation of the desktop metaphor does not resemble the desktop metaphor of the past, but rather the virtual desktop of today. Thus, the desktop metaphor is an ambiguous term as it
represents several meanings. The desktop metaphor is considered to be a multi-modal blend that encompasses the desktop metaphor, the virtual desktop and the desktop blend into one phrase, namely the desktop metaphor as a multi-modal blend (DMMB). The present study focuses on the DMMB. The use of this term is motivated further in Chapter 2.

The DMMB, as a metaphor that facilitates human-computer interaction in information technology, is used in this study to determine how the blend is conceptualised, what social variables motivate the conceptualisation of the DMMB, what type of interactions it yields and to what extent it maintains its metaphoric quality in the minds of the participants. Furthermore, the technological era has influenced everyday behaviour and interactions to a great extent. It can thus be assumed that the introduction of technology has impacted our conceptual processing as well. The DMMB was selected as a subject of study, because it acts as a representation of technology that may have an influence on our conceptualisation of computer-related features, which this study means to investigate. Conceptual Blending Theory and the DMMB, in particular, were selected as the main theoretical framework and subject of study for the reasons provided above.

The section below briefly outlines Conceptual Blending, as the main theoretical framework of this study.

1.1.5. Conceptual Blending Theory

Conceptual Blending Theory emerged from the work done by Lakoff and Johnson with Conceptual Metaphor Theory (1980) as well as Fauconnier’s Mental Spaces Theory (1984, 1994, 1997). It is acknowledged that Conceptual Blending Theory borrowed some of those frameworks’ characteristic features. Conceptual Blending makes use of mental spaces, which have the capacity to house conceptual information. In Conceptual Blending these spaces are called input spaces (of which there are three), but there are a total of four (or more) spaces that can be involved in the process of blending, where Conceptual Metaphor Theory contains two domains (instead of spaces), namely a source and a target. In both Conceptual Blending and Conceptual Metaphor Theory, these spaces are believed to interact with one another. This interaction between domains or spaces
allows meaning to emerge that serves to make the conceptual metaphor understandable and logical. This interaction occurs by means of relations that are defined as cross-domain mappings (in Conceptual Metaphor Theory) or projections/mappings (in Conceptual Blending Theory). The conceptual blending network contains a third space, known as the generic space, which contains information that exists in both inputs. The generic space is projected onto the input spaces and all spaces are projected onto the emergent space, which is known as the blend. Fauconnier and Turner (1998: 135) provide a condensed explanation of what the blended space is and how it is formulated:

A particular process of meaning construction has particular input representations; during the process, inferences, emotions and event-integrations emerge which cannot reside in any of the inputs; they have been constructed dynamically in a new mental space – the blended space – linked to the inputs in systematic ways.

Conceptual Blending Theory, and related theories, is afforded further examination in Chapter 2 of this dissertation.

1.1.6. Cognitive Sociolinguistics

Recent research trends reveal a merger of Sociolinguistics and Cognitive Linguistics. Scholars, including Croft (2009) and Geeraerts (2001) among others, promote research that adheres to the usage-based principles of Cognitive Linguistics and the focus on social dimensions, as the main area of study in Sociolinguistics, in an attempt to gain a more realistic and accurate understanding of the nature of cognitive processing. In light of this research, the interdisciplinary field, known as Cognitive Sociolinguistics, emerged. This field places focus on the study of cognitive processing as it relates to social aspects that may play a role in influencing cognition. Croft (2009: 395) argues that this merger has the potential to bridge the gap between cognition and social dimensions, which are historically studied in isolation.

The present study, which examines conceptualisation and its relationship with social variables, contributes to this interdisciplinary trend by acknowledging the inevitable influence that social variables may have on cognition and attempts to determine the extent and the manner in which variables, like exposure, affect
conceptualisation by defining the role of exposure-related variables in terms of the DMBD. Cognitive Sociolinguistics is examined further in Chapter 2.

1.2. The Research Problem

In consideration of the above overview, it is clear that this study is situated in Cognitive Semantics, and places its focus on conceptual metaphor as a cognitive phenomenon by employing Conceptual Blending Theory as a theoretical framework. From the research questions below, a research problem is formulated.

1.2.1. Research Questions

The following primary research questions are addressed within this study:

- Does exposure to computer technology influence the conceptualisation of technological phenomena?
- Does exposure to computer technology motivate the behaviour within an office (and computer-related) environment?
- Is there a relationship between conceptualisation and behaviour?
- How does exposure to computer technology influence the contents and cognitive processes of the DMBD?

The secondary questions that are explored in this study include:

- Are there particular social variables, besides exposure, that influence technology-related conceptualisation and behaviour more than others?
- Is there a relationship between other social variables (like parental support, interests, access, etc.) and technology related conceptualisation and behaviour?
- What are the relations between the variables identified and the way(s) in which the DMBD is constructed? As in, constructed in the mind when conceptualised.

From the questions listed above, a research problem is identified:

To determine whether social variables, specifically exposure to computer technology, in any way alter individuals' conceptualisation of the computer
desktop. This study also intends to ascertain to what extent, if any, the individual has conventionalised (in the sub-conscious mind) the metaphor of the electronic desktop and whether it has formed an entirely technology-based blend or whether it is still conceptualised as a metaphor that features aspects of the paper-based office environment in the blend.

It is hypothesised that exposure as a social variable makes up a considerable part of the generic space and inevitably influences the blended space to the point where a participant with regular and prolonged exposure to computer technology will adopt the computer desktop as literal, while a participant with irregular and brief exposure to computer technology will still conceptualise the concept as non-literal. For example, a participant who is exposed to the computer regularly and has been exposed to the computer for a long period of time is likely to conceptualise the term 'mail' as a reference to electronic mail, which is an advancement of the World Wide Web, while a participant who is exposed to the computer less regularly and has not been exposed to the computer from an early age is likely, due to a lesser degree of technological exposure, to conceptualise the term ‘mail’ as a reference to so-called snail mail, which makes use of postal services. Therefore, the technology-based blend is adopted as a literal reference to the term ‘mail’ by the participant with a high level of computer exposure (the concept loses its metaphorical quality and the computer desktop is a literal conceptualisation – the concept is then assumed to possess low metaphoric quality), while the participant with a low level of computer exposure still regards the technology-based blend as a blend that refers to the literal term 'mail' through postal services (the concept maintains its metaphorical quality and the computer desktop is a representation of a paper-based office environment – the concept is assumed to possess a high metaphoric quality). In this dissertation, reference is made to metaphors that possess low metaphoric quality, which implies that a lesser degree of mapping occurs in the conceptualisation of the blend, and as a result the blend is closer to becoming conventionalised; and to blends that possess high metaphoric quality, which indicates that a greater degree of mapping to real-world objects takes place in order to conceptualise the blend, and consequently the blend is not yet conventionalised.
1.2.2. Research Aims and Objectives

The aims and objectives of this study are:

- To determine whether exposure to computer technology influences the conceptualisation of technological phenomena;
- To ascertain whether exposure to computer technology motivates the behaviour within an office (and computer-related) environment;
- To investigate whether there is a relationship between conceptualisation and behaviour;
- To determine the manner in which exposure to computer technology influences the DMMB.

Additional aims and objectives of this study are:

- To ascertain whether there are particular social variables, besides exposure, that influence technology-related conceptualisation and behaviour more than others;
- To establish whether there are relationships between other social variables and technology related conceptualisation and behaviour;
- To define the relations between the variables identified and the way(s) in which the DMMB is constructed.

1.3. Analytical Framework

This study examines the above research problem by means of a mixed-method paradigm with a cross-sectional, between-subjects research design. With regard to data collection, the participants for this study were selected from a small college, which presents Information Technology courses. Students who study at the college are all required to maintain some amount of computer exposure on a regular basis (a minimum of 6 hours per day). A further explanation of the setting and the sample group follows in Chapter 3 of this dissertation.

The data collection process was executed in two to three days at the college. The first day involved the completion of questionnaires related to demographic information. On the first and/or the second day, participants completed a conceptual task verbally with the researcher and answered follow up questions,
where needed. On the third day, participants took part in a behavioural task that involved a set-up office space, with an electronic desktop. After the behavioural task, each participant was interviewed by the researcher to examine what social variables are at play during conceptualisation of and behaviour toward the office environment (both paper-based and computer-based). Chapters 3, 4 and 5 focus on the data collection process and the qualitative (Chapter 4) and quantitative (Chapter 5) research methods.

In terms of data analysis, qualitative and quantitative data were analysed separately and integrated afterwards. The qualitative data from the questionnaires and interviews were analysed first. The interview data were analysed according to a thematic analysis in order to identify and define the prevalent social variables in the data. The questionnaires were consulted in order to motivate possible outlier cases, but also to further examine representative examples in the data. Afterwards, the quantitative data from the conceptual and behavioural tasks were examined and the themes that emerged from the qualitative analysis of the interviews were analysed quantitatively. Responses to the conceptual task were categorised as either technology-driven (such as a response like “software” to the concept “word”) or as non-technology-driven (such as a response like “writing” to the concept “word”). The total occurrences of technology-driven and non-technology-driven responses within the group and per individual were then calculated. An item analysis of the group’s responses to concepts was executed in order to determine which items in the conceptual task are conceptualised as attributes of the computer desktop, and which items are considered to be attributes of the paper-based office environment.

With regard to the behavioural task, the interactions of each participant were categorised as computer-based (the participant used the computer to complete the task) or paper-based (the participant used paper folders and stationery on the desk to complete the task). Based on the data, further statistical tests were administered, including correlation tests between conceptualisation and behaviour, as well as correlation tests between conceptualisation, behaviour and the prevalent themes in the interview data (which are deemed to be the relevant social variables that come into play during conceptualisation of computer-related
phenomena). Furthermore, the results of the above analyses indicated whether individual participants can be grouped into a high computer exposure group or a low computer exposure group based on the nature of the social variables and the extent to which their conceptual and behavioural tasks are technology-driven and computer-based or non-technology-driven and paper-based. A non-parametric Mann-Whitney U test was done to confirm whether a prediction can be made that a participant (or group of participants) that maintains predominantly technology-driven conceptualisations regarding computer-related phenomena due to prolonged and regular exposure will also interact more often (and/or will interact more comfortably) with the computer than with paper-based features.

Greater detail is afforded to the analysis, results and discussion of the data in Chapters 4 and 5.

1.4. The Structure of the Dissertation

This chapter introduces the field of Cognitive Linguistics and its central commitments and assumptions, which this study complied with throughout. The two major branches of Cognitive Linguistics are introduced, with specific focus on Cognitive Semantics within which this study is situated. A major phenomenon that is studied in Cognitive Semantics is conceptual metaphor, in other words metaphor as a product of the everyday thought process, which is outlined briefly. The key theoretical frameworks with regard to the study of conceptual metaphor are identified, with particular attention to Conceptual Blending, as the main theoretical framework that was employed as a basis of this study. Cognitive Sociolinguistics is introduced as a recent trend in the field that is of particular relevance to this study. The research questions are determined and a research problem is formulated from the questions. Lastly, the study's aims and objectives are listed and an analytical framework introduces the methodological aspects and the approach to analysis of the results of the study.

Chapter 2 deals exclusively with the theoretical aspect of the study. It provides more in-depth explanations of the frameworks that this study employed, including both Conceptual Blending and its related theories. Furthermore, a context is provided by a review of the available literature related to this topic.
Chapter 3 focuses on the methodological aspect of the study. The research paradigm is discussed and justified, including the need for empirical research in Cognitive Linguistics as well as the selection of the mixed-method approach as most adequate to this study. Lastly, the research design is explained.

Chapter 4 concentrates on the qualitative aspect of this study. It considers the qualitative research tools, including the questionnaires and interviews. A qualitative analytical framework is presented and the findings are presented and analysed in light of the analytical framework. Lastly, a discussion of the findings follows.

Chapter 5 deals with the quantitative aspect of this study. It explains the quantitative research tools, consisting of the conceptual and behavioural tasks. A quantitative analytical framework is provided and the results from the statistical tests are analysed. A discussion of the results concludes the chapter.

Chapter 6 aims to consolidate the theoretical framework and the study’s results. The research questions and research problem are revisited and addressed in light of the study’s results. Lastly, the hypotheses formulated in Chapter 1 are addressed.

Chapter 7 concludes this dissertation and the study’s contribution to the field of Linguistics is stipulated. Furthermore, limitations that may be identified by this study are discussed and recommendations are made regarding future research on this topic.
Chapter 2
Theoretical Framework and Literature Review

*The way we think is not the way we think we think. Everyday thought seems straightforward, but even our simplest thinking is astonishingly complex.*

*Fauconnier and Turner (2002: v)*

2.1. Introduction

In this chapter, conceptual metaphors are explored in greater depth. In addition, the concepts *frames, domains* and *mental spaces* are explained in relation to conceptual metaphors. Contemporary theories related to conceptual metaphors, namely Conceptual Metaphor Theory and Conceptual Blending Theory (or Conceptual Integration Networks) are described and the DMMB is dealt with in light of these theories. Next, categorisation, with reference to Prototype Theory, is examined as it informs aspects of the study’s methodology. Lastly, recent literature that forms a part of a novel trend in Cognitive Linguistics, namely Cognitive Sociolinguistics is introduced and outlined with the intent of emphasising the significance that this study holds.

This study assumes the inherent existence of conceptual blends within the cognitive processes of humans, in keeping with one of the main tenets of Conceptual Blending Theory. Its intent is to study a particular conceptual blend, namely the DMMB, with the aim of determining to what extent this blend has been internalised and, in turn, to determine whether differences exist in the conceptualisation of technology-related blends in individual participants by examining the amount of exposure to the DMMB in individuals. The hypothesis is that those with a higher degree of exposure will conceptualise the DMMB to the extent where it is no longer a metaphorical blend, but is immersed in the conceptual system as a real-life, literal concept in no need of representation via any mapping process. Conceptual Blending Theory, being the key framework, and Conceptual Metaphor Theory, a related theory, deal with conceptual metaphor
and are, as a result, used to investigate the nature of the conceptualisation and to determine whether there are identifiable social variables that influence the extent to which the DMMB is conceptualised as a metaphorical blend within a group of individuals. Before examining conceptual metaphor and blends and its related theories, relevant concepts, including frames, domains and mental spaces, are introduced in order to demonstrate its relation to the DMMB and to provide a contextual basis for conceptual blends.

2.2. Relevant concepts

The relevant concepts are dealt with separately below. However, it should be noted that these concepts tend to interrelate and overlap. The concepts and their interrelations are explored in further depth in the following sub-sections.

2.2.1. Frames

According to Charles Fillmore, one of the initial exponents of what has come to be known as ‘frame semantics’, frames are defined as culturally embedded schemas of knowledge and experience as is represented at the conceptual level and stored in long-term memory (Fillmore 1985). Frames have bearing on cognitive psychology, where it is the case that knowledge representation is moulded in relation to frames. Barsalou (1992: 29) outlines frames to “represent all types of categories, including categories for animates, objects, locations, physical events, mental events and so forth”. Frames are regularly updated and amended by constant human experience and are further used to make new deductions.

Frame Semantics plays a significant role in cognition in relation to grammar. Evans and Green (2006: 222) define frames as representations of “a complex knowledge structure that allows us to understand, for example, a group of related words and that also plays a role in licensing their grammatical behaviour in sentences”. Fillmore also claims in various other works that meanings that relate to particular words (or grammatical constructions) cannot exist independently of the frame with which it is associated (cf. Fillmore 1975, 1977, 1982, 1985; and Fillmore and Atkins 1992).
A well-known example of a frame is the COMMERCIAL EVENT\(^1\) frame. Consider words like \textit{buy}, \textit{sell}, \textit{charge}, \textit{price}, \textit{sale}, etc. There is a clear relation between these words. This is due to the fact that they all belong to the COMMERCIAL EVENT frame. Further participant roles are identified in this frame, including BUYER, SELLER and GOODS, among others. These participant roles interact on a semantic level, but also associate with one another grammatically. Consider the sentence \textit{Amy bought a dress}. Semantically, \textit{Amy} is the BUYER, whereas \textit{a dress} is the GOODS. The nature of the participant roles and its grammatical organisation are dependent on the verb, \textit{bought}. Therefore, the semantic effect of the frame and its features will influence the grammatical structure of the sentence, positioning \textit{Amy} at the beginning of the sentence as a subject, and \textit{a dress} at the end of the sentence as an object (that is, in English). Therefore, the semantic frame determines the grammatical organisation of the sentence.

Fillmore’s theory of frame semantics provides a platform for further work done on conceptual structure and organisation in Cognitive Semantics. Conceptual metaphors are also rooted in cognitive frames. Conceptual metaphors are frame-to-frame mappings where the contents of one frame are understood in terms of the contents of another frame.

A link exists between semantic frames and categorisation (which is addressed later in this chapter) in that frames incorporate sets of categories that can further be divided into attributes and values. It is also evident from Barsalou’s (1992) definition above that frames are structures which store these knowledge groupings (categories), and which can further be broken up into smaller features (attributes) and sub-features (values). This definition of frames is adopted in this study.

\section*{2.2.2. Domains}

Clausner and Croft (1999: 2) state that the most rudimentary unit in Cognitive Semantics is the ‘concept’ (“a basic unit of mental representation”). Concepts are not isolated cognitive phenomena as they require contextual knowledge and

\footnote{The convention of using upper case to refer to frames, domains, conceptual metaphors and categories will be adhered to in this dissertation, in line with scholars like Evans and Green (2006) among others.}
background mental structures to be understood. This contextual knowledge and/or background mental structure is known as a domain. Langacker (1987: 147) defines domains as “necessarily cognitive entities: mental experiences, representational spaces, concepts, or conceptual complexes”. Thus, domains are mental structures that differ in complexity and structure, used as background information for the understanding of other concepts, such as the domain of FOOD, which ‘contains’ lexical items like breakfast, dinner, supper and dessert.

Langacker’s theory of domains (1987) can be regarded as a theory that complements frame semantics. Clausner and Croft (1999: 2) consider these theories to be similar to one another: “The term domain has been used by Langacker (1987) and Lakoff (1987) for basically the same theoretical construct. Both were influenced by Fillmore’s work on semantic frames.”

Evans and Green (2006: 230) explain that frames and domains share many similarities, but that there are slight differences. They add that frame semantics determines that concepts can draw on multiple frames/domains, while the theory of domains considers the use of multiple domains as a standard occurrence, known as a domain matrix. The domain FOOD can be exemplified as follows: when one brings to mind FOOD, it is not only meals and food items that are conceived, but also the act of dining and social experience. It further conjures up references to health and body shape, and so forth. Thus, FOOD draws on several frames such as OBJECTS, PHYSIQUE, EXPERIENCE, SOCIAL EVENTS, etc.

The theory of domains explains domains as being structured hierarchically in terms of complexity – this is based on the belief that concepts exist in meronymic (part-whole) relations (Evans and Green 2006: 231). Therefore, domains can be segmented into further sub-domains and the domain at the top of the hierarchy does not presuppose anything else. The MOVEMENT or MOTION domain constitutes a domain at the top of a hierarchy; for example, PISTON → ENGINE → CAR → VEHICLE → MOVEMENT or MOTION. This example illustrates a vertical hierarchy of domains due to existing meronymic relations.

Langacker distinguishes between basic domains and abstract domains, which do appear in frame semantics. Basic domains are classified as such due to
embodiment. These domains relate the knowledge that we gain through our embodied experience, while abstract domains draw on our embodied experience indirectly as they are regarded to be more complex concepts. Consider the FOOD domain: Basic domains of EATING and OBJECTS (including food items) are directly embedded in our embodied experiences. At a more indirect level, the abstract domains SOCIAL EVENTS and HEALTH form a part of FOOD, but are considered to be more complex associations in terms of embodiment, as this is beyond the scope of simple physical interaction with food. Fillmore’s focus was mainly on abstract domains (frames) and Langacker addresses both abstract and basic domains.

Furthermore, Fillmore’s aim in creating frame semantics varies from Langacker’s aim in pioneering the theory of domains. Evans and Green (2006: 231) motivate that Fillmore’s focus is grammatically-driven in the sense that frames were created to explain certain grammatical phenomena. On the other hand, Langacker’s application of the theory of domains relates to conceptual ontology, which is how concepts relate to one another and are organised within knowledge structures.

Lakoff and Johnson’s Conceptual Metaphor Theory (1980) draws on domains as well as frames. Domains are the knowledge structures which hold experiential information that prompts the emergence of the conceptual metaphor. It is relevant to note that domains function in relation to one another in Conceptual Metaphor Theory, which distinguishes the source (which is typically more concrete, and therefore a more easily understood concept) from the target domain (which is typically more abstract, and therefore a more complex concept). The distinction between ‘source’ and ‘target’ domains are dealt with in further detail below, in Section 2.3.1. For the moment it should be kept in mind that this study considers frames and domains as important fundamental concepts that act as the basic mental structures, which prompt the emergence of conceptual metaphors. The distinction drawn in the current study regarding these two terms are as follows: domains extract contextual, background knowledge from frames in order to structure the content housed in domains.

Conceptual metaphors, which are discussed in the next section, feature in cognition by means of domains/frames (Clausner and Croft 1999), which are
associated with one another by means of mappings that generate the conceptual metaphor (Lakoff 1990, 1993).

2.2.3. Mental Spaces

Fauconnier (n.d.) defines mental spaces as partial constructions that are created as we think and communicate, with the aim of enforcing comprehension and action in response to how we think and communicate. Mental spaces are connected to contextual, background knowledge (in other words to frames), and are structured by frames.

Mental Spaces Theory (Fauconnier 1994, 1997) holds the view that meaning construction in language is affected by context. Thus, no sentence can be analysed in isolation from the contextual discourse in which it is embedded. Evans and Green (2006: 364) add that “semantics (traditionally context independent meaning of a sentence) cannot be meaningfully separated from pragmatics (traditionally, the context dependent meaning of a sentence)”. Furthermore, this theory relies on general cognitive processes and principles that add to meaning construction, such as the type of conceptual projection which leads to metaphorical concepts, which is the focus of this study. Conceptual projection (mapping) is a key cognitive process, which is required for conceptual metaphors and conceptual blends to be constructed. Fauconnier and Turner (1998) define conceptual projection as follows:

Projection connects frames to specific situations, to related frames, and to conventional scenes. Projection connects related linguistic constructions. It connects one viewpoint to another and sets up new viewpoints partly on the basis of old [...]. Projection is the backbone of analogy, categorisation, and grammar.

(Fauconnier and Turner 1998: 134)

From the definition above, conceptual projection is considered a fundamental cognitive process, which lies at the core of several conceptual phenomena, such as analogy (taken in this study to be similar to conceptual metaphors, since there is a mapping process which occurs between two disparate domains), categorisation and grammar. Fauconnier and Turner (1998) explain that frames are employed to associate with one another in particular ways during the process
of conceptual projection. In essence, conceptual projection is a cognitive connector, which joins frames in specific ways in order for them to project selective content onto one another, depending on the conceptual phenomenon, which is at play at that particular moment. Conceptual projection is revisited in later sections of this chapter.

Returning to mental spaces, Fauconnier (n.d.) regards mental spaces as connected domains that allow speakers to make connections to mental spaces which have been constructed earlier in ongoing discourse, due to the complex relationships that exist between mental spaces, which contribute to a dynamic process of meaning construction (or conceptualisation). It is apparent that mental spaces are similar in nature to domains, as in Conceptual Metaphor Theory. Nevertheless, Turner (2014: 13) distinguishes between mental spaces and domains as follows: domains in Conceptual Metaphor Theory are stable ‘idealised cognitive/cultural models’ (also called ICCMs), which are rooted in long-term memory. However, mental spaces are online constructions, which are ephemeral.

In Conceptual Blending Theory, mental spaces are referred to as input spaces, which Fauconnier and Turner (2002: 40) explain as “small conceptual packets constructed as we think and talk, for purposes of local understanding and action”. Therefore, mental spaces/input spaces can be assumed to imply the same thing; i.e. hypothetical containers in the conceptual system which are structured in ongoing discourse. These ‘containers’ draw on frames (knowledge that is derived from our embodied experiences and environments) to extract information that is relevant to the particular subject matter at that time in order to successfully form meaning. Like domains, input spaces are entrenched in frames and are linked to particular knowledge that is stored in long-term memory. Fauconnier (n.d.) explains the role that frames adopt in relation to mental spaces: “On this view, mental spaces operate in working memory but are built up partly by activating structures [frames] available from long-term memory” (p. 2). Like mental spaces, input spaces are interconnected and are subject to online and dynamic thought and language processes. Henceforth, the term ‘input spaces’ will be used.

It is evident from the above discussion that the concepts frames, domains and input spaces share several overlapping similarities, but also, depending on the
scholar and theory at hand, maintain some differences. The main theoretical framework of this study, namely Conceptual Blending Theory, makes use of input spaces, which are dynamic and online conceptual constructs, necessary for further mapping and blending to occur. These input spaces derive content from frames, which are more permanent conceptual structures housed in long-term memory. Conceptual Metaphor Theory makes use of domains (which appear to share more similarities with frames than with input spaces) because of the stability and permanency of domains that are drawn from long-term memory.

The following section introduces key theories related to the DMMB:

- Conceptual Metaphor Theory (Lakoff and Johnson 1980),
- The Neural Theory of Metaphor (Lakoff 2009),
- Conceptual Blending Theory (Fauconnier and Turner 1998); (Fauconnier and Turner 2002); Turner (2014).

### 2.3. Theories related to Conceptual Metaphor

Before examining the theories related to the DMMB in greater detail, it is worth outlining what the concept of conceptual metaphor means in Cognitive Linguistics (as briefly summarised in Chapter 1).

According to Fauconnier and Turner (2002), in their seminal work *The Way We Think*, metaphor has its roots in Greek rhetoric. Aristotle stated that metaphor is both “the hallmark of genius and that all people carry on their conversations with metaphors” (Fauconnier and Turner 2002: 17). Historically, metaphors were known as products of the poetic mind – a literary phenomenon which presents itself solely in creative writing. Evans and Green (2006: 293) explain metaphors to be implicit comparisons applying the schematic form: A is B. Lakoff and Johnson (1980:3) define this conventional idea of metaphor as “a device of poetic imagination and rhetorical flourish – a matter of extraordinary rather than ordinary language”. Lakoff and Johnson argue vehemently against this notion of metaphor as a feature of literary language alone; this is discussed further below.

Due to its literary affiliation, metaphors were once thought to be purely linguistic phenomena. However, research in the field has shown that metaphors are in fact the result of underlying conceptual phenomena which happen to manifest
linguistically most of the time. As per the convention introduced by Lakoff and Johnson, these underlying conceptual metaphors will be represented in upper case in this dissertation. Gibbs (1997: 145) explains that “metaphor is not merely a figure of speech, but is a specific mental mapping that influences a good deal of how people think, reason and imagine in everyday life”. A mental mapping in this case represents a relationship that exists between different concepts housed in cognition during the process of meaning-making. Conceptual metaphors are regarded as conventional and unconscious means of constructing meaning with the intent of making sense of our surrounding realities. Therefore, metaphor functions in cognition by drawing on our embodied experiences and environments, and our embodied experiences and environments prompt metaphors in cognition. Embodied realism, which forms the basis of this assertion, implies that our conceptual systems are rooted in the awareness of our physical existence within a particular environment, which we engage with constantly by means of a series of physical interactions (Lakoff and Johnson 1999: 90). The awareness of our physical existence within an environment influences our conceptual system automatically and dynamically to enforce the creation of meaning in the mind of a person. Janda (2010) refers to embodied realism in terms of meaning construction:

Making sense of what we experience entails not just understanding, but an ability to express that understanding, and indeed these two projects inform each other: our experience is formative to expression, but it is also the case that our expressive resources have some influence on how we perceive our experiences.

(Janda 2010: 6)

Janda explicates that meaning construction and understanding relies on embodied experiences. Lakoff and Johnson (1999: 45) explain that meaning construction and understanding rely on our subjective experiences. In this regard, Lakoff and Johnson identify sensorimotor experiences as experiences that lead us to constructing and understanding meaning. When we understand one subjective experience in terms of a particular sensorimotor experience, a conceptual metaphor is formed: “Metaphor allows conventional mental imagery from sensorimotor domains to be used for domains of subjective experience” (Lakoff and Johnson 1999: 45). For example, when we cannot understand something (a
subjective experience), we can form an image of something that ‘goes over our heads’, such as a gesture that draws a path of something going past us or over our heads (sensorimotor experience). As a result, our sensorimotor experience (of using a simple hand gesture) can represent our subjective experience (of failing to understand a given concept). This indicates the function of conceptual metaphors as a means of facilitating understanding through embodied experience.

In light of this, cognitive linguists regard metaphor as a powerful mental phenomenon that aids in the construction of meaning. Lakoff and Johnson (1980) highlight the potential effect that metaphor has on cognition by acknowledging that metaphors are firmly implanted in our daily thoughts, which motivate our daily actions, the manner in which we function in the world and our perceptions. They go as far as to say that our conceptual system seems to be dominated by metaphor, which in turn defines our everyday realities to the extent where “the way we think, what we experience and what we do every day is very much a matter of metaphor” (Lakoff and Johnson 1980: 454).

2.3.1. Conceptual Metaphor Theory

Conceptual Metaphor Theory was pioneered by Lakoff and Johnson in their influential work entitled *Metaphors We Live By* (1980). Their work in this regard is considered to be one of the first influential theories pertaining to the role of metaphors in meaning construction. Conceptual metaphors are represented in domains. Grady, Oakley and Coulson (1999: 102) explain that “in the CMT [Conceptual Metaphor Theory] framework, metaphors are analysed as stable and systematic relationships between two conceptual ‘domains’”. As discussed in Section 2.2 above, domains are the knowledge structures, which hold experiential information that prompt the emergence of the conceptual metaphor. It is relevant to note that domains function in relation to one another in Conceptual Metaphor Theory, which distinguishes the source from the target domain. This distinction is motivated by Kövecses (2002: 20) as follows: “Target domains are abstract, diffuse and lack clear delineation; as a result they ‘cry out’ for metaphorical conceptualisation.” As pointed out by Clausner and Croft (1999), ‘abstract’ is a rather ambiguous term, which does not fully cover the content of some target domains.
Consider the popular conceptual metaphor, namely THE SURGEON IS A BUTCHER. Based on the discussion of frames, domains and mental spaces (Section 2 of this chapter), it is evident that both the source domain, which is butcher in this case and the target domain, namely surgeon, are concrete entities, which are not abstract in terms of their features (it is very clear to us what a butcher and a surgeon are and what they do). Thus, both of these domains are based on sensory experience, but it is the case that one domain is more directly derived from sensory experience than another. The source domain, butcher, more clearly draws on one’s sensory experience than the target domain, surgeon. In general, we are more inclined to have experienced interactions with a butcher in an abattoir and have been direct witnesses of a butcher’s job. On the other hand, it is less likely that we have been bystanders while a surgeon performs a surgery in an operating room. Therefore, the target domain (surgeon) is less directly rooted in our sensory experience and is in need of a more familiar association that relates directly to our sensory experience – the source domain (butcher). ‘Abstract’ should then be understood as a term, which describes target domains to be less embedded in sensory experience and, as a result, less familiar and in need of more direct association by means of the source domain.

Target domains are understood to be more complex concepts, which although they may be grounded in embodied experience, are more abstract and higher-order. Fauconnier and Turner (2002) consider ‘higher order’, in terms of cognitive neuroscience, as a conceptual task which is more difficult to execute. They identify ‘perceptual categorisation’ as one such task, and ‘conceptual categorisation’ to be an even more complex cognitive task. Source domains are more easily comprehensible and are therefore channels of representation that convey the underlying target concept.

The source and target domains are connected to one another by means of a unidirectional mapping from the source to the target domain. These mappings are relational links that are drawn between the knowledge in the source domain and the knowledge in the target domain. The nature of the mapping is defined by the information housed in the domains and, due to the varieties of mappings that can emerge the metaphor maintains a distinct character (Evans and Green 2006: 298).
Although it is clear that a particular source domain is called upon to interact with a particular target domain and that metaphorical links are not drawn at random with any target domain, it is still unclear how the mapping process between source and target domains occurs. As a means of placing restrictions on the mapping process, Lakoff (1993) hypothesised the Invariance Principle. Lakoff summarises the gist of this principle:

Metaphorical mappings preserve the cognitive topology (that is, the image schema structure) of the source domain, in a way consistent with the inherent structure of the target domain.

(Lakoff 1993: 215)

The invariance principle restricts arbitrary and unsuited mappings, thereby ensuring that image-schematic organisation does not change from one metaphoric mapping to another within a particular conceptual metaphor. The mapping maintains the source domain structure, but it also has to be coherent with the target domain. According to the invariance principle, mapping is governed by “target domain override”, which is the process that stops unsuitable mappings (entailments) to project to the target domain (Evans and Green 2006: 303). Evans and Green (2006: 302) use the example of the conceptual metaphor: DEATH AS DESTROYER to explain the process of target domain override. DEATH can be associated with agents, like DESTROYER or REAPER. However, it cannot be paired with arbitrary agents. Thus, DEATH cannot be described in terms of KNITTER or TEACHER. The invariance principle also determines that metaphorical links, which are unsuited to the target domain, will not be able to map at all. In this instance, Evans and Green (2006: 302) exemplify the metaphor CAUSATION IS TRANSFER (OF AN OBJECT). Consider the following sentences:

a) We made him tired. STATE
b) We gave him a handshake. EVENT

The source domains of both (a) and (b) are TRANSFER, which indicates that the recipient has the transferred entity. TRANSFER in relation to STATES function as temporarily unbounded, while TRANSFER in relation to EVENTS is temporarily
bounded (this implies that it cannot span across time). The latter causes the entailment to be mismatched. This is illustrated below:

a) We made him tired and he still feels tired. STATE
b) *We gave him a handshake and he still has it. EVENT

Lakoff (1993) considers this to be an instance of ‘target domain override’. In Conceptual Blending Theory, similar restrictions on the process of mapping have been identified. This is discussed further in sub-section 2.3.3.3.

Linguistic realisations of metaphor, based on the conceptual system, are most evidently reflected in language use. Cognitive phenomena, including conceptual metaphors, are often instinctive and naturally-occurring cognitive constructions, in the sense that we do not consciously construct a conceptual metaphor for ease of understanding; it takes place ‘automatically’. An example of such a conceptual metaphor as it occurs in cognition is illustrated by Lakoff and Johnson (2003: 16), namely MORE IS UP and LESS IS DOWN. These metaphors are known as primary metaphors.

Primary metaphors have a basis in conflation. Lakoff and Johnson (1999: 46) explain that young children do not differentiate between subjective experiences and sensorimotor experiences. These experiences are conflated. During the conflation stage subjective and sensory experiences are automatically placed in domains, which then map onto each other. The authors exemplify this when they refer to an infant, who experiences affection (a subjective experience), with the warmth of being held (the experience of warmth being a sensory experience). Eventually, children can distinguish between the different domains, but the associations between those domains remain intact. This is known as the differentiation period. The intact associations are the mappings of conceptual metaphor, which allow children at an older age to understand and make use of a metaphor, such as “a warm person”. Primary metaphors, which join subjective experiences with sensorimotor experiences, emerge due to early conflations. Lakoff and Johnson (1999: 49) add that a primary metaphor is “an atomic component of the molecular structure of complex metaphors”. Complex metaphors are, as a result, formed by primary metaphors through the process of conceptual
blending (which is addressed later in this chapter). Thus, primary metaphors are smaller pieces that join together to form a larger whole. During this process, long-term associations are acquired, and these put several primary metaphorical mappings into effect. These associations of primary metaphorical mappings form a complex metaphorical mapping.

The MORE IS UP and LESS IS DOWN primary metaphors can be witnessed in language in a multitude of ways:

MORE IS UP

She achieved the highest mark in the class.

The actor rose to stardom last year.

He reached the top of the corporate ladder.

LESS IS DOWN

He is down in the dumps after losing his wife.

She is at the bottom of the chain of command.

Her low marks will cause her to fail.

The above linguistic examples reveal the emergence of the conceptual metaphors MORE IS UP and LESS IS DOWN as they occur in cognition and the linguistic examples illustrate the way in which they are manifested in our everyday communication. The links between UP and BETTER/HAPPY/HIGH STATUS as well as DOWN and SAD/LOW STATUS/WORSE are effortlessly understood and, appear to occur in cognitive processing without any conscious effort or awareness.

In light of Conceptual Metaphor Theory, the conceptual metaphors MORE IS UP and LESS IS DOWN exemplified above are considered to be orientational metaphors. This is due to the spatial orientation that comes into play in these metaphors, which in this case is up-down. Lakoff and Johnson (2003: 15) explain that orientational metaphors are not simply metaphorically structured in terms of one another (which they call structural metaphors), but that this type of metaphor
“organises a whole system of concepts with respect to one another”. The authors motivate this definition by placing focus on embodiment, as spatial orientations have to do with our physical bodies and how they function in their surrounding physical environments, for instance the act of *waking up* by physically standing upright as a contributor to the MORE IS UP metaphor. They further argue that these metaphoric associations are based on systematic structures, and cannot be arbitrary due to the fact that they are grounded in our physical and cultural experiences. Although the physical relation is clear with regard to the orientational metaphor, this can be affected or amended by cultural differences due to the fact that cultural affiliations influence a person’s experiences, which ultimately affect how that person sees the world and conceptualises it. An example of this is the orientational metaphor FRONT-BACK. Lakoff and Johnson (2003: 15) explain that in some cultures the future is conceptualised as being in ‘front’ of us, whereas in others it is conceptualised as being ‘behind’ us.

It is apparent that the above UP-DOWN metaphors have a physical basis — a more concrete notion that acts as a representation of a more abstract idea. Thus, *He reached the top of the corporate ladder*, is effortlessly interpreted as ‘he achieved success by means of a promotion in his job. The MORE IS UP metaphor appears with the word ‘top’. This orientational metaphor relates to UP being associated with a HIGH STATUS, which is part and parcel of being a boss/executive/manager. Here there is interplay between social and physical power. The UP IS POWER metaphor is employed as physical power is a concrete representation of the social power of a high status, which is an abstract notion that is at the core of the conceptual metaphor.

In light of the above, this study assumes as axiomatic that conceptual metaphors are premised on authentic conceptual structures, which exist within the conceptual system as source and target domains that connect to one another in order to provide concrete description to a more abstract (or complex) concept. It is assumed that all conceptual metaphors function according to this process. Therefore, the metaphor in question, namely the desktop metaphor, functions in this manner and is considered in this light as a representation of a technological, computerised interface (target) that resembles a socio-culturally familiar office
environment (source). Furthermore, all technology-related objects that are featured on the computer desktop are considered in a similar light. For example, a folder icon on the computer desktop also features as a paper-based folder on the office desk; and a recycle bin icon on the computer desktop has a trash can under the office desk as a counterpart, etc. Consequently, Conceptual Metaphor Theory resides at the core of this study and provides a framework for understanding the conceptual metaphor that is examined in this study.

The desktop metaphor is dealt with in further detail in sub-section 2.3.3.9. Fauconnier and Turner’s view of the desktop metaphor (1998) is explained and recent research related to the desktop metaphor, as a metaphorical blend, is examined, including the work of Terkourafi and Petrakis (2010) and Agarawala and Balakrishnan (2006).

2.3.2. Neural Theory of Metaphor

To corroborate the existence of conceptual metaphors within cognition, Lakoff (2009) postulates a neural basis for conceptual metaphors. Research in neuroscience was conducted to trace the physiological basis of conceptual metaphors. The results led to the emergence of the Neural Theory of Metaphor. According to this theory, a metaphorical mapping is considered to be a complex neural circuit (a physical entity), which can be activated by means of linking integrated neural circuits. Lakoff (2009: 14) explains that each frame is a neural circuit and each role in a frame is a node. Thus, one frame circuit contains many nodes. This is exemplified by considering the LOVE IS A JOURNEY metaphor. This metaphor comprises several other conceptual metaphors; one in particular is PURPOSES ARE DESTINATIONS. This conceptual metaphor is activated due to our existent frame-based knowledge that people are expected to have life goals, but when in a relationship, lovers ideally have compatible life goals. This notion is structured in this manner in the metaphor:

The life goals are destinations.

The lovers are travellers attempting to reach those destinations.
Lakoff (2009: 14) makes use of these two conclusions that can be drawn from the above metaphor when illustrating the Neural Theory of Metaphor. He demonstrates that the use of the word ‘destination’ appears twice in the above conclusions and both times this word activates the same node within the frame circuitry. The fact that the same node is activated with the same frame circuitry shows its integrated nature, which can only be activated by the metaphor (in this case, LOVE IS A JOURNEY). As a result, the more integrated the frame circuitry is when activated by the metaphoric mapping, the better suited the metaphor is to other brain structures.

It is further hypothesised that when source and target domains are active at the same time, the two areas of the brain housing the source and target domains will also be active. This activity in two parts of the brain simultaneously will allow for neural mapping circuits to be created, which link the source and target domains with one another. These neural mapping circuits are what constitute the metaphor. The learning of these neural mapping circuits results in the creation of primary metaphors (as explained in the previous section). The metaphors will be learnt naturally and unconsciously when functioning in one’s outside environment. An example of such a primary metaphor is PURPOSES ARE DESTINATIONS (which is the basis for the LOVE IS A JOURNEY metaphor). Our daily interactions allow us to understand the correlation that exists between purposes and destinations, such as having to go to the bathroom in order to take a shower. In this case, correlating experiences is actualised in the brain by means of the co-activation of different neural areas (the source and target domains), which results in those areas being linked by means of the formation of circuits (the metaphorical mapping between source and target domains).

Eventually, complex metaphors are structured based on existing primary metaphors as they require the connection of other circuitry over an existing metaphor. Thus, it is understood that she is a warm person because she has a loving, nurturing, caring and so forth disposition. Lakoff (2009: 17) explains that “in most cases, new conceptual metaphors that are easy to learn and make sense of are using conceptual mappings that pre-exist, frame-based knowledge that pre-
exists, and adding connections in the form of circuitry that binds, links, maps, extends and forms gestalts”.

The neurological evidence shows more convincingly that conceptual metaphors are ever-present in cognitive processes. Naicker (2013: 347) outlines the impact that these cognitive linguistic phenomena, such as conceptual metaphors, have on humans as active participants in the world:

The brain gives rise to thought, among others, in the form of conceptual frames, image-schemas, prototypes, conceptual metaphors and conceptual blends. The process of thinking is not algorithmic symbol manipulation, but rather neural computation, using brain mechanisms and global cognitive tools not modularised for the processing of language only. Hence, it is through our framing and conceptual metaphors that we understand the world around us.

In the current study, it is assumed that the metaphor in question, namely the desktop metaphor, is a product of neural activity. Thus, the source domain, which is the physical office space, and the target domain, which is the computerised interface, activate two different parts of the brain based on pre-existing frame knowledge (knowledge of what an actual office environment contains and looks like and knowledge of what a computer desktop looks like and how it functions). These frames and the nodes they contain (such as the physical office space containing an office desk, stationery, files and papers, etc., and the computerised interface containing icons, folders, documents, etc.) are neural circuits that connect to one another with regular interaction. In other words, two different parts of the brain are connected to one another via a neural pathway, and integrated in order to form a metaphor, which is learned automatically for the purposes of meaning construction and ease of understanding.

In the next sub-section, Fauconnier and Turner’s Conceptual Blending Theory (1998) is discussed. This theory is introduced in Chapter 1, and is expounded upon below, as it constitutes the main theoretical framework of this study.

2.3.3. Conceptual Blending Theory

considered by some to have originated from Mental Spaces Theory, which is outlined in sub-section 2.2.3. Fauconnier (1997: 9) acknowledges the interaction that appears to exist between domains (or spaces) and consequently argues for the existence of what he calls “projection mappings” (1997: 9). His stance supports that of Lakoff and Johnson (1980). Fauconnier (1997) explains Lakoff and Johnson’s view when he says that “there has been mounting evidence for the central role played by various kinds of mappings at the very heart of natural language semantics and everyday reasoning” (Fauconnier 1997: 8-9). Both Fauconnier and Turner are cited as having observed that meaning construction appears to emerge from “structure that is apparently unavailable in the linguistic or conceptual structure that functions as the input to the meaning construction process” (Evans and Green 2006: 401). It is this type of emergent structure which Conceptual Blending Theory tries to explain.

Conceptual Blending Theory hypothesises a four-space model: the two input spaces that contain information that would be required to create the blend; the generic space, which consists of frame-based knowledge that is projected into the two input spaces; and the blended space, which contains the emergent content that draws on the two input spaces in an attempt to construct meaning successfully. Each of the spaces in the blending theory model is now examined individually in terms of an example:

### 2.3.3.1. Input Spaces

The model of Blending Theory usually consists of two input spaces. Note that Conceptual Blending Theory is a versatile theoretical framework which has the capacity to account for conventional metaphors (Grady, Oakley and Coulson 1999: 110), such as the example above, and other non-metaphoric cognitive phenomena. In fact, its versatility is often critiqued by some scholars, like Glebkin (2013), who are of the opinion that the authors are prone to “unreasonable generalisations” (2013: 2408). Consider this rather simple example of a metaphor which produces emergent structure: The old computer is a dinosaur. This metaphor intends to represent the computer as a figurative dinosaur. In this case, these two concepts are represented in two input spaces. ‘Old computer’ and its relevant features (such as dated technology, discontinued, large device,
inefficient, and so forth) that contribute to the creation of the blend will be displayed in one input space, while ‘dinosaur’ and its relevant and contributing features (such as prehistoric animals, extinction, big animals, cumbersome and so forth) will be maintained in the other mental space, as illustrated in Figure 2.1 below.

<table>
<thead>
<tr>
<th>Mental space 1: DINOSAUR</th>
<th>Mappings</th>
<th>Mental space 2: OLD COMPUTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREHISTORIC ANIMALS</td>
<td>←</td>
<td>DATED TECHNOLOGY</td>
</tr>
<tr>
<td>EXTINCTION</td>
<td>←</td>
<td>DISCONTINUED</td>
</tr>
<tr>
<td>BIG ANIMALS</td>
<td>←</td>
<td>LARGE DEVICE</td>
</tr>
<tr>
<td>CUMBERSOME</td>
<td>←</td>
<td>INEFFICIENT</td>
</tr>
</tbody>
</table>

*Figure 2.1 Selective mappings for OLD COMPUTER AS DINOSAUR blend.*

**2.3.3.2. Mappings**

To enforce interaction between the two input spaces, namely ‘old computer’ and ‘dinosaur’, a network of connections are postulated. These are known as cross-space mappings, which are synonymous with the term “projection mappings”, used by Fauconnier (1997: 9). Mappings are established between associated counterparts in the inputs, which are also referred to as ‘analogical relations’ or ‘counterpart connectors’ (Fauconnier and Turner 2002: 314; Evans 2007: 154; Sørensen 2007: 55; Evans and Green 2006: 409; Fauconnier and Turner 1998: 134). Evans and Green (2006: 419) refer to these connectors as a particular type of vital relation, which are defined as links that match two counterparts in the input spaces. The phrase ‘counterpart connectors’ is used throughout this dissertation to refer to these vital relations between input spaces.

Counterpart connectors assume a bidirectional identity relation. In keeping with Grady (2005: 1596-1597), analogy serves ‘as the basis for metaphorical blends’, because ‘the association between the two concepts [referring to input spaces] is often said to reflect shared features which align the two’, denoting a one-to-one
mapping. It should be noted that Conceptual Blending Theory (BT) varies from Conceptual Metaphor Theory (CMT) in some respects. Firstly, it is a more elaborate structure of organised spaces (where BT has multiple spaces depending on the kind of blend it creates, CMT only has two). Secondly, the processes of mapping in CMT and in BT involves some differences, in particular that mapping is isomorphic, which implies that the structure of elements in the input spaces are similar in form and relations. Figure 2.1 refers to the process that happens prior to generating a blend, and therefore the connection between the two input spaces is assumed to be bidirectional. Scholars like Grady (2005: 1596) consider these theories to be complementary in many respects, one of which is the assumption that metaphors are the inputs to blends.

These mappings also occur systematically and have the ability to constrain the content of the inputs and, eventually the content of the blended space. Simply put, mappings can occur in several ways, but in this case connections between counterparts are established when the input spaces interact with one another. It is also notable that counterpart connectors are drawn between selected features of each input. Thus, the content in one input space is not projected in its entirety onto the other input space. We project only the features that are necessary for emergent structure to occur. This process is known as selective projection.

In this dissertation, for the purposes of practicality, element-to-element mappings from the generic space, into the input spaces and into the blended space are not indicated in detail. However, counterpart connections between the input spaces are indicated explicitly by means of element-to-element mappings to ensure clarity.

2.3.3.3. Selective Projection

Selective projection in Conceptual Blending Theory is similar to the Invariance Principle, proposed by Lakoff (1993), in the context of Conceptual Metaphor Theory, as explained in sub-section 2.3.1 of this chapter. The notion implies that not all content from the input spaces can be projected onto the blended space. Only content, which will allow the construction of a particular blend, is projected onto the blended space. Consider the example ‘the old computer is a dinosaur’: In
order for the blend to yield information that constructs a particular meaning, namely that the specific computer is an out-dated device, the mappings will not allow for the mapping of arbitrary information from the input spaces. As a result, the physical appearance of a dinosaur, for example, will not be mapped onto the blend. In the blended space, the computer will still look like an electronic device. Meaning construction will not occur if the computer adopts the reptile-like physical features of a dinosaur. Selective projection of content from the input spaces into the blended space ensures that arbitrary mapping of this nature cannot take place. In his recent book, Turner (2014) alludes to selective projection by considering an example of a child-related blend: “We are adept at adjusting what we project to the blend. If we are old and tall, we do not project what goes with those features to a blend we make for a child” (Turner 2014: 44). He further discusses this by referring to a person’s ‘sunset years’ saying that we may only project a part of the cyclic day, but “not the cyclicity”, because “projection to the blend is selective” (2014: 256). Clearly, certain restrictions exist that place a boundary on what content is mapped onto the blended space and what is not mapped. Nevertheless, aside from admitting that such restrictions take place in the case of both Conceptual Metaphor Theory and Conceptual Blending Theory, scholars have not yet determined precisely what governs these restrictions. Lakoff’s Invariance Principle (1993) is one attempt to determine the governing principles of these restrictions. In fact, as a result of “backward projection”, information can be projected from the blended space back into the input spaces, and by inference also into the generic space; hence the blend can undergo modification as a whole (Evans and Green 2006: 412).

In Conceptual Metaphor Theory, the mapping process occurs between domains. In Conceptual Blending Theory, the inputs are connected in a similar way. However, Conceptual Blending Theory postulates a more intricate mapping process that is at play when conceptual integration networks are established, and the model has the ability to determine the relationship of counterpart connectors between input spaces and define its status (Grady et al. 1999). When considering the OLD COMPUTER AS A DINOSAUR blend above, counterpart connections are drawn between the two input spaces’ content. Refer to Figure 2.1 above.
Although it has been made clear that mappings occur in both Conceptual Metaphor Theory and Conceptual Blending Theory, it is has been argued that Conceptual Metaphor Theory and the cross-domain mappings that create the metaphor do not suffice to explain the metaphor fully. In consideration of the example, the dynamic cognitive process involved in understanding the metaphor requires an aspect of creativity and novelty to comprehend the pairing of ‘old computer’ and ‘dinosaur’ in order for meaning construction to occur. Grady et al. (1999: 105) explain that while “CMT has been primarily concerned with identifying regular, conventional patterns of metaphorical conceptualisation, BT has often explicitly addressed itself to novel and unique examples which do not arise from entrenched cross-domain relationships”. Consider Turner’s (2014: 13) distinction between domains and input spaces (as discussed in Section 2.2 of this chapter). He refers to the term ‘idealised cognitive/cultural models’ (ICCMs) to explain domains, while referring to input spaces as online and ephemeral.

In the example, we know that the hitherto unrelated concepts, OLD COMPUTER and DINOSAUR, can relate to form a new meaning, which is that computers which have out-dated software, lack processing speed and have low functionality are called ‘dinosaurs’ because dinosaurs are associated with the history of the natural world and are, as a result, an ‘out-dated’, primeval species. Conceptual Blending Theory accounts for the emergent meaning that arises from the association between old computers and dinosaurs.

2.3.3.4. The Blended Space

The blended space is formed by means of counterpart connections between the input spaces that create associations, which generate new mappings. Fauconnier and Turner (2002) refer to this process as composition. These mappings project onto the blended space. Fauconnier and Turner (2002: 42) outline this process: “The blend develops emergent structure that is not in the inputs. First, composition of elements from the inputs makes relations available in the blend that do not exist in the separate inputs”. The counterpart connections between inputs create conventional associations, but the meaning behind the metaphor calls upon more extensive mappings that formulate the metaphoric expression in the blend.
In the example ‘the old computer is a dinosaur’ the dinosaur and its relevant features in input 1 and the old computer and its relevant features in input 2 are connected by counterpart connections, which define the commensurable relationship between the two input spaces. From this commensurability, further mapping occurs through composition of novel mappings that underlie the relationship between these concepts, such as the dinosaur as an obsolete, prehistoric species and that particular computer as an out-dated, undeveloped model of technology. In other words, completion takes place. The blend process involves ‘fusion’ of the elements that are drawn from the mappings into a single representation that is often unrealistic and not plausible, which is another element of completion: the blend fuses the out-dated, undeveloped computer with the obsolete, prehistoric dinosaur and consequently forms the metaphorical blend, OLD COMPUTER AS A DINOSAUR (Grady et al. 1999).

2.3.3.5. The Generic Space

Before what Fauconnier and Turner (2002: 44) call the ‘running of the blend’, or elaboration, can occur, a fourth space needs to be introduced, namely the generic space. The generic space contains information that the input spaces draw on to define the counterpart connections between them and formulate emergent structure. Grady et al. (1999: 103), concur with Fauconnier and Turner (2002: 41), and explain that the generic space houses information that is shared by both inputs. The generic space provides content to the input spaces via mappings into the input spaces. Evans and Green (2006: 404) add that “the generic space provides information that is abstract enough to be common to both (or all) of the inputs”. These definitions exemplify what content the generic space is tasked with presenting, but the generic space appears to be more elaborate than this: it is the space that draws on our external realities and experiences to store knowledge in long-term memory and dynamically bring particular knowledge forth when on-line conceptual integration occurs. The generic space consists of information gained via experience. Knowledge that is derived from our embodied experiences fills the generic space with the necessary information that is needed to firstly know what a computer is, what a dinosaur is, and what attributes these concepts conventionally possess before selective attributes of each can be projected onto the input
spaces. An example of the four-space conceptual integration network model, based on the OLD COMPUTER AS A DINOSAUR blend employed in this section, appears below:

Figure 2.2 Conceptual integration network model for OLD COMPUTER AS A DINOSAUR blend.

2.3.3.6. Single- and double-scope integration networks

Turner (2008) identifies and explains various kinds of conceptual integration networks; among these he proposes single- and double-scope integration networks. A single-scope integration network is defined as a blend where, between the two input spaces, one is primarily the dominant input to the blended space. It is not assumed that a person’s knowledge of computers is categorised
into the same frame as his knowledge of dinosaurs. It ought to be noted that the terms ‘frame’ and ‘input space’ are used ambiguously by Turner (2008). However, as referred to in Section 2, ‘frames’ and ‘input space’ are not considered to be similar concepts in the present study. Instead, it is the view in this study that input spaces function within the online conceptual integration network model, but frames are background knowledge structures that are housed in long-term memory. Input spaces derive content (through the generic space) that is relevant to the conceptual blending model from particular frames of existing background knowledge in order to populate the input space and construct a suitable blend.

It is more likely that his knowledge of computers is contained in a frame that relates to technology, electronics, innovation, and the like, while his knowledge of dinosaurs resides in a frame of nature, history, evolution, and so forth. In a single-scope integration network, “only one of those frames is projected to organise the blend” (Turner 2008: 15). In the case of the OLD COMPUTER AS DINOSAUR blend, it is not accurate to say that only one frame is used to structure the blend, as the fusion of selected attributes from both of the input spaces is what allows the blend to run. Turner uses a suitable example, namely gunslingers at a shootout (Turner 2008: 15). This example makes use of the SHOOTOUT frame to organise the blend. Only one frame is employed in this instance. It can thus be assumed that the input space that contains content related to ‘shootout’ maps more content into the blended space than the input space that houses information regarding ‘gunslingers’. In other words, the ‘shootout’ input space can be considered the dominant input space in this regard, which most informs the blend, making it a single-scope blend.

The OLD COMPUTER AS DINOSAUR blend is an example of a double-scope integration network. Turner (2008: 15) explains that a double-scope integration network occurs when “different input frames are blended into a blended frame whose organising frame-level structure includes at least some organising structure from each of the two input frames that is not shared by the other” (Turner 2008: 15). Simply put, when two input spaces rely on two different frames to inform their content, and some attributes of both input spaces are mapped into the blended space, the network is seen as a double-scope blend. The OLD COMPUTER AS
DINOSAUR blend is an example of this kind of integration network, as selective aspects of both of the input spaces are mapped into the blended space. In order for the metaphorical blend to emerge, an attribute like ‘old’ from the DINOSAUR input space must be mapped into the blended space, while an attribute like ‘electronic device’ from the OLD COMPUTER input space must be mapped as well.

In the next section, Conceptual Blending Theory is applied to this study, as its main theoretical framework.

2.3.3.7. **Conceptual Blending Theory as it relates to this particular study**

As the theoretical model to this study, Conceptual Blending Theory proves effective in its versatility as it has the capacity to model dynamic, on-line and creative metaphorical blends. In this study, the potential effect of social variables on cognitive processes can be clearly exemplified by employing Conceptual Blending Theory as a theoretical model. Essentially, the generic space will be studied through the lens of participants’ conceptualisations of computer-related concepts. The focus will be on this space because one of this study’s objectives is to identify whether there are social variables, which play a greater role in how computer-related metaphors are conceptualised, and to determine what social variables are most influential in this regard. In this case, the main variable that will be considered is ‘exposure to technology’. It is hypothesised that this type of exposure will have an impact on the nature and degree of the conceptualisation’s metaphoric value, in other words the degree to which the computer-related blend is in fact conceptualised as a metaphor, as opposed to being conceptualised without any metaphorical import. Conceptual Blending Theory will be incorporated in determining whether the metaphor emerges in the blended space, or whether the network in its entirety can be seen as metaphorical, in that each input space maintains some metaphorical value and feeds into the blended space to a certain extent to form the DMMB. It will therefore be determined whether the conceptual integration network model features a balanced distribution of mapping onto the blended space or whether it is input-dominant, what Turner (2008: 15) calls single-
and double-scope integration networks respectively; as discussed in the previous section. By Turner’s definition of double-scope integration networks (2008: 15), the DMMB is the result of a double-scope integration network, since “at least some” content should project from both input spaces and frames. Therefore, there may not be an equal distribution of mappings from each input space into the blended space. It is the intent in this study to determine the extent of the mapping from each input space into the blended space. It should be clarified whether the blend is dominated by computer technology or by the physical office environment, as this will affect the metaphoric value of the blend itself. For example, if the blend is mostly dominated by the computer-related input space, and to a lesser extent by the physical office input space, it can be argued that the metaphoric value maintained by the blend is low and that an individual no longer needs to conceptualise the computer desktop via a representation of a physical office space. In essence, the blend then loses its metaphoric quality and comes to be conceptualised as a thing-in-itself.

### 2.3.3.8. A focus on the generic space

Another aspect of this study is its intent to add a more defining structure to the generic space by explaining it in relation to social variables, which are more or less influential in generating the mapping process onto the input spaces. This study will ideally utilise the conceptual integration network model to not only show the input-dominant structure that motivates the content of a blend, but also to afford the generic space further explanation by means of evaluating its experiential basis and highlighting the influence of social variables on this space and, ultimately, on the blend as a whole. In this regard, Lakoff and Johnson (2003) acknowledge the importance of an experiential basis in metaphor regarding their work in Conceptual Metaphor Theory. They concede:

> We do not know very much about the experiential bases of metaphors. Because of our ignorance in the matter, we have described the metaphors separately, only later adding speculative notes on their possible experiential bases. We are adopting this practice out of ignorance, not out of principle. In actuality we feel that no metaphor can ever be comprehended or even adequately represented independently of its experiential bases.

(Lakoff and Johnson 2003: 19)
This acknowledgement is applicable to most theories that attempt to account for the workings of particular cognitive processes, in this case for how humans comprehend conceptual blends. Consequently, Conceptual Blending Theory is not exempt from the importance of accounting for the experiential bases of metaphorical blends. Little attention has been paid to this avenue of research in these theoretical models and it clearly points to a gap in our understanding of the workings of cognitive processes. The focus of this study is to attain a better understanding of what external factors are relevant to the construction of metaphorical blends and how these factors affect the conceptual integration process as a whole. This study also seeks to find a means of accommodating these factors in a theoretical model, such as Conceptual Blending Theory.

In this study, Conceptual Blending Theory will be applied to the DMMB and its features, which arguably dominate personal computing and computer interface design at present.

2.3.3.9. The Desktop Metaphor as a ‘metaphorical blend’

Fauconnier and Turner (2002) regard cognitive processes, like conceptual metaphors and blends, as structures of unconscious, online cognition that come across as basic cognitive processes. However, an attempt to investigate and explain these processes proves to be a complex task for the researcher. In Fauconnier and Turner’s research on conceptual integration (1998), they identify the employment of metaphors in computer interface design, in this case the desktop metaphor, which is a cognitive phenomenon related to computers. The desktop metaphor has proven a most effective means of familiarising the user of a computer with the device as it draws on well-known, real world objects to represent electronic features that may have otherwise been foreign and unusual to the everyday user of the computer. The simplicity of this metaphor in interface design has allowed our minds to recognise and interact with the computer without much cognitive strain or conscious effort, as a result enforcing a positive user experience (Stone, Jarrett, Woodroffe and Minocha 2005: 6)

The desktop metaphor originated in the 1980s in computer technology when focus shifted towards human-computer interaction (HCI). In interactive design, positive
user experience is the main goal. Rogers, Sharp and Preece (2012: 2) add that “it is about developing interactive products that are easy, effective, and pleasurable to use – from the users' perspective”. The screen-based computer interface is one such interactive product that requires a user to interact comfortably with the computer. In an attempt to simplify human-computer interaction, task-related and usability methods were developed that were derived from an individual user’s cognitive capabilities. As a result, with the advent of personal computing, it became essential to improve the usability of the interface. Similar to the human thought process and its concomitant interruptions that occur, the computer also needed to be capable of the execution of various tasks at the same time, which can be continued or discontinued at any point, thereby mirroring the human conceptual process. Windowing systems were invented for the purpose of displaying separate spaces at once on the interface (Dix, Finlay, Abowd and Beale 1998: 148). Consequently, WIMP (‘Windows, Icons, Menus and Pointer’) was developed as it contained the core features of an interface.

In the mid to late 1990s, the effectiveness of the WIMP interface was reconsidered as it was seen as too restrictive. Interactive design used the rhetoric ‘beyond the desktop’ as a starting point and brought to light new challenges, questions and phenomena that led to the substitute for the WIMP, namely the GUI (Graphical User Interface), which contains added features that the WIMP did not include, such as tool bars, docks and rollovers. The desktop metaphor is the basis for the GUI and the interaction between humans and computers. Though it was an invention by Xerox Parc, Gozzi (2003: 425) reports that the desktop metaphor was never marketed by the Xerox Corporation. Instead, Apple applied the invention to their Macintosh operating system, and later Microsoft ‘borrowed’ the idea to apply to their Windows operating system (Gozzi 2003). Hence, the desktop metaphor found its way into the mainstream market through Apple and Microsoft.

Metaphor has been used in the design of computer-based technologies as a conceptual model. Stone et al. (2005: 200) state that “all UIs (user interfaces) are artificial environments created by the computer, which we can understand only because of our experience of the physical world”. In addition, Rogers et al. (2012: 40) add that metaphor is “an abstraction outlining what people can do with a

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product and what concepts are needed to understand how to interact with it”. The simpler it is to use the computer, the more positive the user experience is. For example, the ‘recycle bin’ on the computer desktop resembles the real-life object both in form and function to the extent where the user is fully aware of its role and use, namely to delete files and documents. Therefore, the user understands that placing a file or document in the recycle bin resembles the act of ‘throwing away’ papers and such.

Fauconnier and Turner (1998: 156) explain that the desktop is perceived in light of an actual desk:

The appearance of the computer screen carries icons corresponding to objects on a desktop. They can be opened and closed, put away, and so on. When working with the icons, we think of them and act upon them in some ways as we would on actual desktop material and in some ways as when dealing with general computer commands.

a) The advancement of the desktop metaphor
Recent works that revolve around the desktop metaphor include Terkourafi and Petrakis’ paper (2010). Their paper considers what they call the “evolution” of the computer interface under the restrictions placed on it by the limitations of technology in the past, and the exponential growth of the users of the computer interface. The authors propose four multi-modal blends to analyse the conceptual processes by which each blend builds on the previous blend in order to better comprehend the evolution of the computer interface leading up to the virtual desktop that we use today. The authors make use of multi-modal metaphors, which they demonstrate and analyse via Conceptual Blending Theory. In sum, multi-modal metaphors refer to metaphors where the source and target domains and in some cases their related mappings are represented by two different sign systems (such as language, pictures, text, etc.) or modes of perception. Forceville (2008) analyses metaphor in pictures and multimodal representations thereof. Terkourafi and Petrakis (2010) consider the desktop metaphor, for one, as a multi-modal metaphorical blend.

Terkourafi and Petrakis distinguish between the office-based desktop, which they define as “the top or working surface of a desk” (Terkourafi and Petrakis 2010: 145), while the computer desktop is explained to be “the working area of a
computer screen regarded as a representation of a notional desktop and containing icons representing items such as files and a waste bin, used analogously to the items they symbolise” (Terkourafi and Petrakis 2010: 145). They explain that there is a metaphorical link between the office-based desktop and the computer desktop. This link is conjured up by pictorial and linguistic means. As a result, features of software and actions related to it are named after and displayed as objects and actions that relate to the original office-based desktop. The metaphorical link that is evoked causes a semantic shift to view the desktop as computerised. The authors acknowledge the initiatives of software companies to explicitly draw on features of an object that are familiar to the computer user in order to make the computer desktop user-friendly.

In the paper, four generations of computer interfaces are identified, including the command prompt, which is an interface used in the 1970s that involved typing formal commands in a computer language, such as DOS script, to carry out certain functions, like saving a file, the WIMP interface, which led to the introduction of the desktop metaphor and to the virtual desktop, which is used at present. The authors illustrate these interfaces via four multi-modal blends. In each blending network, the previous interface acts as the content of the input spaces in the following interface. Therefore, the command prompt makes up content of the input space contained in the WIMP interface blend, and the WIMP interface feeds into the input space of the desktop metaphor blend, and so on. By so doing, the authors demonstrate the enhancement of computer interface technology by employing existing computer interfaces in the input space of an integration network model and illustrating how newer and more user-friendly functions are introduced in another input space, which results in a more recent computer interface technology that emerges in the blended space.

The desktop metaphor allowed the WIMP interface to become a representation of a real-world object, namely the office-based desktop. This was achieved by naming features of the interface after real-life objects, such as ‘files’ and ‘documents’, and by displaying them on screen to resemble their real-world counterparts (a file icon looks similar to a physical paper file). This representation was further validated by matching the functionality of the electronic version of the
object to its real-life function (a computer file is used in the same way as a physical paper file).

Terkourafi and Petrakis (2010) indicate this metaphoric link in a conceptual integration network, where the WIMP interface is housed in one input space, while the office-based desktop is placed in another input space. They also indicate the content of the generic space, which contains Agents, Undergoers and Procedures. They explain that the content in the generic space ensures that mappings are distributed between the two input spaces. The resultant blend is the desktop metaphor – a multi-modal metaphorical blend. See Figure 2.3 below:

![Figure 2.3 The Desktop Metaphor as a multi-modal blend (Terkourafi and Petrakis 2010: 155).](image)

The authors raise a critical point when they reconsider whether the desktop metaphor can be deemed a metaphor at all any longer. They regard the input spaces (what they refer to as source and target spaces) as reversible, as is indicated by the real-world actions in terms of the desktop metaphor. They motivate this point by reporting on children’s acquisition of conceptual content, such as “files”, “folders”, “saving” and “deleting”; as well as the dictionary...
definitions of these terms, which indicate support for the independence of the original desktop metaphor from the input spaces that generate the desktop metaphor as a blend. In other words, the desktop metaphor has since evolved to become a concept that is not as metaphorically loaded as it was when introduced.

Finally, Terkourafi and Petrakis (2010) explain that the advancement of technology has allowed for computer software to be more compact, more versatile, used not only for work, but also for entertainment purposes and internet-related activities. Due to the growing number of uses for the computer, its target user market has expanded drastically to include children and those who are not professional users. Essentially, the desktop metaphor still makes up a part of today’s virtual desktop. The authors illustrate this in the conceptual integration network for the virtual desktop. They include the desktop metaphor and real-world knowledge into the input spaces, which produce multiple inputs generating a multi-modal blend, namely the contemporary virtual desktop. The mapping process involved in this blend is more intricate because the generic space incorporates a large number of Agents (users of the computer and analysts). The Undergoers and Procedures employed in the generic space include a vast array of features and interactions, each with its own real-world counterpart. “Despite these alterations and additions to its original purpose and format, today’s virtual desktop still preserves the desktop metaphor at its core” (Terkourafi and Petrakis 2010: 158).

The virtual desktop raises concerns for the desktop metaphor’s original office-like conceptualisation due to the expansion of the range of tasks that can be done on computers and the varied target user group that now makes use of the computer (some of whom would not have been exposed to a typical Western, office-centric culture). At some point, the desktop metaphor will break down: “The continuing accumulation of unrelated icons […] on today’s virtual desktop challenges two aspects of the metaphor, its predictiveness, and its intuitiveness” (Terkourafi and Petrakis 2010: 160). The authors argue that the semantic shift between real-world concepts and the computer desktop may no longer be suitable to account for the vast uses of the computer nowadays. This then causes an increase in the number of special conventions that need to be learnt in order to conceptualise the virtual desktop, thereby curtailing its predictability. This remains an advantage of the desktop metaphor, as it reduces the need to memorise novel technological
features, and keeps to the representative nature of the computer desktop: “they have already mastered, to a greater or lesser extent, its special conventions, and hence only need to adapt this knowledge to the requirements of the new era” (Terkourafi and Petrakis 2010: 160).

The authors conclude that, although the desktop metaphor makes up an essential part of the DMMB, a distance may need to be established between the desktop metaphor and the virtual desktop to accommodate the novel features and varied target user group of the virtual desktop.

b) An alternative to the desktop metaphor

At present, the virtual desktop (with the desktop metaphor at its core) is the latest advancement in computer interface design. However, new approaches to computer interface design have been proposed. A recent prototype, called the BumpTop, has been introduced by Agarawala and Balakrishnan (2006). These authors argue that the desktop metaphor does not truly represent the physical office environment: “A workspace in the physical world typically has piles of documents, binders and other objects arranged in a way that provides considerable subtle information to the owner” (ibid 2006: 1283). They explain that computer interfaces require users to file documents into a specific hierarchy. The authors suggest the addition of more realism to the virtual desktop: “Our aim is not to argue the validity of the desktop metaphor, but to explore alternative designs to the ubiquitous desktop paradigm” (ibid 2006: 1283). They argue that organising files on the computer desktop is less realistic than piling files in a more casual manner, to truly simulate the office-based desktop. They propose a prototype interface that incorporates a physics simulator in which objects can be dragged and tossed, and can collide with one another and displace each other. The simulator also includes a realistic feeling of friction and mass. Their intent is to make interactions more “continuous and analog[ue]” in order for users to make use of the interface in the same way that they would make use of real-world objects (Agarawala and Balakrishnan 2006: 1283).
c) The desktop as a multi-modal metaphorical blend with relevance to this study

Fauconnier and Turner (1998) explain the blending process involved in the emergence of the desktop metaphor in their work ‘Conceptual Integration Networks’. The desktop metaphor is the result of the counterpart connectors between the input spaces that generate emergent structure, as analysed by Fauconnier and Turner (1998), and as exemplified in Figure 2.4 below. In the present study, the office-based counterpart will be presented in input space 1, while the desktop as a computerised user interface will be presented in input space 2. The mappings between the input spaces and the generic space and the influence of the mappings on the inputs will be examined to determine whether there is one input space, which projects more prominently onto the blended space. This should inform our understanding of the content of the blended space. In this regard, it is worth reconsidering Terkourafi and Petrakis’ (2010) argument, namely that the desktop metaphor has become internalised to the extent where the computer user has knowledge of what the computer desktop entails. The user requires little representative knowledge to conceptualise the computer desktop. Consequently, the computer desktop may not be the result of emergent content in the blended space any longer, but rather inhabits its own input space that leads to new emergent structure in the blended space.

Conceptual integration networks have the potential to become entrenched and automatized, which can then become input spaces to newer blends. This is in line with Terkourafi and Petrakis’ argument that the DMMB is a multi-modal blend that incorporates the original desktop metaphor in its architecture. The desktop metaphor is no longer conceptualised similarly to the way it was conceptualised in the past, as it likely represents today’s virtual desktop to current users. Therefore, the desktop metaphor can be considered a retronym, which Quinion (2001) defines as a term created for an existing object, because the meaning for the original term has become ambiguous. Retronyms can emerge due to new developments or technological advancements. Terkourafi and Petrakis (2010: 159) illustrate the virtual desktop as a multi-modal blend by indicating the document, as an object, as a generic notion in today’s virtual desktop in order to
account for the various purposes and roles that the virtual desktop fulfils. The document's generic quality is a result of the multitude of possible input spaces that inform the DMMB. Consider the figure of today’s virtual desktop below (Terkourafi and Petrakis 2010: 159):

![Diagram](image)

**Figure 2.4** Today’s virtual desktop as a multi-modal blend (Terkourafi and Petrakis 2010: 159).

Figure 2.4 indicates that the DMMB emerges as a result of various input spaces projecting content into the blended space. In the generic space, the Agent can be a shopper, photographer or a music producer (as featured in the input spaces). Activation of the object can occur by means of the procedure of visiting, developing or hearing, while the Undergoer could include a shopping site, film or recording. This content is compressed onto the same terms that are used in the desktop metaphor (the virtual desktop input space), and is projected onto today’s DMMB, thereby causing the term ‘desktop metaphor’ to contain an ambiguous
meaning. Terkourafi and Petrakis (2010) make a convincing case for the desktop metaphor as a multi-modal blend that informs today's virtual desktop. Due to this, the desktop metaphor is considered to be a multi-modal blend that encompasses the desktop metaphor, the virtual desktop and the desktop blend into one phrase, namely the desktop metaphor as a multi-modal blend (DMMB). The DMMB will be used henceforth in this dissertation to refer to these concepts. These hitherto variegated concepts have been compressed into one phrase, and since the metaphorical import may or may not have been lost, it is assumed that the DMMB may, in theory, be de-compressed conceptually, even by ‘digital natives’, and the degree to which the DMMB has become conventionalised is the focus of this study (Fauconnier 2008).

The present study acknowledges Max Black’s theory of interactive metaphors (1954) as relevant to the nature of the conceptual integration structure. Even though it predates Conceptual Blending Theory by several decades, it is still a significant consideration for any theory of metaphor:

A fairly obvious objection to the foregoing sketch of the “interaction view” is that it has to hold that some of the “associated commonplaces” themselves suffer metaphorical change of meaning in the process of transfer from the subsidiary to the principal subject […]. The primary metaphor, it might be said, has been analysed into a set of subordinate metaphors…

(Black 1954: 289)

The interaction theory of metaphor, then, seems to allow for bidirectional mapping. Like Conceptual Blending Theory, the interaction theory implies that the counterpart connections that occur between spaces project onto the emergent blended space, but can also affect the spaces that are being projected onto. Since Conceptual Blending Theory has a multi-directional mapping process from the input spaces to the blended space. An input space will be affected by the counterpart connections that are mapping onto it from another input space. As a result, the input spaces contain structure that was not available before counterpart connecting took place. Consider the OLD COMPUTER AS A DINOSAUR example again: Input space 1 will contain DINOSAUR and its relevant features, while input space 2 will contain OLD COMPUTER and its relevant features. According to this
theory, DINOSAUR will then be conceptualised in light of OLD COMPUTER, and vice versa due to the bi-directional counterpart connections. As a result, neither of these concepts will be seen as representations of their ‘pure frames’, but will rather be seen as metaphoric versions of their frames as they are influenced by one another. The blend thus emerges from input spaces that are tailor-made for the particular blend that they inform. Therefore, it cannot be assumed that metaphoric content only exists in the blended space. According to this theory, the conceptual integration model as a whole is already metaphoric, since meaning and understanding is meant to reside in the entire blend, not any one part of it (Zawada 2005: 171). The study identifies the metaphoric nature of the entire structure to the extent where it is more suitable to consider the content of the input spaces and the blended space as more metaphoric or less metaphoric. For example, when considering the DMMB, the OFFICE DESK input is a physical entity that is defined as a real-world object. Thus, has less metaphoric value, but as it forms part of the network as a whole, it is still a version of an office desk that contains features specifically related to the DMMB and its network structure. The COMPUTER DESKTOP input possesses more metaphoric value, as its contents is based on a representation of a real-world object. Nevertheless, the COMPUTER DESKTOP is not the content of the blended space, as the emergent structure in the blended space can either be dominated by mappings from the OFFICE DESK input space or by mappings from the COMPUTER DESKTOP input space. In turn, the blended space will generate a metaphorical blend, but the blend will either have low metaphorical value (content that does not represent another object) or high metaphorical value (content that is representative of another object).

The technological era has steered people in a direction where they interactively explore and use computerised devices of all sorts from a very young age. This generation is known as the ‘Net Generation’, which refers to people born after 1980 (Rosen 2004). Rosen (2004) briefly characterises this generation. Note the extent to which their daily lives are driven by technology:

They have been entangled with technology from birth. The average age that they started using a computer is 3 and most sent their first email before they entered kindergarten. They live on instant messaging (IM) and communicate with friends more on IM than any
other way. They multi-task constantly with the average teen talking to 3 people at once on IM plus doing several other tasks at the same time.

(Rosen 2004)

Indeed, the Net Generation thinks and processes information differently from the generations preceding it. Prensky (2001) examines this generation’s approach to education, by evaluating the effectiveness of the approach that educators take to teaching students of this generation. He makes the distinction between what he calls ‘Digital Natives’ and ‘Digital Immigrants’. Digital Natives refer to the Net generation because they are “speakers of the digital language of computers, video games and the Internet” (Prensky 2001: 1). Prensky considers Digital Immigrants to be those, who did not grow up with exposure to new technology, but who adopted the use of it later in life: “The importance of the distinction is this: As Digital Immigrants learn – like all immigrants, some better than others – to adapt to their environment, they always retain, to some degree, their “accent”, that is their foot in the past” (Prensky 2001: 2). Prensky (2001: 1) is of the view that these generations’ brain structures are physically different from one another, and, as a result, educators from the older generation (the Digital Immigrants) cannot expect their Net generation students (the Digital Natives) to receive education similarly to previous generations. Prensky proposes various means of changing approaches to teaching by suggesting that educators incorporate computer technology into teaching practice, particularly by means of educational video games.

Based on Rosen and Prensky’s delineation of the Net Generation (or Digital Natives), the DMMB is no longer required to introduce this generation (in the present study participants aged 18 to 25 will be tested, which constitute representatives of the Net generation) to computer ware, seeing that there has been an evolution of sorts towards the increased use of technology in our daily environments. Therefore, this constant exposure moulds new experiences which affect our embodied knowledge stored in long-term memory (Lakoff and Johnson 2003). This presumed technology-driven embodied knowledge will inevitably inform the content of the generic space and, as a result, the conceptual integration structure overall. This study assumes that this ‘evolution’ did not end at our external realities, but has been internalised to affect our cognitive processing as it
has our embodied experiences. As a result of this, it is hypothesised in this study that the computer desktop is conceptualised as a metaphorical blend with a low metaphorical value by individuals with high exposure to technology. The basis for this hypothesis is that such individuals do not understand or interact with the computer desktop by considering it in terms of real-life objects any longer.

The emergent, blended space will therefore verify whether the participants’ conceptualisation(s) of the computer desktop in its various instantiations remain highly metaphoric in nature (represented by real-life, office-based objects and incorporating a large number of mappings) or whether it has evolved to be a metaphor with low metaphorical value (no representation required, and conceptualised as a technology-driven, computerised object with little to no mappings required). Note that if the computer desktop input space projects more prominently onto the blended space, the emergent blend will maintain a low metaphorical value, as it is now conceptualised as an object in and of itself and it is not represented by any other objects. If the office-based workspace input space dominates the emergent blend, the blend will be highly metaphoric, as the computer desktop is still conceptualised by means of a representation of a literal object and cannot be conceptualised as a thing-in-itself.

In conclusion, the present study will attempt to determine to what extent social variables determine the conceptualisation of the DMMB. Furthermore, it will aim to establish whether mapping from the input spaces is governed by social variables. Finally, the researcher hopes to determine to what extent the DMMB maintains its metaphorical value. In order to achieve this, conceptual and behavioural processes will be tested in students attending an information technology college. Categorisation and word association will be used to evaluate the nature of the participants’ online cognitive processing. In the next section, categorisation, which informs the study’s methodology, is considered in light of Prototype Theory.

2.4. Prototype Theory

Prototype Theory, as a theory that explains human categorisation, is discussed in this section. Firstly, it is necessary to outline an important concept that relates to
Prototype Theory, namely categorisation, where the classical theory of categorisation is introduced and distinguished from Prototype Theory. Word association as it is applied in the present study is also introduced in this section.

2.4.1. Categorisation

Categorisation is a fundamental part of the conceptual system and organises information in our conceptual structure. It acts as one of the bases for knowledge representation and linguistic meaning. Evans and Green (2006: 248) define categorisation as “our ability to identify perceived similarities (and differences) between entities and thus group them together”.

Early studies in categorisation were conducted in psychology by scholars, like Vygotsky (1934, 1962); Hull (1920), with work in associationism; Bruner et al. (1956) and Levine (1966), who did further work in the hypothesis-testing framework; as well as Rosch (1978) with prototype theory (which is the focus of the following sub-section). Before examining prototype theory in further detail, the ‘classical theory’ of categorisation is discussed.

The classical theory of categorisation was introduced by Aristotle. Taylor (2003: 10) explains Aristotle’s premise as follows: “To say that X is a Y, is to assign entity X to category Y. Entity X belongs to category Y in virtue of exhibiting the ‘essence’ of the category”. The theory states that conceptual and linguistic categories have definitional structure, which means that an entity can act as a category member if certain necessary and sufficient conditions are fulfilled (Taylor 2003: 10). Human beings typically share similar categorisations. The classical theory accounts for this by referring to universal, a priori perceptual categories, which are likely to be genetic, or due to other factors, like social conditioning, or a possible combination of the two, among other possibilities. Taylor (2003) outlines the main assumptions of the classical theory of categorisation:

(a) word meanings can be defined in terms of sets of features, (b) that the features are individually necessary and jointly sufficient, (c) that words pick out categories of entities which exhibit each of the features, (d) that all members of a category have equal status within the category, and (e) that membership in a category is a clear-cut, all-or-nothing matter. (Taylor 2003: 39)

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The definitional structure of the classical view determines that categories have clear-cut boundaries, which implies that an entity either possesses all of the right components to be included in the category or it does not fit at all. In most cases, this is a true observation, but Evans and Green (2006) mention an example like FURNITURE, which has ‘fuzzy boundaries’. It is clear that table and chair are members of this category, but carpet does not clearly fit into this category, or indeed into any clear superordinate category at all, according to Sampson (2005), in his discussion of the topic. Therefore, categories are defined according to conditions that are very challenging to determine. Another issue regarding this view is that of typicality of category members. It seems to be the case that there can be ‘good’ and ‘bad’ examples of a category member (like table compared to carpet for the FURNITURE category). This is called typicality effects of a category, also known as graded categories (Evans and Green 2006: 169).

Due to the clear definitional structure that categories in the classical view possess, typicality is not accounted for, as each member of the category is considered to be equally typical. Further problems with the classical view, like the problem of psychological reality and the problem of ignorance and error\(^2\), make this approach to categorisation seem less capable to account for the nature of categorisation as a conceptual phenomenon. In light of this, Rosch (1973) has made great strides in arguing against the classical view (Taylor 2003: 39), by conducting categorisation experiments to account for the disparities that appear in the classical theory with the development of prototype theory, which is now discussed.

### 2.4.2. Prototype Theory

Prototype Theory was put forth by the psychologist Rosch (1973). A prototypical member is “the clearest case(s) of pry membership defined operationally by people’s judgments of goodness of membership in a category” (Rosch 1978: 11). A category is organised around a prototypical member, to which all other members (called radial categories) connect. The prototype acts as a “schematic representation of the most salient or central characteristics associated with members of the category in question” (Evans and Green 2006: 249).

\(^2\) Discussed in further detail in Evans and Green, Chapter 8 (2006: 251-255), and Taylor, Chapter 2 (2003: 7-11).
For the purposes of this study, it is assumed that categorisation acts as a ‘basic-level’ form of blending; for example, the category FURNITURE connotes certain attributes, like wood, upholstery, seating, storage capacity, legs and arms, and so forth. According to these criteria, chair may be considered a prototypical member of the category FURNITURE. Footstool, on the contrary, may not be a prototypical member of FURNITURE, as it does not feature a majority of the attributes. Lakoff and Johnson (1999: 27) claim that this level of categorisation “optimally fits our bodily experiences of entities” and thus human beings apply prototype theory to categorising concepts in various manners.

Rosch (1978) focuses on two principles in the formation of categories, which are ‘cognitive economy’ and ‘perceived world structure’. Cognitive economy represents the function of category systems and affirms that the role of category systems is to supply the maximum amount of information with the least amount of cognitive effort. ‘Perceived world structure’ refers to the claim that the perceived world is represented as structured information that is not made up of random or unpredictable attributes. The maximum amount of information with the least cognitive effort is gained if categories map the perceived world structure as familiarly as possible. This is accomplished when categories are mapped to provided attribute structures or by defining attributes to depict a provided set of categories that is adequately structured.

Category systems have both a vertical and horizontal dimension (Rosch 1978). The vertical dimension identifies the level of inclusiveness of the category where it is clear that not all possible levels of categorisation are equally useful, but that the most basic level of categorisation will be the most inclusive (abstract) level where categories can reflect the structure of attributes perceived in the world. If the above example is considered, the vertical dimension differentiates between FURNITURE, table, kitchen table and chair and rocking chair. The level of inclusiveness is divided into three categories, namely basic-level, superordinate and sub-ordinate. Basic-level categories appear in the middle of the vertical axis (Evans and Green 2006: 257). Smyth, Collins, Morris and Levy (1994: 73) explain that “at the basic level of categorisation are the concepts which are most

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3 Consider the discussion on mappings earlier in this chapter. The mappings mentioned here are similar to those mappings in that it forms a part of conceptual projection as a cognitive process.
commonly used and among the first to be learned”. For instance, *table* and *chair* are basic-level categories. The basic-level category is most inclusive in terms of detail as members of that category have the most shared features at this level of inclusiveness (Evans and Green 2006: 257). The superordinate category appears higher up on the vertical axis and contains fewer detailed category attributes, such as FURNITURE. The sub-ordinate category is the lowest on the vertical axis and adds specific category attributes, such as *kitchen table* and *rocking chair*.

The horizontal dimension involves the division of categories at the same level of inclusiveness where distinctiveness and flexibility of categories are emphasised. This dimension relates particularly to perceived world structure. Evans and Green (2006: 264) explain that the world consists of “correlational structure”. This means that sets of attributes do not have an equal opportunity to appear in relation to any category: “Instead, the world itself has structure, which provides constraints on the kinds of categories that humans represent within the cognitive system” (Evans and Green 2006: 265). The most correlational structure then appears within the prototype. In this case, categories are defined in terms of prototypes or prototypical instances that consist of the attributes that most represent items inside, while least representative items are outside of the category; for instance, the differences that exist between a chair and a footstool. In this case, category members show family resemblance, which implies that not all categories possess exactly the same attributes, and thus are not identical. However, there is enough similarity between members to identify resemblance between them only to differing degrees (which relates to typicality effects, discussed above). Consider the figure below:
Lakoff and Johnson (1999: 19) consider categorisation as a product of our neural structure and embodied minds: “Since we are neural beings, our categories are formed through our embodiment. What that means is that the categories we form are part of our experience!”. They explain that categories are formed and used in relation to our experience and not simply our intellectual abilities. They agree that humans categorise in terms of prototypes: “Each prototype is a neural structure that permits us to do some sort of inferential or imaginative task relative to a category” (1999: 19). According to their view, categories can be formed by conscious categorisation, but are mostly formed by our actions and behaviours in the world, although this happens in an instinctive and unconscious manner. Lakoff and Johnson go further to claim that we cannot deliberately control what and how we categorise, because the act of thinking itself causes us to categorise on an unconscious level. They add that our bodies and brains determine what kinds of categories we will form, and what the structure of the categories will be:

What is important is not just that we have bodies and that thought is somehow embodied. What is important is that the peculiar nature of our bodies shapes our very possibilities for conceptualisation and categorisation.

(Lakoff and Johnson 1999: 19)
This study concurs with Tendahl (2009: 126), who claims that “conventional metaphors are understood by categorisation”, hence Prototype Theory is considered to be a contribution to the study’s theoretical framework, but it is also used to inform the methodology regarding the conceptual word association task, which will allow for the observation of the participants’ conceptualisations of given categories. The given categories in this regard are concepts within the COMPUTER TECHNOLOGY frame, such as keyboard, cloud and screen. These concepts were selected specifically as they have the capacity to activate different frames: cloud can be categorised as a phenomenon of NATURE or WEATHER, but also as a platform for SOFTWARE COMPUTING. This should shed light on the conceptualisation processes of each participant, since conceptual prototypes (Lakoff 1987) link to the work done in frame semantics, where Fillmore\(^4\) pointed out that words activate certain frames, and subsequently affect. This is discussed in more detail in the subsequent chapter which deals with the methodology of this study.

Prototype Theory *should* also shed light on the familiar associations that participants draw automatically and dynamically in online cognition, in other words direct input that takes place in our immediate environments, which requires faster processing to produce automatic responses and to do ‘here-and-now’ tasks (Toates 1998). Online and offline cognitive processing are distinguished as follows: offline cognition refers to slower, reflexive and purposeful responses or actions (Toates 1998), whereas online cognition is dynamic, faster. In relation to the study, both online and offline cognitive processing will be examined. The conceptual task (which makes use of prototype theory) intends to study online cognitive processing as it calls on quick, automatic and spontaneous responses, while offline cognitive processing will be studied in light of the behavioural task (dealt with in a subsequent chapter), which requires conscious and deliberate selection of the manner in which particular tasks will be executed. It will hopefully provide some insight into the nature of the conceptualisation of the DMMB in an attempt to identify whether it is dominated by concrete, real-world conceptualisations (which involve metaphorical mapping), or by abstract, technology-related conceptualisations (which are non-metaphorical, and

\(^4\) Cf https://framenet.icsi.berkeley.edu/ where various examples of such are discussed.
presumably require less ‘online’ mapping). The conceptual task and its relevance to this study are further explained in Chapter 5 of this dissertation, which deals with the quantitative aspect of this study.

2.4.3. Word association

It has been determined in the field of psychology that words are associated in the mental lexicon in certain ways. It is most prevalent to associate words in terms of their meanings (rather than in terms of form). Field (2004: 23) explains that:

Meaning associations in the lexicon are stronger than those of phonological or graphological similarity. The meaning associations are usually based on semantic groupings, not physical resemblance [...]. There is also a tendency to choose a word in the same word class as the stimulus.

There are a number of types of association that can be made in semantics (Field 2003). Firstly, semantic fields group words in relation to the topic that words fall under, such as relationships or animals. Secondly, words can be associated through sense relations based on the similarities and differences of meaning. In this case, sub-types include: synonyms (words with similar meanings), opposites (words with contrasting meanings) and hyponyms (members of a particular category – cat is a hyponym of animal). Thirdly, words are associated by collocates (words that appear together frequently), such as coffee and tea.

Word association and related cognitive association methods can help us understand unconscious cognitive processes. To date, psychologists have used an array of methods to attain a better understanding of the underlying conceptual associations that are made regarding the link between the subject’s environment and, often unintentional psychological reactions (such as responses to impressions, evaluations, goals or behaviour) to them (Bargh and Chartrand 2000: 1). In this regard, priming and automaticity research in social psychology is distinguished. Bargh and Chartrand (2000: 256) differentiate between priming and automaticity when they explain that priming research is focused on the temporary activation of cognitive representations that are generated by the environment. ‘Priming’ research studies the psychological effects of a subject’s exposure to a
particular environment. On the other hand, ‘automaticity’ research considers permanent sources of activation that result from constant and prolonged access to particular social knowledge structures. In this study, automatic, unconscious conceptualisations are under scrutiny. In other words, automaticity processes are the subject of study in this regard, because these processes entail “mental representations that transcend the current context” (Barh and Chartrand 2000: 258). It is the view of this study that word associations can provide a means to examine such automatic, unconscious conceptualisations. Zeelenberg, Pecher, Shiffrin and Raaijmakers (2003) discuss the benefits of priming in word association tasks to test implicit memory, for example.

Greenwald, McGhee and Schwartz (1998) developed the Implicit Association Test in order to measure implicit attitudes and judgments, which are often not intentionally and/or consciously reflected by a subject. The test allows researchers to define “a wide range of socially significant associative structures” (Greenwald et al. 1998: 1464). The authors explain that this test is similar to cognitive priming methods in order to test automatic responses related to affects or attitudes. The value of the Implicit Association Test is in its ability to “resist masking” (Greenwald et al. 1998: 1465). In other words, the benefit of this test is to gain access to attitudes and judgments that the subject may not consciously share with the researcher. The test proves effective in providing semantic associations in cognition. In the present study, the focus does not relate to attitudes and judgments, but rather to technology-related conceptualisations.

In the present study, semantic associations will be drawn by means of a word association task, similar to the Implicit Association task developed by Greenwald et al. (1998). As explained by Gao and Xu (2013: 2030), word association relates to semantic fields, which are groups of words that share meanings that are closely related. Lehrer (1985: 283) explains that the basic premise of semantic field theory is that lexical meaning can be studied by means of accessing sets of words that are semantically related. In this regard, Lehrer (1985: 283) states that it is impossible to study words in isolation. Instead, it is necessary to consider the relationship that exists between words. Semantic field theory assumes that words within a language are associated with one another, and ultimately form an entire
lexical system. Within the lexical system, certain words relate to the same topic and can form a semantic field. Goa and Xu distinguish between ‘genus’ and ‘species’ to explain what constitutes a semantic field (2003: 2031). ‘Genus’ refers to a general concept that can be explained as the topic of a particular semantic field. A set of words that are related to the topic can be found in the semantic field, known as ‘species’. Consider books as an example of a general concept (or what is known as a ‘genus’). The specific concepts (also called ‘species’) that are grouped under the genus are novel, textbook, biography, anthology, and so forth. Gao and Xu (2013: 2030) summarise semantic fields as “a combination of a group of words that interact, dominate, distinguish and depend on one another”. Semantic fields relate to categorisation, since it also refers to a grouping together of related concepts into a category or, known in semantic field theory as a genus.

Word association will be used in this study to determine to some extent the nature of a participant’s conceptualisation as it relates to real-life representations of features of computer technology. A particular genus or species of a semantic field will be provided to the participant, and the participant will draw on the semantic field, as conceptualised by him as an individual, to supply a related genus or species. The word association task in the study should provide insight into the nature of the particular semantic field. For example, if the participant responds to the species ‘word’ by saying ‘typing’, the relevant semantic field can be related to the concept of COMPUTER TECHNOLOGY. In other words, the participant conceptualises the given concept ‘word’ in terms of a semantic field that is based on COMPUTER TECHNOLOGY and draws related associations from this field. It can then be assumed that all related genus and species from this semantic field will be associated with computer technology. The given concepts will all be representations of technological features of the computer. The objective is to evaluate if the participant relates these representations to its real-world associations or to its technological counterparts.

In the following section, Cognitive Sociolinguistics is introduced as a current trend in cognitive linguistic research. The present study is situated within this new approach.
2.5. Cognitive Sociolinguistics

Thus far, cognitive linguistics has proven to be a versatile and rewarding approach to language study. However, it has been criticised as being “incomplete” (Croft in Evans and Pourcel 2009: 395). Although the discipline is considered to be loaded with promise, Croft (2009) is of the opinion that it is “too much ‘inside the head’”. The essential focus on the internal (mind) undoubtedly plays an immense role in exploring and uncovering the mysteries in the study of language, but the role of the environment should not be underplayed in a linguistic study. Croft (2009: 395) argues that “there is a long-standing separation of the social and psychological dimensions in the study of human behaviour, language included. This gap must be bridged in order to achieve progress in understanding the nature of language”.

Croft (2009) argues that language cannot be a network of cognitive processes that are in need of investigation. If language was only a mental phenomenon, as it is presumed to be in the a priori Rationalist philosophy, which scholars like Chomsky advocates, there would be little point in using it in the first place. The main function of language is, after all, to communicate: “An approach to language such as cognitive linguistics, as it is presently constituted, therefore cannot provide us with a complete understanding of the nature of language. Cognitive linguistics must reach out and embed itself in a more general social-interactional model of language” (Croft 2009: 397). As a result, recent works have drawn on a merger of usage-based cognitive linguistics and variationist sociolinguistics. This has borne an interdisciplinary trend known as Cognitive Sociolinguistics. The merger allows the two tendencies to be studied as inter-dependent, flexible and dynamic approaches that can benefit mutually from this relationship.

In a recent work in this regard, Campbell-Kibler (2010: 31) emphasises the necessity of focusing on the effects that social variables have on linguistic cognition:

Variationists to date have been little interested in studying how social information is represented in the mind, despite a strong interest in how linguistic structures function cognitively. As a result, debates about the mental relationships between social and linguistic structures have been hampered by a lack of clarity regarding the nature of social processing.
In their study, Hollman and Siewierska (2011: 25-26) emphasise the fact that Cognitive Linguistics cannot simply be studied exclusively as a mental phenomenon, but should be viewed as a social activity as well. They cite Langacker (1999: 376) in support of their claim:

Articulating the dynamic nature of conceptual and grammatical structures leads us inexorably to the dynamics of discourse and social interaction. While these too have been part of Cognitive Grammar from the very onset, they have certainly not received the emphasis they deserve.

In an attempt to account for the relationship between social and cognitive processes, and the effects that they have on one another, it is essential that cognitive linguistic studies do not eliminate the influences of social variables on the cognitive process, but instead account for these as much as possible. Social variables can differ greatly from one individual to another, and this should be considered when attempting to study the individual subject. Social variables include, for example, ethnicity, gender, culture, religion, status, environment, attitudes, education, age, and so forth. Nevertheless, there is a boundless array of social variables and some of these are context-dependent, such as exposure to a particular phenomenon. The present study will take into consideration the impact of mainly exposure-related social variables on the cognitive process and determine in what way conceptualisation is influenced by these variables.

The intent of this study is to examine the cognitive process of blending, with particular focus on the generic space of the DMMB, by identifying the underlying social variables that affect the nature of dynamic, creative online cognition. In the case of the DMMB, the assumption in this study is that exposure to computer technology plays a vital role in the forming of technology-based blends. With this being said, this study acknowledges Croft’s (2009) [among others’] argument of achieving more realistic results by examining more intently the influence that social variables have on the human cognitive process. It further emphasises the demand for the establishment of a usage-based approach to Cognitive Linguistics. It calls for a hybrid approach that is not simply made up of internal ‘mind’ science, but aims to prove that these internally-focused studies require the incorporation of external social variables, which inevitably influence the internal processes of the
participant. In this case, the study positions itself in the realm of Sociolinguistics as well as Cognitive Linguistics.

Cognitive Linguistics is considered to be a usage-based approach, meaning that “language structure emerges from language use” (Evans and Green 2006: 108). In this regard, the usage event (or utterance) is considered to be a fundamental part of the usage-based approach. Based on this definition, a usage-based approach cannot be adopted if the focus is solely on internal aspects of cognition:

While it is clear that sociolinguistics is firmly embedded in the analysis of language as it is used in its social context, it is less clear that this is true of cognitive linguistics, despite the various claims that it is a 'usage-based' model.

(Clark and Trousdale 2010: 292-293)

Geeraerts (2001: 46) addresses this issue when he infers that "it is impossible to take seriously the claim that Cognitive Linguistics is a usage-based approach and at the same time to neglect the social aspects of language use". This emphasises the need for the inclusion of social considerations in linguistic research in cognition.

Some scholars in the field have placed an active focus on the study of the interplay of social variables and the cognitive processes involved in linguistic study. Croft (2009: 419) emphasises the necessity for the research in the integration of Cognitive Linguistics and social cognition. He states that it would provide a better understanding of the role that language plays in humanity. More recent research that firmly advocates the merger of Cognitive and Sociolinguistics is found in Hollman and Siewierska’s (2011) exploration of the effects that Cognitive Linguistics and Sociolinguistics have on grammar through the consideration of social variables; Campbell-Kibler's (2010) study of social processing in Sociolinguistic Cognition and how the inclusion of cognitive study can benefit Sociolinguistics; as well as Geeraerts and Kristiansen’s (2014) investigation of language variation as it appears in Cognitive Linguistics and their argument for a variationist shift in the field. Cognitive Sociolinguistics also extends to dialectology and other aspects of language structure, with studies like Zenner, Speelman and Geeraerts’ (2012) study of the application of Cognitive Sociolinguistics to loanword research in terms of Dutch anglicisms.
This therefore shows that there is a growing emphasis on socio-orientated approaches in linguistic inquiry. Nevertheless, this aspect of linguistics has not been explored to any great extent. Research in this area, with a specific focus on the role of social variables in cognition in usage-based linguistics, is still relatively sparse. There is, however, an overall awareness of the potential for usage-based research with regard to socio-cognitive mergers that have the capacity to illuminate aspects of cognition that cannot be examined in full based solely on externally- or internally-focused approaches. Indeed, the need to focus on research of this nature is acknowledged by scholars like Croft (2009). Research in this regard, like that of Hollman and Siewierska (2011), Campbell-Kibler (2010), Zener, Speelman and Geeraerts (2012) and Geeraerts and Kristiansen (2014), has only recently become available and seems to be promoted by scholars like Geeraerts (2001, 2010, among others). Therefore, many research possibilities arise in light of this new hybrid approach to linguistics. The outcome of the present study has the potential to contribute to this growing trend in light of the fact that its main focus is on the role of social variables in cognitive processing (in particular conceptual projection) and the effect that this may have on cognition in this regard. Ultimately, it could add to our understanding of how these variables influence cognition in individuals and (in this case) in a particular group of individuals.

2.6. Conclusion

This chapter expounds on the theoretical framework that this study is based on, with particular emphasis on Conceptual Metaphor Theory, Conceptual Blending Theory and Prototype Theory. It connects these theories to the main focus of this study, which is on conceptual metaphors and blends and their workings in the embodied mind. Due to the pervasive nature of conceptual metaphors and blends, it is not realistic to study the variety of conceptual metaphors and blends that do exist, and thus the focus is on the DMMB, with the intent of identifying common features that make up a part of technology (specifically computer) related conceptual metaphors and blends. The methodological process involved in testing this is explored in the following chapters; this chapter acknowledges the study’s reliance on Prototype Theory as a theory that informs aspects of the methodology. Lastly, the hybrid discipline of Cognitive Sociolinguistics is introduced as well as
some of the work done in this field. This study is also situated in this hybrid stream of linguistics to account for its strong focus on external variables and how they affect internal cognition. Finally, a study of this nature requires an immersion in everyday thought processes, which are often unconscious and are very complex. Despite its complexities, Lakoff and Johnson (1999: 13) explain the importance of the unconscious mind and why a study that attempts to resolve at least a miniscule part of the mystery that is the unconscious is a worthy endeavour:

Conscious thought is the tip of an enormous iceberg. It is the rule of thumb among cognitive scientists that unconscious thought is 95 percent of all thought – and that may be a serious underestimate. Moreover, the 95 percent below the surface of conscious awareness shapes and structures all conscious thought. If the cognitive unconscious were not there doing this shaping, there could be no conscious thought.
Chapter 3
Research Methodology: An Overview

3.1. Introduction

This chapter provides an overview of the methodology that was employed when gathering the data. More specifically, the mixed-method research paradigm that was used in this study is introduced.

The chapter is structured as follows: Firstly, the notion that there is a growing awareness of the need to conduct empirical studies in Cognitive Linguistics is discussed. Secondly, the type of mixed-method research design used in the present study is highlighted and the advantages of using this design are explained. Thirdly, other studies which employ a mixed-method paradigm in Cognitive Linguistics are reviewed in this chapter. Finally, the research design, research setting, sampling procedure and data collection procedures are introduced. The present study was conducted using primarily empirical methods, consisting of a conceptual word association task, an experiment that determines behaviour in an office space and a structured interview.

3.2. Empirical methods in Cognitive Linguistics

Traditionally, semanticists relied on their native-speaker intuition and on introspection as a method of scientific inquiry. In Geeraerts’ (2010: 46) opinion, the reason for this is that meaning is not easily quantified or easily expressed in numbers, and as the most “qualitative, ephemeral and subjective of all linguistic phenomena”, it seems hard to do research in this field using empirical methods that aim at objectivity. Scholars, like Geeraerts (2010), question the validity of the Chomskyan approach to linguistic research by arguing that an ‘ideal native speaker’ is “too much of an idealisation to be valid as the methodological basis of linguistics” (2010: 50).

Scholars, like Geeraerts (2010), advocate the inclusion of empirical research methods in cognitive linguistic studies. Geeraerts argues that the methods of
experimental psychology and quantitative data analysis have been applied successfully in sub-fields of Linguistics (like Psycholinguistics) and that such methods could be applied successfully in the field of Cognitive Linguistics too. Another point argued by Geeraerts is that attempting to find generalisations and regularities in data (typical features of empirical studies), already constitute a part of any linguist’s focus. Thus, “the transition to a quantitative methodology would seem to be a gradual step, a continuation rather than a rupture – an observation that makes it even less probable that the adoption of an empirical methodology is an impossibility” (Geeraerts 2010: 47).

While Geeraerts (2010) promotes the inclusion of empirical research methods as a methodological approach, he makes it clear that introspection on the side of the researcher will always be important in linguistic inquiry. Geeraerts (2010: 55) explains that the “creativity and intuition” of the researcher should remain a part of any linguistic research study. Researcher introspection plays a crucial role in empirical study, as it is required for the translation of hypotheses into workable predictions, finding suitable operationalisations for data collection and processing the results of data collection. Lakoff advocates a similar view in this email found on the COGLING email list (2004), he explains that the linguist's involvement (what he calls “introspection”) is essential when analysing data in Cognitive Linguistics:

To do Cognitive Linguistics with corpus data, you need to interpret the data – to give it meaning. The meaning doesn’t occur in the corpus data. Thus, introspection is always used in any cognitive analysis of language. [...] There is no empirical research in Cognitive Linguistics without introspection. The idea that there is an empirical research/introspection contrast makes no sense at all in our field.

(Lakoff 2004 in Jenset 2007: 24)

The presupposition that introspection on the researcher's part plays no role, therefore, has no justification within the methodologies conventionally employed in the field of Cognitive Linguistics. Empirical methods can be seen as quite commensurable with the philosophy of embodied realism, and indeed in Lakoff and Johnson (1999), one of their key motivations for advocating a paradigm shift in what they call ‘second generation cognitive science’ was an empirically responsible philosophy. Geeraerts (2010: 55) points out one reason why empirical research is supported by intuition: “Empirical research does not lower the
demands on the subjective skills of the researchers; it only raises the criteria for the objective validity of their claims”.

Similarly, Schwartz (1999) identifies how inductive reasoning influences the finding of empirical regularities that are in need of explanation. He asserts that “reason has a higher calling” (Schwartz 1999: 704), which requires observation in order to determine patterns which can result in a tentative hypothesis and eventually into a theory. On the other hand, deductive reasoning often starts with a theory as a basis for a hypothesis, which requires observation (with data) in an attempt to verify the theory. Its intent is thus to test hypotheses. Bearing this distinction in mind, it is therefore clear that inductive reasoning requires the proactive role of the researcher in order to make observations and determine patterns from these observations. Essentially, Schwartz (1999) acknowledges that inductive reasoning can be conducive to empirical studies in order to provide the researcher with the opportunity to explain and motivate particular empirical patterns.

As opposed to more empirically orientated fields, such as psycholinguistics and cognitive psychology, Cognitive Linguistics has not necessarily advocated for the inclusion of experimental research methods. Bergen (2007: 277) explains that “cognitive linguistics has predominantly produced static, verbal models of linguistic and other conceptual representations, rather than the dynamic models of psychological processing required to explain the processes of language understanding”. Seminal works in the field of CMT and BT, such as Turner (1996), Turner (1987), and Lakoff and Johnson (1980) did not rely on empirical methods, yet these scholars now concur that a more empirically motivated framework is necessary (cf. Lakoff and Johnson 1999: 551).

As a result, more recently, research has emerged that links the methods of experimental psycholinguistics with the theoretical perspectives of Cognitive Linguistics. Gibbs (2007: 45) acknowledges that there are certain challenges in Cognitive Linguistics that can be overcome by introducing experimental methods to its research. He emphasises that it is necessary to consider whether competing hypotheses can be tested, since this is not ordinarily done within the Cognitive Linguistics paradigm (Gibbs 2007: 46). Gibbs (2007: 46) outlines some methods of experimental psycholinguistics that have been employed successfully to test
theoretical concepts, such as conceptual metaphors, namely mental imagery and context-sensitive judgments. Zelinsky-Wibbelt (2000: 12) explains that experimental psycholinguistics focuses its research on observable referential behaviour of language speakers: “psycholinguistic experiments are constructed so as to give clues to the speakers’ mental organisation of the meaningful relations of linguistic expressions” (Zelinsky-Wibbelt 2000: 12).

Redeker and Janssen (1999: 2) raise an important concern for Cognitive Linguistics. Due to its functional nature, the discipline requires methodological diversity. They explain that “functionalists (including Cognitive Linguists) have to cover such diverse domains as language change, typology, acquisition, and the neurological basis of language” (Redeker and Janssen 1999: 2). Thus, selecting a fitting methodology becomes a challenging task for the researcher. The authors emphasise that an important guiding principle of Cognitive Linguistics, namely converging evidence, should inform the selection of a methodology. In the past, cognitive linguists relied greatly on research findings of related disciplines in order to show how these findings converge with linguistic research.

As stated by the cognitive commitment (as discussed in Chapter 1), it is necessary for findings of Cognitive Linguistic research to converge with findings in related disciplines, such as psychology, among others. With the increasing use of empirical research methods in Cognitive Linguistics, the discipline has become empirically-driven. However, the convergence of evidence is still a fundamental principle of the field and must be one of the goals of any research study in Cognitive Linguistics. Converging evidence is discussed in relation to this particular study in the next section. For now, it is worth emphasising the necessity of converging evidence in a discipline such as this:

Perhaps the most fundamental methodological principle I follow is to look for converging evidence from multiple sources. This is especially important considering the diversity of the cognitive-functional enterprise. An essential source of guidance and empirical support for work in any one area is its broad compatibility, and hopefully its convergence in specific details, with the findings of others.

(Langacker 1999: 26)
In light of the above, the present study adopted an empirical approach to cognitive linguistic research in that it set out to collect and analyse real-life linguistic data by means of fieldwork in order to attain an accurate understanding of conceptualisation. The empirical approach to research was most suitable to this study, as it was the intent to better understand the complexities of the relationship between conceptualisation and one’s social and environmental context, particularly the technological environment which forms a part of most people’s daily lives. The present study adopted the viewpoint that the researcher’s intuition is an inevitable and also a necessary part of an empirical study, as presented by Lakoff (2004), Geeraerts (2010) and Schwartz (1999), among others. This study further makes use of experimental methods in order to test the theoretical assumptions of Conceptual Blending Theory, for one. This has proven a successful approach to Cognitive Linguistic research, as argued by Bergen (2007), Turner (1996), Turner (1987), Lakoff and Johnson (1980; 1999), Gibbs (2007), and Zelinsky-Wibbelt (2000). It also acknowledges the importance of converging evidence, as a guiding principle in Cognitive Linguistic research.

### 3.3. Mixed Method Research

The concept of mixing qualitative and quantitative research methods was not favoured in the past. Tashakkori and Teddlie (1998: 3-4) agree that scholars have been debating whether the quantitative or qualitative approach is superior in the study of human and social sciences. The quantitative approach is more formalised and explicitly controlled than the qualitative approach, which is less formalised and might have a less defined scope and “philosophical mode of operation” (Mouton and Marais 1990: 155-156 in De Vos, Strydom, Fouche and Delport 2005).

Patton (2002: 69) explains that philosophers of science and methodologists have been participating in a long-lasting debate about the disposition of reality and knowledge, and this debate has seeped into research and assessment in arguments related to the aim of empirical studies and the varying views of what is considered to be ‘good’ research. This is known as the paradigm wars. De Vos et al. (2005) explain the current status of the ‘war’:

> Though many have pronounced the war and even the debate over, not everyone has adopted a stance of methodological enlightenment and tolerance, namely that
methodological orthodoxy, superiority and purity should yield to methodological appropriateness, pragmatism and mutual respect.

(De Vos et al. 2005: 358)

Some researchers, like Creswell (1994), originally preferred to adhere to a single method and steered clear of mixing methods, but they started paying attention to mixed-method research by acknowledging it as a research paradigm in more recent research methodology texts. Creswell focuses extensively on mixed method research in one of his recent works, namely Designing and Conducting Mixed Methods Research (Creswell 2011). De Vos et al. (2005) explain that the paradigm wars yielded ‘pacifists’ who believed that the quantitative and qualitative approaches are congruent, and do not need to be regarded as two conflicting extremes. Patton (2002) as a pragmatist does not agree that the adoption of either extreme is acceptable. He describes pragmatism as the use of “methodological appropriateness as the primary criterion for judging methodological quality, recognising that different methods are appropriate for different situations” (De Vos et al. 2005: 359). Tashakkori and Teddlie (1998: 2003) were the researchers who cemented mixed methods research as a valid means of inquiry in the social sciences. Mixed method research is a combination of qualitative and quantitative methods in one research study (Dörnyei 2007). The term ‘pragmatist’ here, as understood by Patton, is to be distinguished from the Pragmatism propounded by C.S. Peirce and William James.

In his more recent work, Creswell (2011) has narrowed down mixed method research into six mixed method designs, namely the convergent parallel design, the explanatory sequential design, the exploratory sequential design, the embedded design, the transformative design and the multiphase design\(^1\). The design which reflects the methodological approach of this study is the explanatory sequential design, which is outlined by Creswell (2011) as an approach in which the researcher initially collects and analyses only quantitative data. The quantitative data is tasked with answering the study’s research questions. Then, the researcher focuses on the qualitative phase of the study. The qualitative

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\(^1\) For the context of the present study the differences between the six mixed method designs are not of importance. The interested reader is referred to Creswell (2011: 69), who provides a thorough overview of the differences between these mixed method designs.
findings are used to interpret the results of the quantitative phase. In the case of this study, quantitative data was collected and analysed, and qualitative data collection was employed afterwards, which provided scope to further explore the results of the quantitative data. As a result, the present study can be classified as a mixed method study with an explanatory sequential design (Creswell 2011: 71).

Creswell (2011: 82) explains that the explanatory sequential design to mixed method research is advantageous in the case where groups are formed on the basis of the quantitative results, and further data collection is done to determine particular group characteristics by means of qualitative data collection. The explanatory sequential design is a fitting design in the case where the research problem is more quantitatively-orientated; where the relevant variables are known and suitable quantitative research tools can be accessed; where the participants can be returned to more than once for the purposes of qualitative data collection; where it is possible to conduct the research in two phases (a quantitative data collection phase and a qualitative data collection phase); where it is only possible to collect and analyse one type of data at a time; and where new research questions, that cannot be answered by quantitative data, emerge from quantitative results (Creswell 2011: 82). The advantages of the explanatory sequential design are viewed, within the context of the present study, as this design’s strengths.

The mixed method approach to research has several general strengths that are not only particular to the explanatory sequential mixed method design. The general strengths of mixed method research are mentioned in Dörnyei (2007: 45). Firstly, due to the fact that this approach combines both the qualitative and quantitative methods, it has the capacity to integrate the strengths of each of these methods. In addition, it has the versatility to diminish a weakness of one of the methods by enhancing the strength of another. Consider that generalised patterns and regularities which are quantitative in nature tend to decontextualise, simplify or reduce findings (Dörnyei 2007: 45). A focus on finding generalised patterns and regularities can cause the researcher to overlook participants’ personal circumstances that have the capacity to explain the nature of the findings. However, the qualitative method of examining each participant’s personal circumstances and lives can lead to findings which are unrepresentative of the particular sample group. With this in mind, the present study employed mixed
methods to collect data that have the capacity to be generalised. Nevertheless, these emergent generalisations need to be justified by means of a closer examination, in a qualitative manner, of each participant’s circumstances, which could provide reasons for the occurrence of regularities or irregularities in the data.

A second strength is that different analytical tools can be employed to converge quantitative (statistical) data with qualitative (detailed) data. As Dörnyei (2007: 45) puts it: “Words can be used to add meaning to numbers and numbers can be used to add meaning to words”. This multilevel approach to data collection and data analysis provides the researcher with an opportunity to collect data that takes the individual participant into account, but also the broader context. In the present study, qualitative methods were used to draw on individual participants’ personal details in an attempt to better understand the reason for the occurrence of possible patterns in the quantitative data.

Through mixed method research, validity of research findings can be reached due to the fact that mixed methods have the capacity to converge and corroborate findings. One way of ensuring that the results of a study are valid is through the application of triangulation. Triangulation has been defined by Leedy (1993: 143) as a means of combining quantitative and qualitative approaches, within the context of a mixed method approach. In other words, triangulation applies different complementary methods to arrive at a confirmation of research findings.

The present study did not attempt to achieve triangulation through its selection of methods nor did the validity and reliability of the research rely solely on achieving convergence via triangulation. The conceptual task, which draws on participants’ cognitive categorisation processes, and the behavioural task, which observes participants’ interactions within an office environment, have the potential for convergence, and it was expected that there would be some degree of convergence should the hypothesis prove to be true. In other words, the conceptual tasks’ data should indicate whether a participant tends to conceptualise in a technological or non-technological manner, while the behavioural tasks’ data should indicate whether the participant tends to complete tasks by using the computer or by using paper. For the purposes of this study, computer-based actions were considered to be technology-driven, while paper-
based actions were considered to be non-technology-driven. The conceptual tasks’ and the behavioural tasks’ results may converge if a participant’s conceptualisation is predominantly technology-driven, and his behaviour is mainly computer-based (or if a participant’s conceptualisation is predominantly non-technology-driven, and his behaviour is mainly paper-based).

Lastly, Dörnyei (2007: 46) points out that “[a] well-executed mixed methods study has multiple selling points and can offer something to everybody, regardless of the paradigmatic orientation of the person”, meaning that a mixed method approach allows for a larger audience to welcome the results.

Greene, Caracelli and Graham (1989 in Creswell 1994: 175), similar to Dörnyei (2007), list the purposes of mixing research methods in a study as follows:

- Triangulation
- Complementary: Several aspects of one phenomenon can emerge
- Developmentally: The first method assists in informing the second method
- Initiation: New perspectives and contradictions can appear
- Expansion: The study can be broadened over a wider scope.

Although mixing methods in research has shown to have several strengths, the weaknesses of this approach need to be considered as well. Hesse-Biber and Leavy (2006) explain that mixing methods may affect the quality of the research output, as the use of more methods does not necessarily make for a better study. Morse (1995 in Hesse-Biber and Leavy 2006: 334) cautions that mixed method research may be used as a “substitute for sharp conceptual thinking and insightful analyses”. Furthermore, a researcher’s skill in the use of both methods can be questioned. Dörnyei (2007) considers the possibility that most researchers do not possess the methodological skills to deal with both qualitative and quantitative data: “Apart from a relatively small number of unique, methodologically ambidextrous specimen, can we assume that the vision of a multi-methodologically savvy new breed of researchers is realistic?” (Dörnyei 2007: 46). Another issue is the fact that there exists a considerable possibility of combinations of methods. It is argued whether any typology can truly account for all these combinations.
Though an awareness of the possible pitfalls of employing mixed methods on the researcher's part is essential in an attempt to avoid these pitfalls from realising, it is clear that the strengths outweigh the weaknesses of using mixed methods in a study within the social and human sciences. Dörnyei, whose focus is particularly on research methods in the field of Linguistics (2007: 47), offers his viewpoint: "I do accept that certain issues are best researched using either QUAL or QUAN methods but I have also come to believe that in most cases a mixed methods approach can offer additional benefits for the understanding of the phenomenon in question". In fact, De Vos et al. (2005) acknowledge Harrison’s (1994) argument that quantitative and qualitative methods are inevitably mixed, and although these approaches are different views to research methods, they do not function independently from one another, but are instead interlinked. Campbell (in Brenner, Marsh and Brenner 1978) agrees that quantitative methods can only exist if there is knowledge of qualitative research conventions regarding theories, operationalisation, analysis, drawing conclusions and making generalisations. Similarly, qualitative methods rely on communications which are in some way agreeable to quantitative representation, which has the potential to be quantitatively analysed.

This study used a mixed method research paradigm with the intent to not only study possible patterns that occur in the conceptualisation of metaphoric phenomena among individuals with different levels of technological exposure, but also to gain an understanding of the reason for the particular conceptualisation of metaphoric phenomena based on the social context within which the participants are situated. The qualitative aspect of the present study, which consisted of conducting individual interviews and questionnaires, determined the unique social variables that could potentially affect the outcome of each individual’s conceptualisation of and behaviour toward the DMMB. The quantitative aspect of the present study consisted of a word association task (i.e. the conceptual task), which was employed to try to determine how/whether conceptual processes motivate behavioural processes. A controlled observation experiment related to participant behaviour in a set-up office space also formed a part of the quantitative aspect of this study. The abovementioned methodological tools are addressed in greater depth in the subsequent chapters.
The analysis of the data will also consist of mixed analytical methods. The conceptual task will be analysed by listing the actual words that the participants uttered in response to the target words/categories and by searching for regularities within these responses (e.g. by counting occurrences of each response). The occurrence of similar responses of a target word within the sample group will be counted and it will be determined whether the target word/category is associated with a word form from the COMPUTER TECHNOLOGY frame or not. Each participant’s response to a particular target word and to all the target words will be classified as either technology-driven (i.e. associated with a word related to the computer) or non-technology-driven (i.e. not associated with the computer), and the sample group’s overall response to a particular target word will be classified as either technology-driven or non-technology-driven.

The behavioural task will be analysed by classifying each task that will be executed by a participant as either computer-based or paper-based. The occurrences of computer-based and paper-based tasks of the sample group as a whole and of each participant’s behavioural data will be counted in order to determine to what extent the sample group and each participant’s actions are computer-based or paper-based. Once the conceptual tasks’ data and the behavioural tasks’ data are codified, further statistical testing will be done. Gibson and Brown (2009: 8) explain that qualitative data can be coded and categorised numerically in order to be tested statistically. In the case of the conceptual tasks’ data and the behavioural tasks’ data, tests for normality of data (the Kolmogorov-Smirnov test) will be done. Once the data are proven to be normally or non-normally distributed, further correlation tests will be conducted in order to determine whether there is a significant positive correlation between the conceptual tasks’ data and the behavioural tasks’ data.

The interview data (and where necessary the questionnaire data) will be analysed by means of a thematic analysis (which is explained in Chapter 4 of this dissertation). Dominant themes will be identified in each participant’s interview data and it will be determined whether similar themes occur within the interview data of the sample group as a whole. Once themes are identified that are prevalent in all the participants’ interview data, these themes will be used for further statistical testing. In this regard, it is hypothesised that exposure, for one, is
a prevalent theme in the qualitative interview data. Statistical correlation tests will be conducted to determine the nature of the relationship between these social variables (prevalent themes in the interview data) and, most importantly, correlations between social variables and the conceptualisation variable and the behaviour variable will be drawn. The current study’s analytical framework is dealt with in more detail in Chapters 4 and 5.

The following sub-section investigates the application of mixed method research in Cognitive Linguistics to determine its effectiveness in dealing with data of this sort.

3.3.1. Research studies using mixed method research in Cognitive Linguistics

Before introducing research studies conducted within a mixed method research paradigm in Cognitive Linguistics, it should be mentioned that mixed method research studies in this field are limited. This could be due to the theoretical nature of the discipline. Cognitive Linguistics has been a rich source of theoretical perspectives, which often motivates research studies in interdisciplinary fields, but rarely allows for purely Cognitive Linguistic research to be conducted by means of employing a mixed method paradigm. This is possibly due to the notion that Linguistics can be studied most effectively from a more intuitive approach (Geeraerts 2010: 55) and that there is no need to make use of quantitative or mixed method research paradigms to answer research questions.

More recent research signals a shift away from predominantly intuition-based research and shows a tendency to make use of quantitative research methods in Cognitive Linguistic research studies. Janda (2013) documents various studies, indicating a paradigm shift in Cognitive Linguistics as a whole. These include Falck and Gibbs (2013: 81), whose study focuses on the relationship between people’s conceptualisations related to their experiences of path and road and the metaphorical uses of path and road in discourse. They provide results from two quantitative research studies, where surveys are used in one study and a corpus analysis is done in another study; and Dąbrowska, Roland and Theakston (2013: 197), whose study investigates the acquisition of questions with long distance dependencies and attempts to determine the age at which these complex
constructions are acquired. They make use of three elicited imitation experiments with children at particular ages and with adults as a control group.

A research study that is situated in interdisciplinary research and which applies the mixed method approach is Neiglick (2008). This research study focuses on the study of cognition in order to examine interactions and behaviour, and other sociological aspects. This study is conducted in an attempt to test whether sociologically oriented Critical Discourse Analysis and cognitive linguistic theoretical frameworks complement one another in practical work. The mixed method approach is incorporated in this study by the use of descriptive statistics and corpus methods in an attempt to chart the frequency and collocates of the lexical item, outsourcing, in texts longitudinally, which essentially constitute the quantitative aspect of this study. Neiglick points out that the use of descriptive statistics and corpus methods act as a framework for discourse analysis, which reveals qualitative information, such as emerging discourses and use cases, which would otherwise be lost in a quantitative analysis alone. She administers a questionnaire with the intent to chart the development and semantic field of outsourcing cross-sectionally, which displays the emotional content and associations linked to outsourcing. Neiglick finds that Cognitive Linguistics adds scope to Critical Discourse Analysis and that the methods she employs complement one another adequately to add reliability to her research. She is convinced that these methods have the capacity to be developed into a research framework: "The mixed methods approach provided solid frames for carrying out this study, and may thus be recommended as a good, general helper in research formulation" (Neiglick 2008: 93).

Works produced in Cognitive Linguistics, as theoretically-driven as it is, are leaning toward adopting mixed approaches in an attempt to test theoretical phenomena in the field. This has given rise to works proposing possible mixed-method research frameworks that may have the potential to test metaphor in organisational management (Wittink 2011), and to test metaphor as a product of human thought by arguing for the convergence of evidence in the selection of research methodologies (Steen 2011). Furthermore, Steen (2011) acknowledges that mixed-method research, where qualitative analysis is necessary, is inevitably done, though under the veil of quantitative study. He refers to his work on studying
people’s verbal responses by asking them to relate their thoughts on particular concepts (Steen 1994) and writing up interpretations of metaphorical stimuli (Glucksberg and McGlone 1999). The use of qualitative and quantitative methods allows the researcher to analyse and codify verbal data. Cognitive linguistics is shifting its focus to attaining reliability and validity in research by testing theoretical models, which often require the versatility and credibility of mixed method approaches, to evaluate and affirm the legitimacy of its theoretical notions.

3.4. Research Design

This study made use of a cross-sectional research design, which De Vos et al. (2005: 135) define as “a design in which a single person, group or event is studied only once, subsequent to some agent or treatment presumed to cause change”. A major strength of the cross-sectional research design is that it allows for data to be collected at one point in time and can, thus, be considered more “practical and economic” (Dörnyei 2007: 88). Dörnyei (2007) further emphasises other strengths of cross-sectional designs that add value to a study of this nature. For one, participants are easier to recruit on a once-off basis as it does not require an investment of time to keep in contact with participants for a sustained period. He further states that the concerns of panel conditioning and attrition effects do not come into play when adopting a cross-sectional design and that cross-sectional data analysis is less arduous than longitudinal data analysis. Panel conditioning and attrition effects are concerns related to longitudinal research designs, in particular when panel surveys and panel data form part of the methodological design of the research study. Das, Toepoel and van Soest (2011: 32) explain that panel conditioning may take place when participant responses are influenced by previous testing in the same research study. Attrition bias may arise when participants drop out of a panel non-randomly: “when attrition is correlated with a variable of interest” (Das et al. 2011: 33). The selection of a cross-sectional design also minimises exposure to unpredictable and uncontrollable external events, which can be detrimental to a research study. Cross-sectional research is beneficial when attempting to describe variables and patterns of relationships as they exist within a particular time. It is also advantageous when one intends to draw comparisons between groups of people.
Due to the fact that the present research study set out to examine the influence of varying levels of exposure to technology on participants’ conceptualisations of the DMMB, a between-subjects design was employed. The level of exposure of each participant determined the group in which they were placed; i.e. either in the ‘high-level’ or in the ‘low-level’ exposure group. Comparisons were drawn amongst these two groups, despite the fact that the participants have been selected due to their relatively similar demographic features. Litosseliti (2010) highlights a concern regarding the use of a between-subjects design, namely that it is challenging to control for the factors that the researcher does not intend to study. For this reason, as mentioned above, the participants were selected with similar demographic features, as it was determined by the setting (discussed in the next sub-section), to ensure that the groups were relatively homogeneous with regard to other characteristics that have the capacity to influence the results of the study.

The setting of the research study, the sampling of participants and the data collection process are dealt with below.

3.5. The Research Setting

The study was conducted within a college. The college is situated in Pretoria (one of the capital cities in South Africa) and presents courses specifically related to the field of Information Technology. The specialisation courses include Advanced Business Systems, Mobile Device Development, CGI (Computerised Graphic Imagery) and Animation, Electric and Electronic Engineering and Embedded Coding. Each student is required to complete the MCSD (Microsoft Certified Software Developer) course in software development, which is a three-year course, before selecting an optional field of specialisation for another year. The college presents an internationally recognised SSETA (Services Sector Education and Training Authority) accredited diploma as a Microsoft partner. According to the college’s training director, the college allows students to apply their knowledge by introducing several Information Technology-related projects and further encourages students to work on independent projects as well.

The environment is intimate and houses approximately 120 students at any given time with about 15 staff members, including trainers, heads of departments and directors. Students are required to attend class from 9 to 4 o’clock every day and,
therefore, spend an average of 5 to 6 hours studying in class per day. Lectures are only provided for small courses, such as English and Project Management. In most courses, however, trainers work in classes of about 10 to 15 students as supervisors and mentors. Trainers are further required to prepare students proactively for each international exam of which 12 have to be completed before a qualification can be attained. Trainers generally train the students in English, as the courses and exams are presented solely in English. Nevertheless, trainers have the freedom to explain content to individual students in their home languages to ensure clarity of understanding.

This setting was selected due to the fact that its staff and students adhere to a routine schedule, which requires students to be exposed to technological phenomena for some part of the day. Therefore, the participants that had been selected from the college are all exposed to computers on a daily basis, which allows for the variable of exposure to be present to some degree in all the results. It is also clear that the selection of this institution provided participants who are similar in demographic nature to some extent, for example the students fall in the same age ranges, often share the same abilities and talents and have similar interests. The selection of this setting allowed the researcher to (as much as possible) control variables that may irrevocably taint the results.

3.6. The Research Sample

From the college setting, discussed above, a simple random selection of students was made and 28 participants participated in the research study. The motivations for selecting the setting, as explained above, allowed the researcher to make use of a convenience sample to select participants. Essentially, the selection of the setting provided sufficient homogeneity within the group of participants. A homogeneous sample is vital to an extent as it allows the researcher to focus more in-depth on a particular subgroup (Patton 2002). The data of 25 participants were used for the purposes of analysis (including 17 male participants and 8 female participants), as 3 participants did not participate in all the phases of the data collection process.

For the purposes of this study, purposive sampling was employed because of the fact that a particular setting was selected, which as mentioned above provided
sufficient homogeneity amongst participants within that setting. The sample is purposive due to the fact that participants from a particular Information Technology college were selected and a certain degree of homogeneity was sought after during the selection of the setting. Boeije (2010: 35) defines purposive sampling as “intentionally selected according to the needs of the study”. Nevertheless, a convenience sample of participants was selected from the relevant setting. In other words, the college was consciously selected due to the average amount of computer exposure that is required of students for study purposes on a daily basis during class time (the average amount of computer exposure is higher and more consistent, at approximately 6 hours per day, than can be expected at other tertiary educational institutions). Hence, the selection of the college as the setting for data collection constitutes purposive sampling. However, on the first day of data collection, 28 students were selected based on their availability and willingness to partake in the research study (any student from the college was allowed to participate in this research study). Hence, the selection of the participants is also a convenience sample. Patton (2002: 241) motivates the selection of a random sample in that “the credibility of systematic and randomly selected case examples is considerably greater than the personal, ad hoc selection of cases selected and reported after the fact – that is, after outcomes are known”. Patton (2002) classifies this sampling technique as a purposive sample. This type of purposive sample is a convenience sample, or what Patton (2002: 241) calls purposive random sampling.

The qualitative approach requires an in-depth, information-rich study and this can usually be attained by employing purposive sampling. However, the quantitative approach rather aims to test larger samples that allow for statistical representativeness that have the capacity to be generalised, which is attained through random sampling (Patton 2002). As this study employed the mixed-method approach, it is argued that this study should be able to handle data that can be both studied in great depth as well as be statistically analysed. To accommodate this demand, this sampling technique was applied, as it is versatile enough to cater to both the qualitative and quantitative aspects of this study.
3.7. The Data Collection Process

This study employed several methods of data collection, namely a questionnaire, a conceptual task (prototyping and word association), a behavioural task (controlled observation experiment) and an interview. The data collection process was divided into three phases that took place over the course of two to three days. This was done to ensure that no issues of priming could affect participants’ responses to each task. The data collection process took place in this regard:

- **DAY 1**: Administering questionnaires (qualitative)
- **DAY 1 or 2**: Completing conceptual tasks and follow-up (quantitative)
- **DAY 3**: Completing behavioural tasks (quantitative)
- **DAY 3**: Conducting interview (qualitative)

The materials and the test methods referred to in this sub-section are addressed in further detail in Chapters 4 and 5.

3.8. Conclusion

In conclusion, Chapter 3 serves as an overview of the research methodology that this study adopts. The importance of doing empirical research in Cognitive Linguistics is examined with the intent of motivating the empirical methods employed in this study. In this chapter, a case is made for data collection and analysis, and concomitant fieldwork that are important when conducting a study of this nature. This marks a shift in emphasis from traditional methods in ‘mainstream’ linguistics, with an added emphasis on more scientific methods, as Janda (2013) has documented.

The mixed method research paradigm is introduced with the aim to emphasise the benefits of merging quantitative with qualitative aspects to ensure that the two methods complement one another within the study. It is also determined that this study applied mixed methods in an explanatory sequential manner. A major strength of mixed method research, namely the potential for triangulation and/or convergence of findings, is identified and its relevance to this study is explicated. Interdisciplinary studies are presented with the objective of presenting the effective use of mixed method research within the field of Linguistics, in particular Cognitive
Linguistics. It is further shown that mixed method research and methodological frameworks are currently being formulated to accommodate the theoretical nature of Cognitive Linguistics. Additionally, the present study made use of a cross-sectional, between-subjects research design and had selected an Information Technology college as its setting to maintain some extent of homogeneity in its selection of participants. The sample was purposive, due to the selection of a particular setting, but was also a convenience or random sample. Lastly, the data collection process that occurred in three phases is briefly described. In the following chapters, the qualitative and quantitative aspects of this study are presented separately; Chapter 4 focuses on the qualitative aspect, whereas Chapter 5 focuses on the quantitative aspect.
Chapter 4

The Qualitative Aspect

4.1. Introduction

In this chapter, the qualitative aspect of the study is presented. Firstly, the need for adopting a qualitative approach to this study is explained. In light of this, the qualitative data collection methods (the questionnaire and interview) are described. The process of data collection, including the materials used, is explained, and the analytical framework related to the qualitative aspect of the study is addressed. Furthermore, the findings of the qualitative analysis are examined. Although the qualitative aspect of this study works in conjunction with the quantitative aspect, these aspects are dealt with separately (the quantitative aspect is addressed in Chapter 5).

4.2. The Need for Qualitative Research

This section identifies the need for qualitative research with regard to this particular study. Qualitative research allows for a deeper look into the way each of the participants conceptualises, and provides scope to explore each participant’s unique nuances. It is acknowledged that examining human interactions and cognition leaves the door open for a variety of confounding variables to enter a study, such as the present one, which is why it is necessary to conduct tasks in a controlled environment. Due to the fact that humans interact with the environment, it is assumed that their environments do influence their cognitive processes. Considering that this study investigates the extent to which certain variables, particularly exposure, affect participants’ conceptualisation regarding computer-related blends, it would not be sufficient to examine this phenomenon from a quantitative perspective alone. Marshall and Rossman (1999 in De Vos et al. 2005) explain that the qualitative approach is preferred when contributing variables still need to be identified and where it is necessary to study complexities and processes in greater depth.

Fortune and Reid (1999 in De Vos et al. 2005: 74) provide the following characteristics of the qualitative approach:
- A holistic understanding of the issue is attained through the employment of a flexible research problem and data collection methods;
- Methods, including participant observation and unstructured interviewing, are used to gain a deeper knowledge of how a participant views his social environment;
- Qualitative methods are flexible enough to be adjusted according to the information gained throughout the course of researching the issue in question. Consequently it is necessary for the researcher to constantly analyse and evaluate findings throughout the course of the study;
- It is assumed that a valid understanding can be reached by knowledge gained through first hand contact with the participant by one researcher.

In conjunction with these characteristics, Boeije (2010) defines the qualitative research enterprise as follows:

> The purpose of qualitative research is to describe and understand social phenomena in terms of the meaning people bring to them. The research questions studied through flexible methods enabling contact with the people involved to an extent that is necessary to grasp what is going on in the field. The methods produce rich, descriptive data that need to be interpreted through the identification and coding of themes and categories leading to findings that can contribute to theoretical knowledge and practical use.

(Boeije 2010: 11)

This definition displays key elements that are relevant to this study, namely (1) determining people’s perspectives of their social environments; (2) applying test methods that require participant activity of some sort; and (3) analysing data in terms of coding and categorising. In consideration of (1), Boeije (2010: 12-13) explains that “the focus of qualitative methods on ‘what it all means for the people involved’ is often a main attraction for qualitative researchers”. Hence, to determine which social variables influence the participants’ conceptualisation; the present study employed qualitative methods to explore the world of the participant from his perspective.

With regard to (2), the qualitative approach allows the researcher to employ methods of data collection that afford an opportunity to interact with the participant to the extent that the researcher can effectively construe the participant’s view of
the environment and that which affects him on a conceptual level. This study emphasised a need to examine the participant’s environment in an attempt to determine whether exposure to computer technology is a significant variable that influences perceptions of computer-related blends and/or whether there are other variables, from the individual’s personal circumstances, which play a role in moulding their conceptual processes in this regard.

Bearing in mind (3), a sound qualitative analysis is needed to allow for accurate findings to emerge. Boeije (2010: 14) motivates the importance of analysing qualitative data when stating that “researchers cannot present ‘raw data’ alone, such as a transcribed interview; instead they are required to re-interpret the information while preserving the participant’s meaning. It is while analysing the data that they reduce, select, interpret and decide what they will use to convey their message to the reader”. Data collected from the interviews were analysed by means of a thematic analysis. Two representative cases of participants were identified in the data set, as their data were representations of typical features of two exposure groups within the sample group (the grouping of participants is explained further in sub-section 4.4.2.). The present study’s thematic analysis and the representative cases are returned to later in this chapter.

4.3. Qualitative data collection methods and materials

This study employed several methods of data collection, namely administering questionnaires, conceptual tasks (word association), behavioural tasks (controlled observation) and interviews, which are mentioned in Chapter 3. The questionnaire and interview are addressed in sub-section 4.3.1 and sub-section 4.3.2 as these tools were used to gather the qualitative data.

4.3.1. Questionnaires

At the commencement of data collection, a questionnaire (see Appendix A) was administered, which included questions related to demographic information, such as age, gender, level of education and familial circumstances. De Vos et al. (2005: 166) explain that the purpose of questionnaires is “to obtain facts and opinions about a phenomenon from people who are informed on the particular issue”. In this case, some knowledge on participants’ demographic contexts was needed in
order to explore the possible effects of demographic variables on the way in which participants completed other tasks during the study. Essentially, the uniqueness of each individual’s environment cannot be understated, and it was the acknowledgement of this fact that led to the incorporation of questionnaires in the study.

The questionnaire was designed to provide the researcher with contextual knowledge regarding each participant mainly to ensure that social factors deriving from the participants’ personal backgrounds were known and accounted for during data analysis.

Participants were required to complete the questionnaire on their own, immediately upon receiving the questionnaire. The researcher remained present to address questions that might have arisen during completion of the questionnaire. De Vos et al. (2005: 268) outline the researcher’s role in this case: “The researcher thus largely remains in the background and can at most encourage the respondent with a few words to continue with his contribution, or lead him back to the subject”.

The questionnaire was also designed to be completed swiftly, and as a result was approximately two pages long, so that “respondents can communicate as much information as possible in the briefest possible time” (De Vos et al. 2005: 170). Open-ended questions, such as briefly explain your familial circumstances, were formulated to be simple, articulate and specific in order to provide participants with clear directions on how to answer the question. Additional instructions were provided in cases where participants were required to answer in a different manner, such as tick the relevant box or explain briefly.

4.3.2. Interviews

At the end of the data collection process, each participant was interviewed. Interviews were conducted with the purpose of identifying and exploring the variables that could have affected the findings of the controlled observation experiment (behaviour) and the word association task (conceptualisation). Furthermore, the researcher wanted to establish the reasons for the relevance of the variables that emerged. The interviews provided a glance into the participants’
everyday environment and their perspectives regarding this environment. Patton (2002: 4) explains that “interviews yield direct quotations from people about their experiences, opinions, feelings, and knowledge”.

For the purposes of this study, a semi-structured one-to-one interview was conducted with participants. The semi-structured interview technique provides flexibility to both the researcher and the participant, but still ensures that certain predetermined topics are covered: “The researcher is able to follow up particular interesting avenues that emerge in the interview, and the participant is able to give a fuller picture” (De Vos et al. 2005: 296). De Vos et al. (2005) explain that in a semi-structured interview the researcher is equipped with a set of predetermined questions on an interview schedule, which acts as a guide to the interview. In the present study, the interview not only addressed matters related to or affecting the topic in question, but also acted as a means of following up on the other data collection methods, particularly the behavioural task, where the participants were given the opportunity to provide their opinions on the motivation for selecting either the computer or the physical equivalent of the office tools on the computer (such as the physical documents, dustbin, and so forth) in completing the tasks in the controlled observation experiment.

In preparation for the interviews, an interview schedule was designed (see Appendix B). De Vos et al. (2005: 296) state that “producing a schedule beforehand forces the researcher to think explicitly about what he hopes the interview might cover. It forces the researcher to think of difficulties that might be encountered [...]”. Questions were developed to cover specific areas related to the topic of interest, which are participants’ conceptualisation of the computer desktop. Focal areas and an example of the questions asked under each include:

- Time of immediate exposure
  
  *(Approximately how many hours do you spend working on a computer every day?)*

- Daily routine
  
  *(When you create a reminder, how do you do this?)*

- Preference/skills
  
  *(Have you had any formal computer training of any sort and what was it?)*
Early/childhood exposure

(How old were you when you started using the computer?)

Technology (and the participant’s perception thereof)

(What, in your mind, is technology?)

Lack of exposure

(Was there a time when you had no exposure to technology? Please explain.)

Interests

(How did you develop an interest in IT?)

Parental influence

(Were you encouraged to enter the IT field, if so by whom?)

Current exposure to technology and communication

(What is your preferred means of communication and why?)

Opinion (related to experience of study)

(Why do you think you tend to work more comfortably on the computer or with paperwork?)

Each interview was approximately 20 to 30 minutes long and was voice-recorded for the purposes of transcription, upon which the thematic analysis was based. The present study’s methods of analysis of the qualitative data are discussed in the next section.

4.4. Qualitative Analytical Framework

The themes, patterns, understandings, and insights that emerge from fieldwork and subsequent analysis are the fruit of qualitative inquiry.

(Patton 2002: 5)

In light of Patton’s explanation, qualitative analysis is considered to be inductive\(^1\) as it involves the discovery of patterns, themes and categories in data (Patton 2002: 454). In this case, findings reveal themselves through the researcher’s interactions with the data. This type of analysis typically occurs in the early stages of analysis where possible categories, patterns or themes are searched for. In this

\(^1\) An inductive approach is explained in Section 2 of Chapter 3. In the sense of qualitative data analysis in the present study, it refers to the researcher’s observation of the data in order to find particular patterns (or themes), which may relate in some way to the particular topic of study. Refer to Patton (2002: 454) who addresses the inductive nature of aspects of qualitative analysis.
study, the initial approach to analysis of the interviews was inductive. Based on the findings that emerged from the interview analysis, the questionnaires were consulted in cases where findings needed further substantiation.

Inevitably, data that deviated from the patterns established by the qualitative data collection tools emerged. This was accounted for by identifying the deviations and consulting the questionnaires. In other words, in cases where arbitrary interview responses did not relate to the general, topic-related patterns (themes) found in the rest of the data set, the questionnaires were consulted in order to motivate the reason for the arbitrariness of the interview data. The questionnaire’s demographic content has the potential to indicate unique situations particular to a participant that may affect the outcome of the interview. Therefore, the interview and questionnaire were designed to work in conjunction with one another, to explore individual cases in greater depth.

Due to the fact that the questionnaires play the role of identifying and motivating unique individual cases and attributing reasons to irregular findings, they were not included in the data analysis process. However, the relevant participants’ responses to the questionnaires were considered in the representative cases (i.e. participants representative of the two exposure groups) mainly in order to demonstrate the homogeneity of the sample group.

The interview data was analysed through a thematic analysis. Boyatzis (1998: 7 in Patton 2002: 452) outlines the inherent function of thematic analysis:

> The ability to use thematic analysis appears to involve a number of underlying abilities, or competencies. One competency can be called *pattern recognition*. It is the ability to see patterns in seemingly random information.

Thematic analysis is defined as a tool to analyse texts and revolves around deciphering large amounts of qualitative data in an effort to find core consistencies and meanings, which are known as patterns and themes (Patton 2002). In this study, interviews were analysed with the intent to find themes within each participant’s responses. Each response was categorised according to an inclusive theme (a theme that contains several topic-related questions and answers), such as *Interests*. Responses that were associated with this theme were categorised
accordingly, such as “I was never really interested in computers before”. This response would be considered an interest-based motivation, and would therefore be added to the *Interests* theme. Once this was done, the interview data was revisited in an attempt to determine whether certain themes appear more consistently among all participants’ data and to classify those as the main contributing variables that could potentially influence the conceptualisations and interactions in the word association (conceptual) and controlled behavioural tasks. The interview content was analysed with particular emphasis on *Exposure* as a theme in an attempt to confirm whether exposure is in fact a major contributing variable to the outcome of the conceptual and behavioural tasks.

After the thematic analysis, further explorations of two participants’ interview findings were done. The participants were selected to be representative cases of two groups whose members share particular themes and related responses to these themes, and whose behaviour and conceptualisation (which are addressed in Chapter 5) relate with one another and are influenced similarly by the themes (emergent in the interview data). The groups were defined and distinguished from one another based on the appearance of similar themes in its members’ responses regarding these themes, but in particular the amount of computer exposure determines in which group a member was placed. Participants were placed in either the high-exposure group (participants have been exposed to the computer on a regular and prolonged basis) or the low-exposure group (participants have not been exposed to the computer for a prolonged period of time).

The exploration of two representative cases from the groups played a significant role in this case due to this study’s extensive focus on external factors which could influence the phenomenon in question. Furthermore, the analysis of two representative cases made it possible to verify and motivate the external factors which are closely associated with the particular topic of study, and which dominate other factors which do not have a great bearing on the topic of study.

In the following section, the thematic analysis is dealt with in further detail.
4.4.1. Qualitative Thematic Analysis

Upon analysis of the interview transcripts, several themes recurred in the interview data. The themes that were dominant are the following:

- Current Exposure
- Early Home Exposure
- Early School Exposure and Secondary School Exposure
- Lack of Exposure
- Early Exposure (Access)
- Parental Support
- Interests
- Skills/abilities at school level
- Internet and other technological exposure

Supplementary themes were identified in the thematic analysis of the interview data. These include:

- Ease of implementation
- Obligation
- Technological training
- Goals and objectives
- Communication
- Routine behaviour

4.4.1.1. Current Exposure

Current exposure considers the participants’ daily use of the computer, as opposed to commensurable tasks being done on paper, or on a physical desktop, etc. ‘Exposure’ to computers is understood as not restricted to official tasks, but include the use of computers for recreational purposes as well.

This theme was considered in terms of high exposure to computers, which is 6 or more hours a day, and low exposure, which is 5 or less hours a day. The participants were divided into two groups according to these hours of computer
exposure because the circumstances within the setting require them to work on
the computer a minimum of 6 hours per day (as mentioned in Chapter 3). Participants who spend more than 6 hours per day working on the computer maintain a level of exposure that is higher than what is required of them by the college in question. Participants who expose themselves to the computer for 5 or less hours per day maintain a level of exposure that is below the standard requirement of their current environment (the setting and its requirements for the students are discussed in Chapter 3). In the case of this study, none of the participants’ exposure was between 5 and 6 hours per day, possibly due to the size of the sample. If a significant number of participants’ exposure was between 5 and 6 hours, it would have been necessary to form a mid-level-exposure group in order to avoid excluding possibly relevant data.

Due to the participants’ current environment and field of study, a high level of exposure can be expected. Therefore, most participants had a high level of current exposure (those being Participants 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 23 and 25). Participant 1 explained that he uses the computer approximately 9 to 10 hours per day. He added that he uses the computer to do most of his daily tasks: “Everything – schoolwork, entertainment, everything”. He mentioned that he uses pen and paper “just to sign in and out every day” (to sign the attendance register at college every day). Only four participants had a low level of current exposure (Participants 17, 18, 22 and 24). Due to the predominantly high level of current exposure, which is due to the demands of their IT studies, this theme was not considered for further quantitative analysis, as it was expected that current exposure is relatively similar across participants and is thus unlikely to significantly affect the outcome of this study. It is relevant to consider that many of the participants who maintained a high level of current exposure do not only make use of the computer for study purposes, but also for other activities, such as gaming or entertainment (movies, music, web surfing, and so forth); this is shown to be particularly relevant in the representative cases discussed in the next section. Participant 1 continued to say that: “I’m in IT; every time I do something it’s on the computer”. As can be expected, there was some variance in the way the participants described their current interaction with the computer. Participant 22 explained: “Short things I’ll rather do on paper”, while
Participant 24 added: “I’m more comfortable with paper and pen”. Even so, majority of the participants (even those with a low level of current exposure) felt more comfortable executing daily tasks on computer rather than on paper. The participants in the low-exposure group were not aware that their computer exposure was low in comparison to others, perhaps partly because they consider themselves comfortable on the computer. Participant 24 explained that she prefers to work on the computer because “the computer is much more fast [sic] and I’m used to typing more than writing”. Participant 17 added that “it’s more convenient”.

4.4.1.2. Early Home Exposure

This theme considers the age at which the participants were initially exposed to the computer, specifically within their home environments. This theme was examined in phases, namely the infant/toddler (0-5 years), the primary (6-12 years) and the secondary (13-17 years) phases. In this case, it was considered whether the participants who were exposed to the computer at a younger age also deem themselves to be more computer-oriented. Only Participants 7 and 20 were exposed to computer technology for the first time in the infant/toddler phase. When asked to share his initial age of computer exposure, Participant 20 stated that technology in various forms has always been a part of his life: “...before I could even start to remember”. He also believes himself to be very technology-orientated, and added that he would always choose to work on the computer, rather than paper. He said that “it’s second nature”. The quantitative analysis of Participant 20’s behavioural data showed that he indeed completed most tasks on the computer (the quantitative analysis is addressed in Chapter 5).

Several participants were exposed to the computer during the primary phase, (Participants 1, 4, 12, 13, 14, 17, 18, 19, 22, 23, 24 and 25). Participant 4 was initially exposed to the computer at age 10. He selected the computer to complete his tasks as he considers it to be the most convenient medium. He explained: “I’ve grown up with it and I can do stuff faster on the computer and it’s neater”.

Participants 2, 3, 5, 6, 8, 9, 10, 11, 15, 16 and 21 were exposed to the computer for the first time during the secondary phase. In some cases, participants still considered the age of their initial home exposure to be relatively young.
Participant 9 was initially exposed to the computer at age 14. She deemed this to be a rather young age of exposure, explaining that working on the computer “it [working on the computer] comes naturally to me. I’ve been exposed to the computer almost all my life”. Participants who responded similarly to Participant 9 all said that they preferred using computers rather than paper for completion of their daily tasks. Nevertheless, some participants did not select the computer as their medium of choice, when asked which medium they prefer to use in the interview. Participant 10 was initially exposed to the computer at the age of 16, explaining that, as a child, she did not foster an interest in computer-related phenomena. She also prefers to work on paper: “I like working with paper more than being on the computer. I think I’m faster with paper than with typing”. Participant 10 selected to complete most of theBehavioural tasks in the present study on paper. Other participants attributed their age of initial exposure to unique situations, such as financial constraints and the rural environment in which they grew up. Participant 3 added that he was not exposed at a young age due to such constraints: “We didn’t have money at the time and it was not a necessity”. From this last response, it is clear that initial home exposure is informed by a variety of factors, including socio-economic constraints, and is not simply a matter of choice or preference.

4.4.1.3. Early School Exposure and Secondary School Exposure

These themes are indicative of the amount of exposure that participants received during their schooling. These themes are considered to be related to the above theme, as the age of initial home exposure consequently motivates the amount of exposure that the participants had during their schooling years. In other words, if a participant has been exposed to the computer at home from an early age, it can be inferred that they have established their interest, talent or ability in working with computers at a young age. Their early computer exposure therefore most likely contributes to their choice to engage in computer-related subjects at secondary school (when they get the opportunity to select the subjects that they want to take in secondary school). To ascertain whether participants were presented with computer-related subjects at school, whether they selected these subjects and performed well in them, these themes were explored further.
Early School Exposure represents the amount of exposure that the participants’ primary schools offered them. As a result of the short time span of primary school periods, 2 and more hours per week was classified as a high level of exposure, while 1 and less hour per week was classified as a low level of exposure. Participants 6, 9, 12, 13, 14, 15, 16, 18, 20 and 24 maintained a high level of early school exposure. In this case, primary schools provided periods where computer interaction was compulsory. Often these classes were informal (no formal teaching and learning took place, no curriculum or programme was followed; students were required to interact with the computer in any manner they saw fit) and were not related to a particular subject. Participant 14 explained that their school provided supervised computer classes, but it was not compulsory to complete any school work on the computer.

Participants 1, 2, 3, 4, 5, 7, 8, 10, 11, 17, 19, 21, 22, 23 and 25 form part of the low level exposure group. In most cases, these participants’ primary schools did not provide computer-related classes at all. In Participant 3’s case, supervised reading classes were presented on the computer for 30 minutes per week. The learners did not interact a great deal with the computer, but simply read texts on the computer.

Secondary School Exposure relates to the amount of computer exposure that the participants had in their secondary schools. This theme often correlates with the participants’ interest in computers, as many of them selected computer-related subjects when they were given the opportunity. A high-exposure group was identified, ranging from 3 and more hours per week, while the low level group was classified, ranging from 2 and less hours per week. Even though, the distinction between the high level group and the low level group is quite small, the majority of participants were exposed either very much or very little to the computer at school. Thus, there tends to be two poles where the average hours of exposure per week for participants in the high level group are between 7 and 10 hours (Participants 13 and 18 were exposed 10 hours per week), where 6 participants fall into this range, and 2 were exposed between 4 and 5 hours per week. In the case of the low level exposure group, most of the participants were either not exposed to the computer at all (like Participants 14, 15, 19 and 22) in their secondary schools, or
were exposed at most for 1.5 hours per week. Nine participants can be classified into this range. However, there are some borderline cases in both groups (2 participants in the high level group with 3 hours of exposure per week, and 6 participants in the low level group with 2 hours per week). In order to group these participants, other themes in their data were evaluated to identify whether they share the closest similarity with participants in the high level or low level groups, such as considering their early school exposure and early home exposure in order to make the most accurate distinction.

The participants who maintained a high level of secondary school exposure are Participants 2, 6, 7, 8, 12, 13, 18, 20, 21 and 25. Participants in the low level exposure group are 1, 3, 4, 5, 9, 10, 11, 14, 15, 16, 17, 19, 22, 23 and 24. Some participants in the low level exposure group also took computer subjects at school, but were afforded less time to interact with the computer at their schools. Although Participant 14 was very keen to take a computer subject at his school, he explained that “there were not enough IT students, so we couldn’t do the subject.” Other participants attributed their low level of exposure to reasons such as inadequate teachers, or the unchallenging nature of the content, which resulted in boredom and lack of enthusiasm for the subject. Participant 4 explained: “I didn’t like CAT [Computer Applications Technologies] because it’s only about how to use [Microsoft] Word and so on”. Participant 5 added that her dislike of the teacher influenced her decision to drop the subject: “I left it because most of us didn’t like the teacher.”

4.4.1.4. Lack of Exposure

This theme is defined as a time when participants had minimal exposure to the computer and other related technology. It should be noted that the responses were very subjective, as it relied on the participants’ perceptions of what they consider technology to be. Some maintained that even electrical appliances, for example, can be considered a form of technology. In these cases, very few participants could remember a time where they were not exposed to some form of technology: Participants 1, 2, 4, 7, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 25. Participant 20 considers technology to include all sorts of appliances, such as kettles, toasters and televisions. Thus, he said that he has never
experienced a lack of technological exposure: “...before I could even start to remember”. Participant 21 added that they always had television at home. He sees technology as “everything you use now; TVs, even a calculator”. Participants 3, 5, 6, 8, 9, 10 and 15 remember a time where they lacked exposure to technology. Participant 6 said that she grew up in a rural environment until the age of 11: “We were staying in the rural areas. There was [sic] only candles there, no TV.” In some cases, participants attributed their lack of exposure to a lack of interest and/or awareness, such as Participant 8 who preferred to play outside instead of watch television or interact with the computer.

4.4.1.5. Early Exposure (Access)

This theme relates to the amount of access that the participant had to the computer during his childhood/youth. Participant responses were classified according to the categories, No Access to Highly Controlled Access and Controlled Access to Unlimited Access. Participants, who indicated that they had a complete lack of access to the computer, or very controlled access (3 or less hours per day), were allocated to the first category, whereas participants, who indicated that their exposure was controlled but very flexible (3 and more hours per day) or unlimited, were allocated to the second category. Participants in the No Access to Controlled Access group were: 2, 4, 5, 6, 7, 10, 15, 16, 18, 19, 21, 22 and 25. The participants attributed various reasons to the level of access that they maintained. Some participants responded that their parents did not agree with excessive use of the computer, while others simply did not possess a computer. Participant 5 explained that she had limited access to the computer (1.5 hours per day), as her parents required her and her siblings to share the computer: “So that we all could get a turn, because I had to share with my brother and sister”. Participant 25 explicated the influence that her parents had on her access to the computer: “They always felt computers were bad. They preferred us reading [physical books and the like]. It helped me; it made me realise the value of books and learning”.

Participants in the Controlled Access to Unlimited Access group include: 1, 3, 8, 9, 11, 12, 13, 14, 17, 20, 23 and 24. Participant 1 said that his computer access was unlimited. When asked how often he was allowed to use the computer, he said:
“As much as I wanted to”. Participant 13 added that his computer access was controlled by his parents, but at a flexible 5 hours per day. He mentioned that he would prefer to use the computer most of the time, especially for recreational purposes, so his parents had to limit his computer access, “so I can do my homework before going on the computer”.

4.4.1.6. Parental Support

This refers to the role that the parents played in supporting the participants in maintaining an IT-related focus and/or interest and the amount of support that was provided to the participants when they selected IT as their field of study at tertiary level. In this regard, three groups were identified. The first group consisted of participants whose parents were unsupportive of their IT interests (Participants 3, 6, 8, 13, 16, 18, 20 and 21). The second group consisted of participants whose parents were initially unsupportive and developed support for their chosen field of study, and also participants, whose parents were initially supportive, but did not support the participants when they chose to study IT, mainly as the parents had another field of study in mind for the participants, or felt that there are few opportunities in the IT industry (Participants 1, 2, 4, 5, 7, 14, 15, 17, 19, 24 and 25). The last group included participants whose parents were always fully supportive of their IT interests (Participants 9, 10, 11, 12, 22 and 23).

Some participants provided several reasons for their parents’ level of support, while other participants were not sure why their parents felt a certain way regarding computers. Participant 13 felt that his parents’ concern for his schoolwork motivated their reason to be unsupportive of his computer usage: “They were worried that I was spending too much time on my computer and it would affect my studies”. Participant 5 added that her parents were initially unsupportive: “They said, ‘Go play outside!’ Most people are old-fashioned that way”. However, her parents’ support grew when the time came to select a field of tertiary study, as they realised that there are many career options available. On the contrary, Participant 10 said that her parents were very supportive, and motivated her to learn basic computer literacy skills. She added that her parents were “encouraging [her] just to learn how to type for high school”. When she decided to continue her IT studies, she cited her father as her supporter.
4.4.1.7. Interests

This theme considers the participants’ level of interest in computer-related phenomena. Participant responses were examined in light of categories, including Obligation (the participant feels that some amount of interest is compulsory, but they do not feel particularly attracted to computers and IT); a Mild Interest (the participant is interested in some aspects of the field, but not the field in its entirety); and a High Interest (the participant is fully engrossed in the field and finds all aspects interesting). Only two participants fostered an interest due to obligation, namely Participants 10 and 19. Participant 19 is enrolled for the CGI and Animation course. He felt that the computer is simply another medium to practise his art on. He stated that if he needs to use the computer to focus on his art, he will do so: “I want to develop my art skills” and “For me it’s an effort to use the computer”. Participants 1, 11, 12, 15 and 21 maintain a mild interest in the field. Participant 11 motivated that she does feel drawn to the field, but only to some aspects of it. When asked whether she is interested in computers and IT, she responded: “Maybe less because there is [sic] other gadgets that I would be into, but not as much as I think I should be”. Most participants are highly interested in the field (Participants 2, 3, 4, 5, 6, 7, 8, 9, 13, 14, 16, 17, 18, 20, 22, 23, 24 and 25), which can be expected due to the fact that they are immersed in an IT-related environment. Participant 4 discussed his keen interest in the field of CGI and Animation: “I like visuals of games and everything, and how stuff explodes. I always wondered how to do it”.

4.4.1.8. Skills/abilities at school level

This theme represents the participants’ level of competence when executing tasks on the computer. In this regard, the results that participants received at school for computer-related subjects were considered. Based on these results, participants were categorised into groups: Subject not taken (Participants 1, 14, 15, 16, 19, 22 and 25); Mark: D and lower (Participant 21); Mark: C (Participants 3, 4, 9, 10 and 11); and Mark: A to B (Participants 2, 5, 6, 7, 8, 12, 13, 17, 18, 20, 23 and 24). As can be expected, most participants achieved high marks for computer-related subjects at school and do consider themselves to be skilled at interacting with the computer, more so than with paper. Participant 20, who is highly proficient on the
computer, added that he feels more comfortable with the computer: “I’ve been working on the PC for the past four years constantly. It’s second nature.” Although Participant 10 attained a C at school for this subject, she explained that “it was a bit of a hassle to get my mind into technology”. Thus, Participant 10 does not share the same level of ease and comfort with the computer than Participant 20. Several participants did not have computer-related subjects available to them at their schools, but they wanted to take a computer-related subject at school. Participant 14 mentioned that there was not enough interest in taking the subject among his fellow students, so the subject was cancelled: “There was [sic] not enough IT students, so we couldn’t do the subject”.

4.4.1.9. Internet and other technological exposure

This theme considers the amount of time that the participants spend on the internet and other technological phenomena for reasons like entertainment, research and social networking. Participants, who spent 5 or more hours per day interacting with other forms of technology, include Participants 1, 4, 6, 8, 12, 13, 14, 15, 16, 17 and 24 (high level internet exposure). These participants often make use of the internet for study and research purposes. Participant 12 added that she uses the internet to research her studies, and the amount of internet use per day is motivated by the level of difficulty of her study content: “According to how much I struggle in the day or how much work I have in the day, I will use it [the internet] more.” She also said that she uses it mainly for research purposes. For some, a motivation to use the internet is social networking. Participant 13 explained that he is very active on social networks and uses both his computer and cell phone to access the internet, as he is a member of 5 social networking sites. When asked how often he makes use of them, he said “whenever I’m sitting still”. Participant 24 said that she spends at least 5 hours per day on social networks “connecting with friends”. Those who exposed themselves for 2 to 5 hours per day are Participants 3, 5, 7, 10, 11, 18, 20, 21, 22, 23 and 25 (mid-level internet exposure). Participant 3’s internet activities depended on his areas of interest: “I don’t go out and look at all the new technologies that much. I do check them as much as I could”. Thus, he prefers to check new technologies on the internet, rather than physically visiting shops to check it. Participant 20 explained
that he cannot always afford to have internet access, but if he gets the opportunity to access the internet, he uses it: “I’ll use it as much as I can”. Participants 2, 9 and 19 spent less than two hours per day exposed to other forms of technology (low-level internet exposure). Participant 2 used the internet only to complete study-related projects, when asked if he uses the internet regularly, he said: “Not that much. We use it just for projects; mostly an hour or two a day”. Participant 19 explained that he is not very interested in making use of social networks: “I have profiles on social networks, but I never really use social networks [...] I go on Facebook once a month or so.” The low internet exposure group seems to make use of the internet mainly for study purposes, which is encouraged by the college (further research in the field of study is recommended).

The themes addressed above are the most prevalent themes that emerged from the interview data. From the thematic analysis, it is evident that these themes are interrelated. For example, a theme like Early Home Exposure can correlate with the theme Early Exposure (Access). If a participant was exposed to the computer in the secondary phase (which is considered a rather late age of exposure), it is also the case that the participant maintained no access to controlled access at an early age (the participant did not have a great deal of access to the computer at a younger age). Similarly, Parental Support can have a bearing on Early Exposure (Access). If parents were generally unsupportive of the participants’ regular exposure to the computer, it can have an effect on the amount of access that the participant was allowed to the computer. Thus, access could then be more limited. It also seemed likely to the researcher that the above themes are either types of exposure or have the capacity to affect exposure. Therefore, these variables were further examined by means of statistical testing (see Chapter 5).

4.4.1.10. Supplementary Themes

Besides the themes above, other salient themes were identified. However, these themes were not delved into in detail, as they did not feature in all of the participants’ data. Thus, the participants’ data did not provide enough information on these themes to establish clear patterns. For the sake of reference, these themes included:
- **Ease of implementation:** The medium that the participants feel most comfortable to interact with. Participants 1, 2, 3, 4, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 24 and 25 selected the computer, while Participants 5, 10, 11, 19 and 21 selected paper. Participant 8 explained why he is most comfortable using the computer instead of paper: “As you use the computer more, you get faster on it. If it’s something I’m used to, I’ll use it”. On the other hand, Participant 10 feels more comfortable using paper: “I like working on paper more than being on the computer. I think I’m faster with paper than with typing”.

- **Obligation:** The medium that the participant is required to use most regularly at present and at school. All the participants felt obligated to use the computer at present, while most participants felt obligated to use the computer at their previous schools. Participant 20 explained that teachers preferred it if students typed their homework: “They preferred PC because it was neater”. Only Participants 1, 15, 16, 19 and 22 stated that it was not a requirement at school level.

- **Technological training:** Participants’ educational background specifically related to IT. In this case, all the participants had some form of previous training, including at school level or short courses. Participant 23 attended a short course in computer literacy as a child: “They taught me from Grade 2 how to switch on a computer and how to use it – twice a week”.

- **Goals and objectives:** The participants’ goals regarding future education and/or employment in terms of the industry or the type of career that they would like to enter. Participants 3, 4, 5, 8, 9, 12, 14, 17, 19, 20, 21, 23 and 25 all intend to enter a corporate career related to their field of study. Participant 8 said: “I want to go overseas and join big companies”. Participants 1, 10, 16 and 24 consider themselves to be creative and want to enter a career in design. Several participants hope to become entrepreneurs in IT fields: 2, 7, 11, 13, 15, 18 and 22. Participant 13 explained that he wants to join his family’s business and to “start a new [computerised business] system with my family”. Participant 6 wants to enter IT education, while Participant 24 is interested in entering the media industry. Participant 6 said: “I’d like to get children from underprivileged homes to get into the [IT] field”. Participant 24 explained that she wants to
enter a design-related career: “I’m more creative. I’m not very much analytical or functional”.

- Communication: This theme considered the participants’ preferred method of communication, namely direct (face-to-face verbal correspondence) and indirect (emails, texts, telephone calls). Participants 3, 4, 6, 7, 8, 13, 16, 19 and 23 preferred direct communication, while Participants 1, 2, 5, 9, 10, 11, 12, 14, 15, 17, 18, 20, 21, 22, 24 and 25 selected indirect communication. Participant 3 added: “I can’t talk on the phone. It’s so impersonal”. Participant 25 prefers indirect communication, particularly email: “I don’t do well with conversations. I don’t like making small talk. I like getting to the point”.

- Routine behaviour: The manner of behaviour in terms of completing daily tasks, which comes most naturally to the participants, according to their own perceptions. Participants 1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 15, 18, 20, 23 and 25 considered themselves to interact more naturally with the virtual environment. Participant 9 explained: “It [working on the computer] comes naturally to me. I’ve been exposed to computers almost all my life”. Participants 2, 7, 10, 14, 16, 17, 19, 21, 22 and 24 interact more naturally with the physical environment (executing tasks on paper, for example). Participant 7 is used to interact with the physical environment: “For me it is faster and quicker. I prefer to work with proper documents. If I use paper, I work. I get it done right away”.

Table 4.1 below provides a basic outline/summary of the key themes that emerged from the analysis of the interview data. Each theme is briefly defined and examples of participants and their related responses are presented in the table:
<table>
<thead>
<tr>
<th>Themes</th>
<th>Definition</th>
<th>Example</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Exposure</td>
<td>Hours of computer and/or paperwork exposure per day and reason for use at present.</td>
<td>Participant 14: 14 Hours per day for studying, entertainment and gaming purposes.</td>
<td>“I do everything on the computer!”</td>
</tr>
<tr>
<td>Early Home Exposure</td>
<td>The initial age that the participant was introduced to and started interacting with the computer in their home environment.</td>
<td>Participant 3: Exposure occurred in the secondary phase (at age 14) as his family did not own a computer.</td>
<td>“We didn’t have money at the time and it was not a necessity.”</td>
</tr>
<tr>
<td>Early School Exposure</td>
<td>The amount of exposure the participant had at primary school level, specifically whether their primary school exposed them to computers, possibly as a school subject.</td>
<td>Participant 9: Primary school had a computer subject for approximately 1.5 hours per week.</td>
<td>“It was compulsory. It wasn’t an everyday subject, I would say two to three days a week.”</td>
</tr>
<tr>
<td>Secondary School Exposure</td>
<td>The amount of exposure the participant had at secondary school level, specifically whether their secondary school exposed them to computers, possibly as a school subject.</td>
<td>Participant 14: Secondary school exposure was lacking.</td>
<td>“For our group there was [sic] not enough IT students, so we couldn’t do the subject.”</td>
</tr>
<tr>
<td>Lack of Exposure</td>
<td>A time during childhood/youth where participants experienced no exposure to technology for whatever reason.</td>
<td>Participant 6: Was not exposed to technology until age 11 due to the environment in which she lived.</td>
<td>“We were staying in the rural areas. There was [sic] only candles there, no TV.”</td>
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<tr>
<td>Category</td>
<td>Description</td>
<td>Example</td>
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<tr>
<td>Early Exposure (Access)</td>
<td>The participant's access to computers during childhood and youth, specifically whether they had no access, controlled access or unlimited access due to a particular reason.</td>
<td>Participant 13: Access was controlled by his parents as he was allowed to use the computer after 5 o’clock and before 10 o’clock every day.</td>
<td></td>
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<tr>
<td>Parental Support</td>
<td>The level of support that the participant feels their parents provided for them to develop and/or nurture an interest in technology and the support that they had when selecting IT as a field of study.</td>
<td>Participant 18: Considers his parents to be unsupportive in selecting IT as an interest and a field of study.</td>
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</tr>
<tr>
<td>Interests</td>
<td>The level of interest that the participant possesses for technology-related phenomena.</td>
<td>Participant 12: Maintains a mild interest in technology due to her regular interaction with computers.</td>
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</tr>
<tr>
<td>Skills/abilities</td>
<td>Whether the participant considers themselves to be competent and proficient in executing tasks on the computer particularly at secondary school level.</td>
<td>Participant 4: Took CAT at secondary school level and attained a C for the subject.</td>
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</tr>
<tr>
<td>Internet and other technological exposure</td>
<td>The amount of time that the participant interacts with the internet and other types of technology, besides the computer.</td>
<td>Participant 17: Makes daily use of the internet and considers himself to be exposed to technology 90% of the day.</td>
<td></td>
</tr>
</tbody>
</table>

“... because it’s always around.”
<table>
<thead>
<tr>
<th>Ease of implementation</th>
<th>An individual account of the medium that the participant feels most comfortable using for daily tasks and the reason for this.</th>
<th>Participant 19: Selects paper as the medium that he feels most at ease with.</th>
<th>“Papers get lost, but it’s easier to do things on paper.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligation</td>
<td>The medium that the participant is required to use most regularly at present, specifically whether they must make use of the computer or paperwork or both to complete majority of their daily tasks.</td>
<td>Participant 10: Is required to use both the computer and paperwork on a daily basis.</td>
<td>“On the computer I have manuals that I study from and on paper I take notes to summarise.”</td>
</tr>
<tr>
<td>Technological Training</td>
<td>The IT educational background that the participant possesses and whether they took part to any extent in IT-related courses.</td>
<td>Participant 23: A short computer literacy course.</td>
<td>“They taught me from Grade 2 how to switch on a computer and how to use it - twice a week.”</td>
</tr>
<tr>
<td>Goals and Objectives</td>
<td>The participant’s aims in terms of further education and employment, and whether they intend to enter the technology industry.</td>
<td>Participant 15: Maintains a financial focus and plans to enter the IT industry for financial gain.</td>
<td>“I just want to have a lot of money.”</td>
</tr>
<tr>
<td>Communication</td>
<td>The participant’s preferred means of communication and whether they prefer using technology or face-to-face methods.</td>
<td>Participant 25: Prefers email or her phone to communicate to focus on the main message that she wants to convey.</td>
<td>“I don’t do well with conversations. I don’t like making small talk. I like getting to the point.”</td>
</tr>
</tbody>
</table>
Routine/Habitual Behaviour

The manner of behaviour which is most natural to the participant due to regular and prolonged exposure.

Participant 9: Feels that working on the computer is a force of habit.

“It comes natural to me. I’ve been exposed to computers all my life.”

From the thematic analysis above, the participant responses could be grouped into two categories: a ‘low exposure’ versus a ‘high exposure’ group. This distinction was drawn based on the themes, discussed above. Each theme was examined in light of each participant’s interview data to determine whether the theme related to high computer exposure (i.e. the participant maintains a high-level of current exposure; initial home exposure was introduced at an early age; the participant had computer exposure at primary and secondary school level; the participant had unrestricted access to the computer; their parents were supportive of their IT interest; etc.) or low computer exposure (i.e. the participant maintains a low-level of current exposure; initial home exposure was introduced at a later age; the participant had no or little computer exposure at primary and secondary school level; the participant was restricted in terms of access to the computer; their parents did not support their IT interest; etc.). As mentioned above, it appears that these themes interrelate and it was therefore possible to form a high-exposure group and a low-exposure group based on the association that the themes related to high exposure share with one another and the themes related to low exposure share with one another.

In the study, the main aim was to determine whether/how level of exposure to computer technology influences the conceptualisation of the DMMB, i.e. are individuals with high levels of exposure less likely to see the computer desktop as a metaphor depicting an actual office desktop than individuals with lower levels of exposure? The thematic analysis supports this distinction by allowing the researcher to categorise participant responses to the word association task (the conceptual task) as low metaphorical (the extent to which the response relates to a technologically-driven conceptualisation or computer-related behaviour is smaller) or high metaphorical (the extent to which the response relates to a technologically-driven conceptualisation or computer-related behaviour is greater). It is also evident that several social variables (early exposure, interests, etc.)
contributed to the grouping of participants into a high- or low-exposure group and that these variables were identified and defined by the qualitative methods used in this study. For example, it is likely that a participant, who was exposed to the computer initially in the infant/toddler phase, will also maintain a high level of interest in computers and will be very proficient in computer-related subjects. This would place the participant in the high-exposure group. It can then be hypothesised that this participant will behave in response to the computer rather than to paper, and will conceptualise according to technology-driven cognitive processing. These exposure groups were tested quantitatively (in Chapter 5) to determine whether this qualitative finding can lead to converging results using statistical methods.

Nevertheless, the following two cases were selected as typical participants from each group, and are discussed in the next section:

4.4.2. Examples of representative cases of each group

Two participants were selected as typical examples of the high-exposure group and the low-exposure group respectively. These representative cases were selected by considering to what extent each theme features in their interview data. The participants were considered to be typical members of a certain group if the themes in their data associated mostly with high computer exposure or low computer exposure (consider the distinction between the two exposure groups based on the themes explained above). Participant 12 was selected as a representative of the high-exposure group, whereas Participant 21 was selected to represent the low-exposure group. The following discussion is focused on these participants’ data in the context of their individual external environments, and how it motivates the themes above as active contributors to the metaphoric value of conceptualisation and behaviour, as the overall focus of this study:

4.4.2.1. The representatives’ demographic information

The questionnaire served to provide personal information that is required to contextualise these participants within their real-life environments and to gain a deeper insight into the motivations behind their responses to the research tasks. Participant 12 is a 20-year-old female who grew up in Witbank, in the Mpumalanga
province. She moved to Pretoria, Gauteng, to pursue her studies in engineering, which she later changed to software development at the college in question. She speaks Afrikaans as her home language, and is proficient in English as a second language. She considers herself to have always been academically orientated and maintained good grades throughout primary and secondary school. Participant 12 added that she started studying engineering, as her father is an engineer and persuaded her to further her studies in his field of specialisation. Nevertheless, she showed little interest in engineering and decided to focus on her IT studies instead.

Participant 21 is a 20-year-old male whose hometown is Musina, in the Limpopo province. He also moved to Pretoria when he got admitted to the college to study software development. He is a first language English speaker, with Afrikaans as his second language, which he understands but struggles to speak fluently. He describes his family as very supportive even in situations when he needs to stand up for himself. Participant 21 mentions that he completed Grade 12, but did not share much detail on his schooling years. He did mention that he had a part-time job while he was in secondary school. His job was to repair computer hardware.

As mentioned in prior chapters, the sample group is relatively homogeneous. This is evident in the above participants’ demographic information, as they share some basic commensurable demographic traits, which are shared by the other participants in the sample group as well: Both of the participants are 20 years of age. Both participants moved to Pretoria from provincial towns to commence their tertiary studies. Both participants study software development.

Below Participants 12 and 21’s interview responses are examined in light of the themes that resulted from the thematic analysis:

4.4.2.2. **An exploration of the themes in the high-exposure group (based on the responses of Participant 12)**

Themes that are more relevant to the current study are focused on in greater depth than the more peripheral themes in discussing the representative cases; however, supplementary themes are also alluded to briefly below.
The theme *Current Exposure* was common in the interview responses, and it was determined that this theme leans significantly to the high-exposure group due to the demands of the participants’ current environment. Nevertheless, this theme was considered to some extent in the grouping of participants into the high-exposure and low-exposure groups. Although, several participants maintain a high-level of current exposure, some participants did maintain a lower level of exposure than others. Despite this, it is the case that most participants’ current exposure is high rather than lower. The groups were formed by considering all the themes and whether they associate mostly with the high- or with the low-exposure group. With this being the case, both Participants 12 and 21 maintain a high-level of current exposure. Participant 12 is exposed to the computer approximately 10 hours per day. She explained that this time is spent mainly to fulfil her study requirements, but also for entertainment purposes, such as watching movies and other programmes, but she does not consider herself to be much of a computer game enthusiast. In comparison, the participants’ daily exposure to paperwork of any kind was also determined. Participant 12 engages in paper-based activities about 1 hour per day, mainly for studying purposes. She added that she prefers to plan her tasks and projects on paper before executing them on the computer. Her exposure to paper-based activities is evidently lower than her exposure to computer-based activities.

The other exposure-related themes of significance are examined in light of Participant 12’s responses below:

- **Early Home Exposure**

  In consideration of this theme, Participant 12 was exposed to the computer at a younger age than Participant 21. Participant 12 was 11 years old upon initial home exposure, which is the primary phase. It is noticeable that she does not consider this age of exposure to be young: “Not since I was small; just from age 11”. She attributed her age of exposure to the fact that she was never interested in playing computer games, and therefore did not feel a need to interact with the computer until it was necessary for her to use the computer for school work.
- **Early School Exposure**

This theme relies on the primary schools that the participants attended, and the extent to which these schools included computer-related tasks in their curricula. Participant 12 attended computer lessons that were supervised by a teacher at her primary school for about 1.5 hours per week. It was also necessary for her to do certain compulsory tasks on the computer in primary school. At an early stage such as the primary school stage, Participant 12’s level of exposure is considered to be high.

- **Secondary School Exposure**

In this instance, it is assumed that participants would opt to take computer-related subjects due to their general interest in the subject and their decision to further their studies in the field, but again the option was not necessarily available at all the secondary schools. For Participant 12, taking a computer-related subject was an option. She took a computer-related subject (CAT [Computer Applications Technologies]) and performed well in this regard, as she earned an A for this subject: “I was the top student in matric for CAT”. It was also compulsory for her to complete much of her school work on the computer. Consequently, she spent about 10 hours per week exposed to the computer at school or studying.

- **Lack of Exposure**

It was further enquired whether participants experienced a lack of exposure to computers and other technology-related phenomena at any point during their upbringing. Both Participants 12 and 21 confirmed that they could not remember a time where they had no exposure to some form of technology at all. As explained earlier, these responses are highly subjective, as it depends entirely on participants’ perception of what constitutes technology. Participant 12 defined technology as “anything computerised that works with development coding”. She said that her first encounter with technology was with a mobile phone at age 9, and since then she has never experienced a complete lack of technology.
- Early Exposure (Access)

In connection with early exposure, it is clear that Participant 12 can be added into the high-exposure group, as she was allowed unlimited access to the computer during her upbringing. No restrictions were placed on her regarding computer usage by her parents: “No boundaries; as long as I would want to use it”. It could be speculated that this is due to the role that the computer played for the participant, as she mainly sees it as a tool to use for work or study tasks, and never considered the computer to be exclusively a means of entertainment.

- Parental Support

*Parental Support* is intertwined with early exposure. Therefore, this theme seems to have the capacity to influence other themes that directly apply to exposure. Consider Participant 12’s situation: she explained that, though her mother did not fully support her IT-related focus at school, her father maintained full support for this focus. Her motivation for her mother’s lack of support was that “they were a bit behind when it comes to technology”. In other words, her mother did not understand the relevance of IT in one’s daily environment, and lacked knowledge in terms of the bearing that IT had on the participant. Nevertheless, Participant 12’s father, an engineer, maintained a better understanding of the prevalent role of IT in a variety of fields, such as engineering: “It started off with my dad; I was following in his footsteps”. However, when it came to her selection to quit her engineering studies and specialise in IT, her father showed less support: “I was discouraged by my father. He doesn't think there’s a future for me in IT”. She emphasised her mother’s role as supporter when she changed her field of study. Thus, it is clear that Participant 12’s IT interests were driven by her parents, although their roles as supporters appeared to have alternated.

- Interests

This theme includes a wide scope of possible responses. Consider that a participant may be very interested in one aspect of the computer, but not at
all in other aspects. For example, a majority of the participants specialise in software development and generally maintain a strong interest in advances in that regard, but few of them are enthusiastic about computer hardware, which in effect influence the level of interest towards the phenomenon as a whole. Bearing this in mind, both participants maintain a so-called mild interest in computers and technology, simply because they are not interested in all aspects of computer-related phenomena.

Participant 12 is enthusiastic about software development and mobile phone technology, as it is in line with her field of specialisation. She stated that her regular use of the computer should inevitably lead to an interest in the computer, particularly in various aspects of software development: “It’s something you use every day so later on it will cause an interest”. As explained earlier in this sub-section, Participant 12 shows little interest in computer gaming, which further motivates her interest in specific aspects that are applicable to her day-to-day computer exposure.

- Skills/abilities at school level

Once more this theme interrelates with the previous theme. In this case, participants’ marks for computer-related subjects at secondary school level were considered, in order to determine how comfortably they execute their daily tasks on the computer. Bear in mind that the participants’ field of specialisation relates to IT phenomena. Thus, as students of IT, their daily tasks are more intricate (software programming and coding among others are tasks that they perform on a daily basis) than general computer interactions with which people who are not engrossed in the IT field, are familiar (tasks such as typing, or copying and pasting, etc.). Like most of the participants, who took a computer-related subject at school, Participant 12 achieved an A in her computer subject. This resonates with the interest that she maintains in the field, which mainly pertains to her area of study.

- Exposure to the Internet and other forms of technology

This theme relates to the theme of Communication (discussed under ‘supplementary themes’ below), and the participants’ medium of choice in
this regard. Participant 12 spends a great deal of her time exploring the internet and other forms of technology, for social networking purposes, but even more so for research pertaining to her studies. Once again, the participants’ particular area of study and interest define the purpose of her exposure to the internet and other technologies, as she spends an average of 5 hours per day utilising these forms of technology.

- Supplementary themes

Despite the themes above, which are particularly relevant to exposure as a key area of focus in this study, additional themes appeared upon further analysis of the interviews. Participant 12’s responses regarding these themes are briefly addressed below:

- Ease of implementation: The response related to ease of implementation aligns closely to Routine Behaviour. Participant 12 finds it most convenient to complete tasks on the computer, due to her daily routine. In response to motivate her choice to complete the behavioural task predominantly on the computer, she explained: “Those [tasks executed in the behavioural task of this study] are stuff that I usually do on the computer”.

- Obligation and Technological training: Obligation as an additional theme is associated with Technological training as a theme. All the participants are considered to have some form of training in this regard due to the field of specialisation in the college. Similarly, the environment motivates the focus on computer-related studies, which inevitably demands a certain amount of time per day that is solely dedicated to computer interactions of all sorts. Consequently, both participants feel that they are obligated to work on the computer more regularly than on paper and that this obligation was also enforced during secondary school because they took computer subjects. It can be argued that obligation can have a positive or a negative impact on the participant. One can consider the role that interest plays. In this instance, Participant 12 would feel obligation, but in a positive sense, as her general interests revolve around the topic of study in her IT curriculum at college. Thus, she may
be urged to want to work on her studies on the computer more often than not.

- **Goals and objectives:** Another theme is *Goals and objectives*, especially regarding the career that the participant is interested in entering. Generally, the participants all preferred to enter an IT-related career. However, some show less interest in entering the typical corporate IT environment, where the focus is on business systems development. Participant 12 ideally would like to enter the corporate IT industry, as it can be deduced that she maintains a strong sense of career-driven ambition, which resonates in her studies and her interests. She explained: “[I would like to] go find a steady job and try to better myself to become a senior developer”.

- **Medium of Communication:** Both participants prefer to use indirect media of communication. However, Participant 12’s preference is more technology-driven than Participant 21’s preference (see sub-section below). Participant 12 enjoys communicating on her mobile phone in the form of texting, because “it’s easier and cheaper”. Nevertheless, if she wants to communicate with people in her environment, she prefers speaking directly to them.

Participant 21’s responses regarding the themes are now considered as he is a representative example of a participant who fits into the low-exposure group:

**4.4.2.3. An exploration of the themes in the low-exposure group (based on the responses of Participant 21)**

As discussed in the previous sub-section, in terms of the theme *Current Exposure* most of the participants are grouped into the ‘high-exposure’ group. As a result, Participant 21 also maintains a high-level of current exposure. He keeps to about 8 hours of computer exposure daily. He added that he spends this time studying or playing computer games. In terms of exposure to paper-based activities, Participant 21 has a part-time assistant job, which requires more exposure to paperwork. He works on paper approximately 3 hours per day. In the case of both participants, their current computer exposure far outweights the amount of time that is used for paperwork.
The other exposure-related themes of significance are examined in light of Participant 21’s responses below:

- **Early Home Exposure**

  Participant 21 was initially exposed to the computer at home in the secondary phase, at the age of 13. When asked if he had a computer at home, he explained “only when I reached high school. My whole junior school years before I got to high school there was [sic] no computers”. It is clear that he had some early prior exposure to the computer, as he explained that he did spend time interacting with the computer at friends’ homes: “Occasionally, if I’d go to my friends’ I’d use the computer there, but other than that I never used the computer”. He seemed to hold greater interest in computer games. The main purpose of his initial exposure was to play computer games. Although the participants’ ages of initial home exposure do not vary extensively, it is evident that different factors motivated their choice to interact with the computer at that time.

- **Early School Exposure**

  In terms of exposure at his primary school, Participant 21 did not have computer lessons, but it was optional to complete school tasks on the computer. He explained that his primary school had a computer lab, but he rarely made use of it. Nevertheless, in light of the previous theme, he did not have a computer available to him at his home at this stage, so he completed his school work on paper.

- **Secondary School Exposure**

  Participant 21 had a computer-related subject (Computer Science) at secondary school. Completing school work on the computer was compulsory for this subject. He spent 3 hours per week doing school work on the computer and earned a D for this subject, which he deemed a low mark. He added, “My marks fluctuated all the time”. It is worth noting that most of the participants in the group (15 out of 25) did not take computer subjects at secondary school. In this case, Participant 21 is an exceptional
case. However, the amount of his computer exposure is relatively low, compared to other participants who had computer subjects at school. If the time that he spent studying on the computer and the mark that he earned for this subject are taken into account, it could be assumed that Participant 21 did not commit a great deal of effort into performing exceptionally well in this subject. However, this will have to be a matter of speculation since the participant did not justify this observation.

- Lack of Exposure

Participant 21 cannot remember a particular time that he experienced little or a lack of exposure to some form of technology. He considers technology as something that mainly has a functional application: “Technology is everything you use now; TVs, even a calculator”, as quoted earlier. Participant 21’s first encounter with technology was a mobile phone at the age of 11. He added that technology has always been present in his life, as he has always been exposed to television.

- Early Exposure (Access)

In Participant 21’s case, access to the computer was strictly limited by his parents to a half an hour per day. He attributed this to his interest in computer gaming, by light-heartedly explaining that “I tend to play games all the time. My mom just chased me off the computer so she could play games”. Although Participant 21’s response comes across as a witty repartee, he is one of many participants whose computer access was strictly controlled by their parents due to their extreme interest in computer gaming. Perhaps these participants’ parents enforced more control over their computer access to ensure that the participants’ time was not dominated by computer gaming alone, obligating them to spend time doing their school work as well.

- Parental Support

Participant 21 did not feel that his parents fully supported his interest in IT. He attributed this lack of support to his parents’ apparent lack of knowledge
in this regard: “My family weren’t [sic] really exposed to computers, so they
didn’t really know about it”. He added that some of his relatives stood by
him in his decision to further his IT studies, but that many of them shared
his parents’ sentiments: “Part of my family said it’s a waste of time”. As a
result, he stated that his parents were unsupportive in this instance. This
response relates with his above response regarding Early Exposure
(Access), as it is evident that Participant 21’s early access was strictly
controlled by his parents and, in turn, he feels less supported in his decision
to have selected IT as his field of study.

- Interests

Like Participant 12, Participant 21 also maintains a mild interest in
computers and technology, but explained that his interest increases and
decreases on occasion. In this regard, the participant responded in this
manner specifically with his IT studies in mind. In light of this, it can be
inferred that his level of interest depends on his motivation to study at any
particular time. Thus, if the participant struggles with certain aspects of his
computer studies, he feels less interested in the field as a whole, while his
interest is sparked again once he achieves success. He also gets
discouraged when he has to repeat certain tasks pertaining to his studies
too often: “If I do something and I enjoy it, I’ll do it again; but I won’t say I’ll
do it again and again”. What is evident is that the participant has shown a
great interest in computer gaming since a relatively early age and is still
enthusiastic about it.

- Skills/abilities at school level

Participant 21 attained a D symbol for Computer Science. This could be
attributed to his focus on gaming, which occupied a lot of his time. He
clearly said that he tends “to play games all the time”, instead of spending
more time on his curriculum-related computer work. Furthermore, earlier
mention was made regarding his secondary school exposure, which was a
low 3 hours per week. Thus, the time he spends studying on the computer
for this subject can further impact upon the mark that he attained.
Exposure to the Internet and other forms of technology

Participant 21 uses the internet, but not on a daily basis; he also uses it to research particular aspects of his studies: “I use it almost every day. It depends on what I’m looking for when I’m researching”. Research in IT is often required of students by the college when working on projects.

Supplementary themes

- Ease of implementation: Participant 21 selected paper as his medium of choice due to regular, prolonged use of this medium. He added that paper is easier to use, although he prefers working on the computer: “I’ve been exposed to paperwork so much in my life that I’m more comfortable using paper than computers; even though I enjoy computers”.

- Obligation and Technological training: As mentioned in the previous subsection, obligation can be deemed either positive or negative, depending on the participant’s interest. In this regard, Participant 21 does not share the sense of positive obligation with Participant 12. In light of his interest in computer gaming, which forms no part of his IT studies, the obligation to interact with the computer in order to fulfil study-related tasks may be more negative than positive, simply because this aspect of IT does not make up a particular part of his interest in computers and technology – his interest in gaming, taking precedence over studies, being a case in point.

- Goals and objectives: Participant 21 is more focused on entering a career where he can work as a website developer. Although the software developer course teaches them aspects of business system development and website development, he enjoys the website development aspect more. It was determined through further analysis of other participants’ responses that website development and CGI and Animation students are more artistic than the participants who prefer to work in business systems development. Participants with artistic tendencies often prefer to work in environments that allow them to explore their artistic ability. This is evident in Participant 21, due to his preference to work as a website developer, but also due to his enthusiasm for computer gaming (a visually-charged aspect
of computers that allows for imaginative thinking and exploration). He explains: “I want to be a web developer. I’ve got a weird creative side”. These focus areas develop a different skill set than business systems development and embedded coding: Participant 21’s ‘artistic’ approach to IT may be attributed to his regular exposure to computer gaming, instead of computer studies. This might be an interesting avenue to pursue for future research, but is not directly relevant to the current study.

- Communication: Participant 21’s preferred medium of communication is less technology-driven than Participant 12’s preference. Participant 21 makes use of texting on his mobile phone, because he says that “it’s quicker and more convenient”. It is worth noting that this was the general response related to this theme. Most of the participants do not live close to their families and make use of texting to communicate with their parents, although most of the participants prefer direct discourse as a medium of communication. Participant 21 does not prefer direct discourse, as he does not consider himself “the best face-to-face communicator”. Participant 21 explained that he enjoys writing, and likes to use pen and paper to write letters: “I enjoyed the days when we used to write letters to people”. This is an unusual response, but requires attention, as it again enforces the participant’s comfort and ease in using paper rather than the computer to perform most tasks.

From the discussion of the representative cases above it is evident that the themes that were identified in the interview responses are intricately intertwined. Nevertheless, despite these interrelations between the themes, discrete groups could still be identified. Participant 12 represents a group of participants who maintains a high-level of computer exposure in their daily lifestyles, while Participant 21 represents a group who maintains a low-level of computer exposure. This deduction was reinforced by the participants’ conscious choices to interact with the computer and/or with paper in the behavioural tasks, as well as by the participants’ tendency to respond literally and/or non-literally to the conceptual tasks (which are examined in Chapter 5). It can be hypothesised that the central tendency for participants to behave consciously in one way reflects on their
cognitive processing in a similar way (this is also revisited in Chapter 5). The responses in their respective interviews also confirmed this tendency.

In the quantitative aspect of this study, this result maintains statistical significance as well. The findings from the above example cases are segmented further in Chapter 6, where these findings are investigated in light of the implications it may have on the study’s theoretical framework, particularly Conceptual Blending Theory. These representations of the high- and low-exposure groups are considered in terms of the effect that it may have on the blended space, to further determine what content is predominantly housed in the generic space in order for the blend to successfully hold emergent structure that is particular to each group with regard to the DMMB.

To briefly summarise the findings of the representative cases in relation to the themes, the differences and similarities featured between the two participants’ responses are outlined in Table 4.2 below:

**Table 4.2** Table containing themes and Participants 12 and 21’s responses.

<table>
<thead>
<tr>
<th>Themes</th>
<th>Participant 12 (High-exposure group)</th>
<th>Participant 21 (Low-exposure group)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Exposure to Computers</td>
<td>10 hours per day (HIGH-LEVEL)</td>
<td>8 hours per day (HIGH-LEVEL)</td>
</tr>
<tr>
<td>Current Exposure to Paper</td>
<td>1 hour per day (LOW-LEVEL)</td>
<td>3 hours per day (LOW-LEVEL)</td>
</tr>
<tr>
<td>Early Home Exposure</td>
<td>Age 11 (PRIMARY PHASE)</td>
<td>Age 13 (SECONDARY PHASE)</td>
</tr>
<tr>
<td>Early School Exposure</td>
<td>1.5 hours per week (HIGH-LEVEL)</td>
<td>0 hours per week (LOW-LEVEL)</td>
</tr>
<tr>
<td>Secondary School Exposure</td>
<td>10 hours per week (HIGH-LEVEL)</td>
<td>3 hours per week (HIGH-LEVEL) (Exception to low-exposure group)</td>
</tr>
<tr>
<td>Lack of Exposure</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Initial Age of Exposure</td>
<td>Age 9 (PRIMARY PHASE)</td>
<td>Age 11 (PRIMARY PHASE)</td>
</tr>
<tr>
<td>Early Exposure (Access)</td>
<td>Unlimited</td>
<td>Controlled (0.5 hours per week)</td>
</tr>
<tr>
<td>Parental Support</td>
<td>Supportive</td>
<td>Unsupportive</td>
</tr>
<tr>
<td>Interests</td>
<td>Mild (focus on studies)</td>
<td>Mild (focus on games)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Skills/Abilities at school level</td>
<td>Mark: A</td>
<td>Mark: D</td>
</tr>
<tr>
<td>Internet and other technological exposure</td>
<td>5 hours per day (HIGH-LEVEL) for research and social networking</td>
<td>Not daily (MID-LEVEL) for research</td>
</tr>
<tr>
<td>Ease of Implementation</td>
<td>Computer (due to routine behaviour)</td>
<td>Paper (due to extensive exposure)</td>
</tr>
<tr>
<td>Routine Behaviour</td>
<td>Computer</td>
<td>Paper</td>
</tr>
<tr>
<td>Obligation</td>
<td>Computer: Positive Obligation</td>
<td>Computer: Negative Obligation</td>
</tr>
<tr>
<td>Technological Training</td>
<td>Trained</td>
<td>Trained</td>
</tr>
<tr>
<td>Goals and Objectives</td>
<td>Business systems developer (due to ambition)</td>
<td>Website developer (due to artistic ability)</td>
</tr>
<tr>
<td>Medium of Communication</td>
<td>Indirect (Texting on mobile phone)</td>
<td>Indirect (Writing on paper)</td>
</tr>
</tbody>
</table>

### 4.5. Conclusion

This chapter’s focus is on the qualitative aspect of this mixed method study. It firstly addresses the need for qualitative research in this study. Thereafter the data collection process, methods and materials pertaining to the qualitative branch of this study, namely the questionnaires and the interviews are addressed. Afterwards, the process of analysis of the qualitative data is dealt with, and the findings of the thematic analysis of the interviews as well as the discussion of representative cases in each group are explained.

The qualitative aspect of this study produced relevant exposure-related themes from analysis of the interview data. These themes were shown to interrelate with one another to the extent where it was possible to distinguish between a high and a low computer exposure group. The interview data of typical representative cases of each of the exposure groups were analysed with the intent to establish the nature of the computer exposure in each group and to gain a clearer understanding of the social variables (the themes identified in the interview data) that come into play when determining the nature of the exposure. This aspect of the study allowed the researcher to ascertain whether social variables are present in further conceptualisation of the DMMB and the interaction with computer technology, and to also determine and define the social variables that play a
prominent role in this regard. These social variables are further tested statistically along with the *conceptualisation* and *behaviour* variables in Chapter 5.

In Chapter 5, this structure holds for the discussion of the quantitative aspect of this study, which made up the first and/or second day of data collection.
Chapter 5

The Quantitative Aspect

5.1. Introduction

This chapter addresses the quantitative aspect of the present study. The quantitative data collection methods of this study, namely the conceptual task (a word association task) and the behavioural task (a controlled observation experiment), are dealt with. Firstly, the need for a quantitative approach in this study is identified. Secondly, the process of data collection is explained, including the materials used. Thirdly, the analytical framework for the quantitative aspect of the study is discussed. Finally, the results of the quantitative data analysis are presented and discussed in relation to the topic of the study.

5.2. The Need for Quantitative Research

Quantitative research is sometimes argued to be more objective, on the basis that it produces numerical data that can be measured statistically (Porter 1995: 22). In fact, Lord Rutherford, quoted in Dörnyei (2007: 31), believed that “any knowledge that one cannot measure numerically ‘is a poor sort of knowledge’”. Although this historical view of quantitative study as the only scientifically sound approach is not accepted today, and is certainly not promoted in this study, it cannot be denied that quantitative research does occupy a vital space in the natural, but also social and human sciences.

The quantitative approach can be viewed in three stages (Dörnyei 2007): (a) observation and identification of a phenomenon or problem; (b) formulation of an initial hypothesis; and (c) testing the hypothesis by empirical data collection and data analysis employing statistical methods.

When applied to the present study, Dörnyei’s three stages prove to be present in that (a) a research problem, related to the dynamic nature of conceptual blends (in particular, the DMMB) in the Information Technology (IT)-based world is identified; (b) it is hypothesised that i) the amount of exposure to technological phenomena will influence participants’ conceptualisation of the DMMB to the extent that the computer desktop will either be seen as an e-version of an actual office space or
as a thing-in-itself; and that ii) this conceptualisation may influence behaviour related to the IT environment; and (c) this hypothesis is tested by using multiple methods to collect data that can be analysed by means of inferential statistics.

Quantitative research methodology in the field of Linguistics is characterised according to certain criteria (Dörneyi 2007):

- The use of *numbers* is vital to quantitative research, which have the ability to add to a study. Researchers specifically define the content and boundaries maintained by the variables we use and further describe exactly what is incorporated into the range of values within the variable (Dörneyi 2007). However, numbers also carry some limitations in that they preferably require a contextual background in order to be interpreted. This limitation is one of the motivations for using a mixed method approach in the present study, which incorporates qualitative research for the purpose of providing context to the quantitative data.

- Categories and values should be determined in advance of the actual study. Therefore, meticulous and extensive *preparation* is needed to ensure that the quantitative material is fully prepared to yield valid and reliable results. In this case, it is argued that careful piloting is essential to effective quantitative research. Conducting a pilot study was also the initial phase of this study. All methods and materials were tested on 10 participants prior to the actual study to ensure that the methods and materials are acceptable, and will yield results that can be analysed.

- The focus of quantitative research is on studying *variables*, rather than studying individual cases. Punch (2014) explains that the study of variables is at the core of quantitative research. He identifies three main functions of quantitative research: “(i) quantitative research conceptualises reality in terms of variables; (ii) it measures these variables; and (iii) it studies relationships between these variables” (Punch 2014: 206). This study intends to identify variables that affect the conceptualisation of the DMMB. In the present study, the variables *behaviour* and *conceptualisation* were studied in light of social variables, including *early home exposure (age)*,
current exposure % (/24 hours), early exposure (access), interests, skills/abilities at school level and parental support.

- The use of statistics in quantitative study is arguably one of its most significant characteristics (Creswell 2003: 18). Statistical tests are employed to ensure that objective results are obtained (it can be assumed that, when interpreted correctly, statistical tests will assist the researcher in attaining objective results). This was seen as another reason for employing quantitative research tools.

- The main goal of quantitative research is to find facts which are generalisable to a larger population than the particular sample group. Winter (2000) explains that “the ability to generalise findings to wider groups and circumstances is one of the most common tests of ‘validity’ for quantitative research”. The question of the existence of generalisations and universalities in human and behavioural sciences is greatly debated. Nevertheless, in an attempt to determine whether and to what extent generalisations can be found in human sciences, it is worth including quantitative aspects in research. This study by its nature is too small to attain generalisability and universality. However, it is possible to replicate this study with a larger group of participants with the intent of testing emergent patterns and for determining whether generalisations and universalities exist with regard to the particular topic of study.

In the present study, quantitative research methods were employed in the form of a conceptual task (a word association task) and a behavioural task (a controlled observation experiment). These methods are discussed in the following section.

5.3. Quantitative data collection methods and materials

In Chapter 3, the methods of data collection, both qualitative and quantitative, are introduced and the data collection process, administered in three phases, is explained. In this section, the conceptual tasks and the behavioural tasks are addressed in more detail.
5.3.1. Conceptual task

The conceptual task was designed to gain insight into participants’ conceptualisations of IT-related concepts. Prototype Theory (see Section 2.4) informed the design of a word association task, which attempted to study the manner in which participants categorise concepts on a conceptual and unconscious level. Through this task, the researcher gained access to participants’ online cognitive processes with the aim of examining whether lexical items (which can be associated with the DMMB) are more likely to be associated with concepts from the COMPUTER TECHNOLOGY frame, or with concepts from other frames. In other words, the goal of the task was to determine what the participants’ conceptualisations of particular concepts are and to what extent prototypical members for each of the tested items exist within the group. The task was administered verbally, as it was believed that participants would have too much time to reflect on their responses if the items were presented in written form.

The researcher addressed each participant individually with a list of lexical items (see Appendix C for the list of items used in the conceptual task). These items were considered to be categories, such as keyboard, file and tools, among others of the DMMB. Forty categories overall were listed: twenty ‘relevant’ categories, i.e. categories that could potentially be associated with computer technology and twenty ‘irrelevant’ categories, i.e. categories that were unlikely to be associated with computer technology (such as ears, love and school). The ‘irrelevant’ categories were inserted in an attempt to counter priming effects.

Semantic priming occurs when administering word association tasks. Research has shown that “the recent presentation of a stimulus affects performance on a subsequent test even when no reference is made to the study episode” (Zeelenberg et al. 2003: 653). In the present study, the subject’s performance in the word association task could be influenced by previously occurring words in the task. Hutchison (2003: 786) explicates that “people tend to respond faster to a target word (i.e. cat) when it is preceded by a semantically related prime (i.e. dog) rather than by an unrelated prime (i.e. table)”. In research that focuses on testing semantic memory, for one, semantic priming is often used as a helpful research method. Since this study is focused on gaining access to participants’ ‘online’ and
automatic conceptualisations of technological phenomena, semantic priming effects need to be controlled for as much as possible. In this regard, it was ensured that the participants were not prompted by the researcher to associate particular categories with particular concepts, and that the participants shared their existing conceptual associations, without trying to determine what it is that the researcher ‘wants to hear’. Thus, in light of Hutchison’s explanation, words that are clearly associated in one way or another were not presented adjacently in the word association task. Semantic priming was controlled for (to some extent) by adding unrelated primes to the list of words (in between primes that share semantic relations).

The participants were instructed to provide the first word that came to mind upon hearing a lexical item. The underlying assumption was that this would give the researcher an idea of what the prototypical member of the given category is (for each individual as well as for the group of participants). The researcher explained to each participant that responses should be given as quickly as possible, without any hesitations. The researcher filled in each participant’s response under the relevant category and classified each response as either technological (a computer-related association) or non-technological (an association related to the actual object). For example, a response, like ‘desktop’ to the file category was classified as technological (TECH), while a response, like ‘paper’ was classified as non-technological (NON-TECH).

Some responses required further probing, as the TECH - NON-TECH distinction was unclear. In these cases, the researcher conducted a brief verbal follow-up after each conceptual task to gain an understanding of what the participant envisioned when responding to the given category. An example of such a case is the response ‘yellow’ to the file category. In the follow up, participants explained the ‘mental image’ that they paired with the category. Some responses suggested that paper files generally are yellow in colour or that papers look yellow when aged. Other responses included the yellow icon that appears on a desktop to show that it is a file icon. The follow up guided the researcher to make the TECH – NON-TECH distinction more accurately. As explained by Snyman (1984 in De Vos et al. 2005: 178), “the follow-up question should have a funnel-like effect, i.e. it should lead to more in-depth knowledge and to finer detail".
In certain cases, responses proved to be unusable for the purposes of this study. For example, one participant responded with ‘porridge’ to the category storage. This response seemed to point to a phonological association instead of a semantic association, and thus does not shed light on what the prototypical member of the category might be. To ensure that data remained relevant to the topic, these responses (which occurred twice during the conceptual tasks), were disregarded in data analysis.

The conceptual task took approximately 10 to 15 minutes per participant to complete and was done well in advance of the behavioural task to ensure that participants’ responses in the behavioural task would not be primed by the word association task.

### 5.3.2. Behavioural task

In an attempt to achieve a good understanding of how participants interact within the college setting, and to effectively determine how they respond to routine tasks, an experiment was executed in the form of a behavioural task. In the present study, the participants’ behaviour was controlled in that participants were provided with an office space (set-up to contain particular features) and a list of tasks to be executed in this office space. The data obtained during this controlled observation was analysed quantitatively, seeing that quantitative data, which could be related statistically to the data obtained in the word association task, was sought in this experiment.

The controlled observation was conducted in a set-up office space at the relevant college. The office contained a desk and chair. On the desk was a laptop computer, which contained icons, named ‘Folder 1’ and ‘Folder 2’ on the desktop. Folder 1 contained icons of Microsoft Word documents, named ‘Document 1’, ‘Document 2’, ‘Document 3’, ‘Document 4’ and ‘Document 5’. Folder 2 contained icons of Microsoft Word documents, named ‘Document 6’, ‘Document 7’, ‘Document 8’, ‘Document 9’ and ‘Document 10’. It also contained shortcut icons to an electronic dictionary, a calculator and a recycle bin. Furthermore, the desktop displayed a calendar and a clock. The behavioural task was designed keeping in mind the role of the computer desktop. Essentially, the electronic features
presented on the desktop were considered to be technological representations of the actual paper-based versions of these features.

Despite the working definition of the DMMB, explained in Chapter 2, the behavioural task necessitated a narrower understanding of the desktop metaphor, more in keeping with the original definition as conceptualised in 1984 as “a blend between the input domains of WIMP interfaces and of the wooden desktop typically found in an office environment” (Terkourafi and Petrakis 2010: 154). There necessarily had to be a real-world analogue between every virtual task and concomitant concept, and as such, categories like CLOUD and PLATFORM, where there are no real-world analogues that could practically be brought into the office space, had to be precluded from the said task.

To account for the actual, non-technological representations of the computerised features above, the set-up office was also furnished with two paper-based folders, named ‘Folder 1’ and ‘Folder 2’. Folder 1 contained paper documents, named ‘Document 1’, ‘Document 2’, ‘Document 3’, ‘Document 4’ and ‘Document 5’. Folder 2 contained paper documents, named ‘Document 6’, ‘Document 7’, Document 8’, ‘Document 9’ and ‘Document 10’. An actual paper dictionary and an actual calculator were also placed on the desk. Furthermore, a paper calendar appeared on the desk and a trash can was placed under the table next to the chair. The set-up office space remained unchanged for each participant (to avoid any unforeseen effects on the outcome of the experiment). All the actual items in the office space were positioned within a reachable distance of the participant (while he was seated at the desk) and it was ensured that all the items were clearly visible to the participant.

A set of ten predetermined tasks were provided to the participants in a list (see Appendix D). These tasks were designed to be simple representations of actions that the participants fulfil on a daily basis. In other words, tasks were not designed to be complex or challenging, but rather routine and mundane. Essentially, the tasks were designed with the purpose of assessing each participant’s natural response to basic office-related interactions. The aim was to determine whether participants choose to execute these tasks using the computer-based or paper-based features. Thus, the participants were free to select any means available to
them to execute the tasks. After completion of each task, the participant had to tick off the task. An example of such a task is: *Open the folder named Folder 1 and search for the document named Document 1.* Clearly, the nature of the tasks is such that they can either be executed on computer or on paper. Consequently, their selection to interact with a particular medium (either computer or paper) would determine whether their office-based interactions are mostly technology-driven or non-technology-driven.

The behavioural task took approximately 10 to 15 minutes to complete and participants' interactions were video recorded for the purpose of analysis. The video recorder was placed on a tripod in a corner of the office space behind the participant, and was operated by the researcher. The researcher was present, while the participants executed the behavioural tasks, but did not get involved in the execution of the tasks in any way. Each task on the task list featured a TECH (technology-driven or computer-based) or NON-TECH (non-technology-driven or paper-based) distinction allowing the researcher to circle the appropriate option upon analysis of the video recordings.

5.4. Quantitative Analytical Framework: Testing methods and results

In this section, the methods used to analyse the data, as well as the results and the interpretation thereof, are addressed. Sub-section 5.4.1 covers the preliminary data analysis from the conceptual task, and the behavioural task. This section also focuses on the statistical tests that were used in this study, in particular the test for normality of the distributions of the abovementioned data sets (the Kolmogorov-Smirnov test), the correlation tests, and the Mann Whitney U test. Furthermore, this section includes an item analysis, based on the data from the conceptual task.

It should be noted that the experiments described above were not analysed in isolation. The qualitative data were incorporated in the quantitative data analysis (as described in section 5.4.1.3) to establish correlations between the qualitative findings (as established with the questionnaire and the interview) and the quantitative findings (as established with the conceptual and the behavioural task).
5.4.1. The preliminary data analysis

After the data was collected, a preliminary analysis of the data was done. Devore and Peck (2001) explain that at this stage of analysis, data are usually summarised graphically and numerically.

5.4.1.1. The conceptual task

Firstly, all data were transcribed and computerised. The researcher classified each response to the lexical items in the task as either TECH or NON-TECH. The lexical items were further categorised by the total number of TECH and NON-TECH responses from all 25 participants.

Secondly, participants' individual responses were categorised into groups, based on the similarity of the response to the others in the group, and an average percentage was calculated in order to establish whether the participants reacted to the category in a predominantly technological or non-technological way. For example, for the category file, ‘paper’ was identified as a common response. Therefore, all responses that relate closely to ‘paper’, such as ‘paper documents’, ‘flipfile’ and ‘book’, were grouped under ‘paper’. This grouping allowed the researcher to determine whether the majority of responses to one category were TECH or NON-TECH and also to define the most common response. In this case, the most common response for file was ‘paper’. Thus, file is a NON-TECH category. Another example of the TECH – NON-TECH distinction can be found in the conceptualisation of the category keyboard, which was responded to either with ‘typing’ or ‘computer’ or a related response (TECH responses) or with ‘music’ or a related response, such as ‘piano’ (NON-TECH responses). Following this analysis, it was calculated whether the majority of participant responses to keyboard belonged to the TECH or NON-TECH frames. This analysis was executed with each of the items that were featured in the conceptual task, in an attempt to determine to what extent each category is associated with computer technology.

Thirdly, the researcher added up each participant's TECH responses and NON-TECH responses in order to determine to what extent each participant conceptualised the items technologically. The total average of TECH responses
and NON-TECH responses across all participants’ data was calculated (average TECH responses: 45.40%; and average NON-TECH responses: 54.60%). In this case, the focus was on gaining insight into the conceptualisation ‘pattern’ of technological concepts in the group as a whole.

The number of participant responses provided the researcher with 500 data points. The TECH and NON-TECH responses were totalled: 224 data points were TECH related (an average percentage of 44.8%); and 276 data points were NON-TECH related (an average percentage of 55.2%).

5.4.1.2. The behavioural task

The video recording of each participant’s behavioural task was analysed and computerised. For each participant, it was established whether the participant completed each of the ten tasks on the computer or by using the actual objects in the office. Hence, the researcher made the distinction between a computer-based or paper-based response to each task. The computer-based responses, as well as the paper-based responses, were totalled for each participant. In this manner, the researcher could determine whether the individual participant’s overall behaviour in the behavioural task was more computer-based or more paper-based. For example, Participant 1’s overall responses were 8/10 computer-based and as a result, Participant 1’s overall behaviour was classified as predominantly computer-based. Further notes were made upon analysis of the video recordings in cases where participants diverted to paper in between tasks in order to identify the reasoning behind this change in behaviour.

Finally, each participant’s ten tasks were totalled in terms of the number of participants, namely 25. This provided a data set of 250 responses. The responses were totalled as computer-based responses (145 computer-based responses) and paper-based responses (105 paper-based responses). The average percentage of computer-based data points is 58%, while the average percentage for paper-based data points is 42%.

5.4.1.3. The social variables

The themes that were most prevalent in the qualitative interview data were considered to be the main social variables that would be tested statistically in the
quantitative aspect of the study. Due to the fact that the interview was semi-structured, it was required in most cases to codify the responses to each of the themes. Thus, categorical scales were developed for the social variables that required codification.

The social variables below were identified as themes in the interview data and were codified accordingly:

- **Early Home Exposure (age):** the initial age at which the participant was exposed to the computer at home.

- **Current Exposure % (/24 hours):** the average number of hours per day (in percentage) that the participant is active on the computer at present.

- **Early Exposure (access):** the participant’s access to computers during childhood and youth. The data were codified on a categorical scale according to the level of access that the participant maintained: 0 = No access, 1 = Controlled (the participant’s parents/guardians allowed access but with a time restriction) and 2 = Unlimited (the participant’s parents/guardians allowed the participant free access at all times).

- **Interests:** the level of interest that the participant possesses for technology-related phenomena, including computers. In order to codify the data, a categorical scale was designed: 0 = Lack of interest, 1 = Obligation, 2 = Mild interest and 3 = High interest.

- **Skills/abilities at school level:** the participant’s competence and proficiency in executing tasks on the computer particularly at secondary school level. In order to codify the data, a categorical scale was designed that relates to the average mark that the participant received for technology-related subjects at school: 0 = Subject not taken, 1 = D and lower, 2 = C and 3 = A – B.

- **Parental Support:** the level of support that the participant feels his parents provided for him to develop and/or nurture an interest in technology and the support that he had when selecting information technology as a field of study. The data were codified to a categorical scale: 0 = Unsupportive, 1 = Developed support (the participant’s parents supported his decision to study information technology at tertiary level) and 2 = Very supportive (parents have maintained full support from when the participant can recall).
The preliminary analysis of the data provided the researcher with numerical and categorical data that can be tested statistically. Devore and Peck (2001: 12) define these types of data: “A data set consisting of observations on a single attribute is a univariate data set. A univariate data set is categorical (or qualitative) if the individual observations are categorical responses; it is numerical (or quantitative) if each observation is a number”. The variables derived from the preliminary analysis of the data are the behaviour variable, the conceptualisation variable (both are numerical data sets) and the social variables, as listed above (which are mainly categorical data sets).

5.4.2. Frequency of distribution

The first statistical procedure that was applied in this study was to determine frequency of distribution of conceptualisation and behaviour respectively. Howell (1999: 89) explains that this is one of the most important distributions to consider, because of the following factors: (i) it is usually assumed that many dependent variables are normally distributed in a population and if the assumption can be adopted that a variable is approximately normally distributed, certain inferences can be made about the value of the variable; (ii) the distribution of the hypothetical set of sample means, which draws on several samples from one population, is approximately normal under various circumstances; and (iii) in most statistical procedures it is assumed at some point in the derivations that the population of observations is normally distributed.

Frequency distributions were used for the behaviour data set and the conceptualisation data set in order to identify which score occurred most frequently and also to organise the data in a logical order (Field 2005, Howell 1999). The normal distribution of the behaviour and conceptualisation variables and the frequency of distribution are presented in section 5.4.2.1 below. Histograms are included as part of the results to provide a visual representation of the data distribution of both data sets, and to form a first impression of whether the assumptions of normality (as discussed above) hold true for these data sets.
5.4.2.1. Results of frequency of distribution

In order to show the frequency of distribution in the conceptual data and in the behavioural data, the data are graphically presented as histograms in Figure 5.1 and Figure 5.2.

Figure 5.1 shows the frequency distribution of the technological conceptualisations of each participant in the group. Note that 24 participants’ data were tested in the quantitative analysis instead of 25 participants’ data. This is due to the fact that one of the participants’ data was considered to be an outlier. Howell (1999) defines an outlier as an extreme case that stands out from the rest of the distribution. In this case, the participant responded to this study’s tasks in an exceptional manner that was found to be unrepresentative of the sample group’s responses. As discussed above, in the conceptual task, Participant 2 provided responses that indicated phonological associations, instead of semantic associations (the manner in which all the other participants responded). This data were not relevant for the purposes of this study and were not used during testing.
and analysis of the conceptual tasks’ data. In order to maintain an equal number of participants in all the tasks and throughout the statistical testing of the data, Participant 2’s data was omitted throughout. This outlier is indicated in the results as ‘Missing’. In this instance, the distribution is concentrated with the lowest TECH conceptualisations being 25% (3 participants in the group), while the highest TECH conceptualisation lies at 75% (1 participant in the group). Figure 5.1 shows that the data cluster around 40 to 45% (6 participants had 40% TECH conceptualisations and 4 participants had 45% TECH conceptualisations).

Figure 5.1 further illustrates that the frequency of the data is unimodal (there is one distinct peak in the histogram above). Field (2005: 6) explains that the standard deviation measures how well the mean represents the data set. He adds that if data points are close to the mean, then the mean is accurate; but if the data points are far from the mean, the mean is not accurate. In terms of Field’s explanation, the figure indicates that the mean for the conceptualisation data set is 44.38, while the standard deviation (SD) is 12.964. The figure shows that the data represents the shape of the bell curve more distinctly than is the case with the behavioural data, addressed below. Thus, it seems to be relatively normally distributed. Figure 5.2 below illustrates the frequency of distribution of the behaviour data set:

![Histogram of frequency distribution of the computer-based behaviour of the sample group.](image)
Figure 5.2 displays the frequency distribution of the computer-based behaviour of each participant in the group. Figure 5.2 shows a relatively wide distribution of computer-based behaviour that ranges from 10% computer-based (1/10 tasks executed on the computer) to 100% computer-based (10/10 tasks executed on the computer). The data tend to cluster around 10% and around 80% to 90%. This result indicates that participants mainly chose to execute all (or most) of the tasks either on the computer or using the paper documents.

Figure 5.2 suggests that the distribution of the behaviour data is bimodal in that it shows two distinct peaks. The data do not follow the shape of a bell curve, which suggests that it is not normally distributed. In consideration of skewness of the data, one cannot determine with conviction what the shape of the data is due to the small size of the sample that was tested (Howell 1999). It can, however, be determined that there is no marked instance of skewness and that Figure 5.2 reflects that the data tend to pile up in the tails of the distribution. The figure further identifies the mean of the behaviour data set, which is 60, while the standard deviation (SD) is 34.262. The behaviour data set’s SD (34.262) is quite big, which probably indicates that the mean does not accurately reflect the nature of the data set. The Kolmogorov-Smirnov test was used to statistically test whether the data obtained in the behaviour experiment is normally distributed. The results of this test are discussed below.

The histograms (Figure 5.1. and Figure 5.2) provide a visual representation of the data and suggest that the TECH conceptualisation data set is normally distributed, while the computer-based behaviour data set is non-normally distributed. In order to test these intuitions, a statistical test of normality was done to confirm whether this initial inspection of the data, implying one normally and one non-normally distributed data set could be accepted as correct.

5.4.3. Test for normal distribution

In order to determine whether the data related to the sample group’s behaviour and conceptualisation respectively are normally distributed, a test of normality (the Kolmogorov-Smirnov test) was conducted. The distribution of data points within a sample is normally distributed if the outcome of the test is non-significant (p > .05).
On the other hand, if the test is significant (p < .05) it indicates that the data set is non-normally distributed. The results of the Kolmogorov-Smirnov tests are presented in Table 5.1 below.

**5.4.3.1. Results of Kolmogorov-Smirnov Test**

*Table 5.1 Results for the normal distribution test of behaviour and conceptualisation data sets.*

<table>
<thead>
<tr>
<th>Test of Normality</th>
<th>Kolmogorov-Smirnov a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
</tr>
<tr>
<td>Computer based Behaviour</td>
<td>.262</td>
</tr>
<tr>
<td>TECH Conceptualisation</td>
<td>.147</td>
</tr>
</tbody>
</table>

a. Lilliefors Significance Correction

The results of the Kolmogorov-Smirnov test indicate that the behavioural data are not normally distributed ($D (24) = .262, p > .001$). This result confirms that the bimodal distribution of the behaviour data, as depicted in Figure 5.2, reflects a non-normally distributed data set. With regard to the conceptualisation data, the test yielded a non-significant result; confirming that the data are normally distributed ($D (24) = .147, p > .191$). Based on the fact that the behavioural data are not normally distributed, and because of the relatively small sample size, it was decided that further statistical testing should be done by means of non-parametric tests.

The non-parametric tests used in the present study were selected as they “make no assumptions about the distribution of the data” (Field 2005: 521) — these tests are also known as assumption-free or distribution-free tests. Non-parametric tests provide valid and reliable results, despite the fact that a data set is not normally distributed. The main disadvantage of non-parametric tests is that, due to the lack of restriction on the distribution of data, non-parametric tests have less power than parametric tests (Tanizaki 1997: 603). Nevertheless, given the nature of the present study, non-parametric testing was the best option. More specifically, to compare the sub-groups within the sample, a Mann-Whitney U test was administered (the grouping of the sample and the Mann-Whitney U test and its
results are discussed below). Before considering the correlations between variables that were tested and the Mann-Whitney U test, the item analysis is addressed.

5.4.4. The Item Analysis

Figure 5.3 below presents the average TECH vs. NON-TECH conceptualisations and computer-based vs. paper-based behaviour of the sample group, as discussed in the preliminary analysis above.

The pie charts in Figure 5.3 show that, on average, the participants produced technological word associations 44.8% (224 out of 500 data points) of the time, while non-technological word associations were produced 55.2% (276 out of 500 data points) of the time. Furthermore, the average of the group’s computer-based behaviour was 58% (145 out of 250 data points) and the average paper-based behaviour was 42% (105 out of 250).

The results related to the lexical item analysis resulting from the conceptual task’s data are presented below.

5.4.4.1. The Results of the item analysis

The analysis of the categories of the DMMB that formed a part of the conceptual word association task is presented in Table 5.2 and in the line graph in Figure 5.4 below:
<table>
<thead>
<tr>
<th>Item No.</th>
<th>TECH</th>
<th>NON-TECH</th>
<th>Prevalent response</th>
<th>Number of participants with similar/related responses</th>
<th>Percentage (the percentage that the item is conceptualised as technological)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FILE</td>
<td>Paper</td>
<td>9</td>
<td></td>
<td>24%</td>
</tr>
<tr>
<td>2</td>
<td>STORAGE</td>
<td>Storage space (i.e. warehouse)</td>
<td>10</td>
<td></td>
<td>28%</td>
</tr>
<tr>
<td>3</td>
<td>WORD</td>
<td>Speech</td>
<td>8</td>
<td></td>
<td>44%</td>
</tr>
<tr>
<td>4</td>
<td>KEYBOARD</td>
<td>Typing</td>
<td>12</td>
<td></td>
<td>84%</td>
</tr>
<tr>
<td>5</td>
<td>DIARY</td>
<td>Privacy</td>
<td>11</td>
<td></td>
<td>4%</td>
</tr>
<tr>
<td>6</td>
<td>COMMUNICATION</td>
<td>Speech</td>
<td>11</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>7</td>
<td>DOCUMENT</td>
<td>Paperwork</td>
<td>8</td>
<td></td>
<td>48%</td>
</tr>
<tr>
<td>8</td>
<td>WINDOWS</td>
<td>Sight (i.e. view)</td>
<td>8</td>
<td></td>
<td>24%</td>
</tr>
<tr>
<td>9</td>
<td>GAME</td>
<td>Computer</td>
<td>11</td>
<td></td>
<td>76%</td>
</tr>
<tr>
<td>10</td>
<td>TOOLS</td>
<td>Toolkit &amp; tools (i.e. hammer)</td>
<td>12</td>
<td></td>
<td>12%</td>
</tr>
<tr>
<td>11</td>
<td>NOTEPAD</td>
<td>Computer features</td>
<td>11</td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td>12</td>
<td>SCREEN</td>
<td>Computer</td>
<td>10</td>
<td></td>
<td>96%</td>
</tr>
<tr>
<td>13</td>
<td>PLATFORM</td>
<td>Stage &amp; construction</td>
<td>14</td>
<td></td>
<td>24%</td>
</tr>
<tr>
<td>14</td>
<td>CLIPBOARD</td>
<td>Paper &amp; stationery</td>
<td>13</td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>15</td>
<td>BROWSING</td>
<td>Internet</td>
<td>20</td>
<td></td>
<td>92%</td>
</tr>
<tr>
<td>16</td>
<td>MAIL</td>
<td>Gender</td>
<td>10</td>
<td></td>
<td>32%</td>
</tr>
<tr>
<td>17</td>
<td>PAGE</td>
<td>Paper</td>
<td>10</td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>18</td>
<td>DATA</td>
<td>Computer software</td>
<td>15</td>
<td></td>
<td>88%</td>
</tr>
<tr>
<td>19</td>
<td>CLOUD</td>
<td>Weather</td>
<td>14</td>
<td></td>
<td>24%</td>
</tr>
<tr>
<td>20</td>
<td>DESKTOP</td>
<td>Computer</td>
<td>14</td>
<td></td>
<td>88%</td>
</tr>
</tbody>
</table>
In Table 5.2, the grouping of participant responses into TECH or NON-TECH conceptualisations is displayed. In the first column, the items are numbered according to how they were presented to the participants verbally (see Appendix C).

The second and third columns in the table indicate the TECH - NON-TECH distinction. The items were added to either the TECH or NON-TECH column to indicate that it is conceptualised as either in a technological or a non-technological manner. The table indicates that 13 out of 20 items were more likely to be associated with a word that is related to the ‘non-technology frame’ of the category. The remaining 7 items were more likely to be associated with a word that is related to the ‘computer technology frame’ of the category. The fourth column in the table indicates the typical (and most prevalent) participant response to the lexical item. In this regard, similar and/or closely related responses were grouped together in order to group the item accurately. For instance, upon response to the item tools, participants did not say TOOLKIT AND TOOLS, but

![Figure 5.4](image)
responded with words like ‘hammer’ or ‘nails’. These were considered as sub-parts (or attributes) of the category TOOLKIT AND TOOLS.

The fifth column contains the number of participants, who responded with a similar and/or related response, as shown in the fourth column of Table 5.2. Note that the average percentage displayed in the last column may not relate to the number of participants, who responded similarly since other, less popular, responses to the item were also considered in the calculation of the average percentage of the TECH - NON-TECH responses. For example, the responses to file (item 1) are generally non-technological (with an average percentage of 24% technology-oriented responses), but only 9 out of 25 participants responded in a similar or related manner, i.e. with ‘paper’. The other responses included, ‘storage’, ‘administration’ (based on the follow-up questioning, these were both considered to be non-technological responses) as well as ‘computer’. Though the other responses were mentioned less often than ‘paper’, they were still included in calculating the average percentages. This was done to avoid excluding participant responses in an attempt to gain a more accurate understanding of the nature of the sample group’s holistic conceptualisation of a category. In the last column of the table, the average percentage that a category is conceptualised as technological is displayed.

Figure 5.4 displays the average percentage of word associations (for each of the presented categories) that were related to technology. Categories such as screen (96% TECH) and browsing (92% TECH) were associated mostly with lexical items that are related to technology, the category page (0% TECH) was not at all associated with technology. It is particularly noticeable in Figure 5.4 that computer hardware seems to be highly technologically conceptualised. Consider categories such as screen (96% TECH), desktop (88% TECH) and keyboard (84% TECH). Aspects of the DMMB that seem to be less associated with technology, including categories such as document (48% TECH), word (44% TECH) and file (24% TECH), fall in the mid to low range (between 48% and 24% TECH). Categories, which have been introduced to the DMMB quite recently, such as cloud (24% TECH) and platform (24% TECH) also feature toward the lower end of the graph. At the lowest end of the line graph are the categories diary (4% TECH), clipboard
(0% TECH) and page (0% TECH). The categories that are the lowest on the technology-driven spectrum also appear to be categories that the participants use regularly in their non-technological forms. This is explained in more detail in Section 5.5, where the results and their relevance to this study are discussed.

5.4.5. Correlation tests

In order to address the primary research questions, namely whether there exists a relationship between conceptualisation and behaviour and between conceptualisation, behaviour and exposure, it is necessary to establish the nature of the correlations between behaviour and conceptualisation, and between behaviour and conceptualisation and the social variables, in particular exposure. Correlations are drawn by means of a correlation coefficient, which is a “quantitative assessment of the strength of relationship between the \( x \) and \( y \) values in a set of \((x, y)\) pairs” (Devore and Peck 2001: 136). In the present study, Spearman’s rank correlation coefficient (\( \rho \)) was used to determine the nature of the association between the above mentioned variables, seeing that \( \rho \) can be used with non-parametric data and is not as sensitive to outliers. The Spearman’s rank correlation coefficient investigates the ranks of the \( x \) and \( y \) variables. A strong positive relationship occurs when the \( x \) variable with small ranks is paired with the \( y \) variable that has small ranks; or in a more extreme case when large \( x \) ranks are paired with large \( y \) ranks. In turn, a negative relationship exists when large \( x \) ranks are paired with small \( y \) ranks. Spearman’s correlation coefficient (\( \rho \)) is applied once these ranks have been determined.

Correlations between behaviour and conceptualisation, and the social variables (i.e. the themes identified in Chapter 4) were drawn using Spearman’s rank correlations. These correlations determined whether a relationship exists between conceptualisation and behaviour and if these variables maintain relationships with the social variables, including the age of early home exposure, current exposure, interests, skills and abilities at school level, early exposure (access) and parental support (it should be noted that age of early home exposure relates to the initial age at which the participant was exposed to the computer at his home, while early exposure (access) deals with the amount of exposure the participant had at his
Correlations were also drawn between the various social variables to determine if there is a link between them (seeing that many of the social variables could be influenced by exposure in some way).

5.4.5.1. The results of the non-parametric correlation tests

Before providing the statistical results of the Spearman’s rank coefficient correlation, the relationship between behaviour and conceptualisation is visually represented in a scatter plot and in corresponding box plots (Figure 5.5).

Figure 5.5 Scatter plot and box plots indicating the correlation between behaviour and conceptualisation.

Figure 5.5 is a representation of 24 data points (the number of participants in the sample group). These data points are \((x, y)\) pairs. Conceptualisation is depicted on the x axis; the extent to which conceptualisations are technological is indicated in percentages. The behaviour variable is depicted on the y axis (again in percentages which indicate the extent to which behaviour is computer-based). As can be seen, the data is clustered at the bottom left and again at the top middle-
to-right of the scatter plot. The general tendency seems to be that more data points are located at the top middle (and toward the right side) of the scatter plot. Hence, this figure seems to indicate that the behaviour variable and the conceptualisation variable generally maintain a positive correlation.

The corresponding box plots in Figure 5.5 indicate the median value (the middle value) of the data sets (the black line inside the box). The boxes display the range in which most of the data points can be found. Thus, the behaviour variable shows a large range (from approximately 20.00 to 90.00), while the conceptualisation variable indicates a more concentrated range in which the data are located (from approximately 40.00 to 55.00). The whiskers of the boxes point to the location of the smallest data point and the largest data point. In the case of the behaviour variable, the smallest data point is located at 10.00 and the largest at 100.00. The smallest data point for the conceptualisation variable is located at 25.00 and the largest data point is located at 65.00. It further indicates two data points outside of the range of data points. These are mild to extreme outliers for the conceptualisation variable. These box plots show that the range of data points surrounding the median differ from a large range for the behaviour variable to a smaller range for the conceptualisation variable. The median values show the concentrated nature of the data set for the conceptualisation variable, as the median line is approximately centred in the box, while the median value for the behaviour variable is located at the upper edge of the box.

Table 5.3 presents the statistics of the Spearman’s rank correlation coefficient. The nature of the correlation between the behaviour variable, the conceptualisation variable, and the social variables is represented in this table.
Table 5.3 Spearman correlations between behaviour, conceptualisation and relevant social variables.

<table>
<thead>
<tr>
<th>% Computer-based Behaviour</th>
<th>% Conceptual TECH</th>
<th>Interests</th>
<th>Skills/abilities at school level</th>
<th>Early Exposure</th>
<th>Early Home Exposure (Age)</th>
<th>Current Exposure % (/24 hours)</th>
<th>Parental Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Computer-based Behaviour</td>
<td>1.000</td>
<td>.451*</td>
<td>.233</td>
<td>.038</td>
<td>.518**</td>
<td>.130</td>
<td>.117</td>
</tr>
<tr>
<td>% Conceptual TECH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td></td>
<td>.027</td>
<td></td>
<td>.273</td>
<td>.860</td>
<td>.010</td>
<td>.545</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interests</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td>.451*</td>
<td>1.000</td>
<td></td>
<td>.375</td>
<td>.434*</td>
<td>.030</td>
<td>.120</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.027</td>
<td></td>
<td></td>
<td>.183</td>
<td>.075</td>
<td>.034</td>
<td>.888</td>
</tr>
<tr>
<td>Skills/abilities at school level</td>
<td>.233</td>
<td>.281</td>
<td>1.000</td>
<td>.405</td>
<td>.165</td>
<td>-.395</td>
<td>.140</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.273</td>
<td>.183</td>
<td></td>
<td>.050*</td>
<td>.440</td>
<td>.056</td>
<td>.513</td>
</tr>
<tr>
<td>Early Exposure (Access)</td>
<td></td>
<td>.038</td>
<td></td>
<td>.371</td>
<td>.405</td>
<td>1.000</td>
<td>-.086</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td>.518**</td>
<td>.434*</td>
<td></td>
<td>.165</td>
<td>.278</td>
<td>1.000</td>
<td>-.196</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.010</td>
<td>.034</td>
<td></td>
<td>.440</td>
<td>.186</td>
<td></td>
<td>.358</td>
</tr>
<tr>
<td>Early Home Exposure (Age)</td>
<td></td>
<td>.587</td>
<td></td>
<td>.888</td>
<td>.056</td>
<td></td>
<td>.358</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Exposure %</td>
<td></td>
<td>.117</td>
<td></td>
<td>.140</td>
<td>-.030</td>
<td>-.182</td>
<td>.072</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parental Support</td>
<td></td>
<td>.587</td>
<td></td>
<td>.577</td>
<td>.513</td>
<td>.891</td>
<td>.396</td>
</tr>
<tr>
<td>Correlation coefficient</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.740</td>
</tr>
</tbody>
</table>

N = 24
An inspection of the test statistics reveals that behaviour and conceptualisation are positively correlated ($\rho (24) = .451; \ p = .027$). This indicates that there is a significant association between the behaviour variable and the conceptualisation variable.

The table further indicates that a significant positive correlation exists between behaviour and the social variable early exposure ($\rho (24) = .518; \ p = .010$), and between conceptualisation and early exposure ($\rho (24) = .434; \ p = .034$). Another correlation appears between two of the social variables: skills/abilities at school level displays a positive correlation with interests ($\rho (24) = .405; \ p = .050$).

The social variables that were tested (and outlined in the previous section), namely Early Home Exposure (Age), Current Exposure % (/24 hours), Interests, Skills/abilities at school level, Early Exposure (Access) and Parental Support, are the key social and environmental factors, which were the dominating themes in the qualitative data analysis. However, as indicated in Table 5.3, the variables early home exposure (age), current exposure % (/24 hours) and parental support did not correlate with either the behaviour or conceptualisation variable and also did not correlate with one another.

In summary, the Spearman’s rank correlation test confirmed that a significant and positive association exists between the behaviour variable and the conceptualisation variable, between the behaviour variable and the early exposure social variable, between the conceptualisation variable and the early exposure variable and between the skills/abilities at school level variable and the interests variable. These statistically significant correlations are further interpreted in the next section.

5.4.6. Testing the group variable

The results of the correlation tests above indicate that a positive correlation exists between the behaviour variable and the conceptualisation variable. That is to say that when a participant predominantly selects the computer to do office-based tasks, he will also maintain more technological conceptualisations of lexical
categories associated with the DMMB. Similarly, when a participant decides to make use of paper to do office-based tasks, it is more likely that he will conceptualise computer-related and other office features as non-technological and actual.

The correlation tests indicate that early exposure (access) correlates with both the behaviour and the conceptualisation variables. The early exposure variable encompasses the amount of access that a participant had, in his childhood years, to the computer. More specifically, this categorical variable determines whether they had no access to the computer, controlled access (where their parents/guardians provided some restriction to how long they were allowed to use the computer) or unlimited access to the computer on a daily basis. In the context of this study, it is interesting to determine whether sub-groups of participants could be identified (based on the amount of early exposure) and whether there are significant differences between these groups with regard to conceptualisation of and behaviour related to computer technology.

In order to determine this, the sample was divided into two groups based on the early exposure of each participant. This resulted in a ‘low-exposure group’ and a ‘high-exposure group’. Group 1, the low-exposure group, consists of participants, who had no access or controlled access (below three hours per day) of computer exposure; while Group 2 is the high-exposure group, which comprises participants, who had controlled access (above three hours per day) or unlimited access to the computer during their childhoods.

Participants, who had no restrictions regarding computer access, were marked as ‘unlimited’ and were placed into Group 2, the high-exposure group. In cases where participants maintained controlled access, a further division was done in order to form only two exposure groups (recall that this variable consisted of three categories in the initial analysis, as described in the previous paragraph). In these cases, the hours of exposure were considered. If the hours of exposure were below 3 hours, the participant was placed into the low-exposure group (Group 1). If the hours of exposure was 3 hours and above, it was still considered to be controlled access, but, for the purposes of this analysis, was seen as a relatively
high exposure (in number of hours) per day. Therefore, these participants were placed in the high-exposure group.

Figure 5.6 indicates the mean values of the computer-based behaviour and the TECH conceptualisation of participants in the high- and the low-exposure groups.

Figure 5.6 Bar graph indicating the mean values of the high and low-exposure groups' computer-based behaviour and TECH conceptualisation.

The division of the sample, based on the criteria discussed above meant that there are 12 participants in the low-exposure group and 12 participants in the high-exposure group. The mean differences between the two groups, in terms of behaviour and conceptualisation, are presented in Figure 5.6. Group 1 (low-exposure group) has a mean of 50 for computer-related behaviour, and a mean of 38.75 for TECH conceptualisation (the first bar and the third bar on the graph). Group 2 (high-exposure group) has a mean of 70 for computer-related behaviour and 52.08 for conceptualisation (the second bar and the fourth bar on the graph). These mean values indicate that there is a general tendency for the low-exposure group to maintain less computer-based behaviour and fewer TECH conceptualisations (as the group’s mean values are lower than that of the high-exposure group). The mean values indicate that, as anticipated, there is a general tendency for participants, who had more exposure to the computer during childhood, to maintain a higher level of computer-based behaviour and TECH conceptualisations.
To test whether the observed mean differences are statistically significant, a Mann-Whitney U test was performed. The results of this test are reported in the next sub-section.

5.4.6.1. The Mann-Whitney U Test

In essence, a Mann-Whitney U test determines whether a null hypothesis can be rejected based on the possibility that two distributions have ‘different central tendencies’ (Howell 1999: 395). In the present study, two null hypotheses were tested. The first null hypothesis is that the distribution of technological (computer-based) and non-technological (paper-based) behaviour is the same across both groups. The second null hypothesis is that the distribution of technological and non-technological conceptualisations is the same across the two groups.

The main reason for using the Mann-Whitney U test in this study is that this test does not presuppose that the data are normally distributed. This test possesses less statistical power than parametric tests in quantitative analysis (Howell 1999) and as a result, generalisations cannot be made with full conviction when applying this type of testing. However, the aim of this study is not to generalise the result that this study delivers, but instead to show that a study of this nature can be conducted using quantitative research tools and that it might be worthwhile to conduct similar studies with bigger samples. The results from the Mann-Whitney U test are indicated in Table 5.4 below.

Table 5.4 Results of the Mann-Whitney U test.

<table>
<thead>
<tr>
<th>Hypothesis Test Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Null Hypothesis</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

Asymptotic significances are displayed. The significance level is .05.

¹Exact significance is displayed for this test.
Table 5.4 shows the results of the independent samples Mann-Whitney U tests. In both cases, the tests show that the null hypotheses can be rejected. Recall, that the null hypotheses (displayed in the first column) were that i) computer-based behaviour is the same across the groups and ii) technological conceptualisation is the same across the groups. Essentially, the results indicate that the distribution of the variables % Computer-based Behaviour and % Conceptual TECH varies between the two groups. The observed difference between the high-exposure group and the low-exposure group in terms of behaviour is significant ($U=.035$). Likewise, the mean difference between the two groups in terms of conceptualisation is significant ($U=.047$). Consequently, the Mann-Whitney test confirms that there exist statistically significant differences between the groups' behaviour and conceptualisation.

Taken together, the results of the Spearman correlations and the Mann-Whitney U tests imply that the observed differences in this sample, specifically with regard to computer-based behaviour and conceptualisation of the DMMB, are not arbitrary, but can be explained as a result of the amount of early exposure to computers during childhood.

In the following section, the results of the quantitative analysis of the data are discussed in detail.

### 5.5. Discussion of the Results

The results from the behaviour and word association experiments are discussed here.

Computer-based behaviour was distributed in a bimodal (non-normally distributed) fashion, while the data from the conceptualisation task was concentrated unimodally (normally distributed). A possible explanation for this pattern of distribution is that behaviour relies on a conscious cognitive process, while conceptualisation is unconscious. Participants had the opportunity to select the means in which they executed the behavioural tasks. Upon questioning participants regarding this conscious selection process, many responded that they
decided to use the medium with which they felt most comfortable and which was a ‘force of habit’. Humans are constantly pressured to make selections that will maximise relevance: “Relevance theory claims that humans do have an automatic tendency to maximise relevance, not because we have a choice in the matter – we rarely do – but because of the way our cognitive systems have evolved” (Wilson and Sperber 2006: 254). Thus, many participants automatically selected the computer, which in turn resulted in a highly computer-based behavioural pattern.

The central premise of Relevance Theory is that an utterance that is accurate and predictable enough should raise the prospect of relevance in order to successfully provide meaning to a listener. Wilson and Sperber’s intent is to determine what these prospects of relevance are and in what way they may contribute to an empirically sound explanation of comprehension (Wilson and Sperber 2006). Wilson and Sperber (2006) use the term contextual implication to explain this effect. A contextual implication occurs from a conclusion that is drawn from the input as well as the context. Wilson and Sperber (2006: 252) argue that there are degrees of relevance: “Relevance theory claims that what makes an input worth picking out from the mass of competing stimuli is not just that it is relevant, but that it is more relevant than any alternative input available to us at that time”. Another aspect to consider, besides cognitive effect, regarding relevance, is processing effort, meaning that if an input takes long or is arduous to process, infer or to memorise, it usually loses relevance.

Relevance Theory affirms the importance of the participants’ current exposure in the college environment. Relevance to this study’s participants usually relates to which medium is used most often and which medium they are required to use to complete certain tasks. Continuous usage of the computer within an environment that promotes computer usage would make participants more familiar and, thus, more comfortable with computer interactions to the extent where they prefer to work with the computer instead of paper.

The choice to make use of the computer or of paper was enforced by participants’ initial selection. In other words, if the participant selected to complete the first task on the computer, it was often the case that they completed all the remaining tasks
on the computer. However, if the participant chose to complete the initial task on paper, they continued to do the tasks on paper. This indicates that the initial selection becomes internalised to the extent where it is a reflexive and continuous process. Naturally, there are exceptions to this observation. In cases where a participant found a task challenging on their initial medium of choice or did not notice that there was an option to do the tasks either on the computer or on paper, it was the tendency to switch to the other medium in order to complete the task with greater speed and ease. Analysis of the video recordings of the behavioural tasks confirmed that participants tended to switch between tasks for particular reasons. If the participant switched between tasks, it was questioned in the interviews afterwards. Participant 1 chose to switch from paper to computer after completing the first task on paper and then noticing that he had the option of completing the tasks on computer. In the interview, he explained that he does most things on the computer and that using the computer is routine behaviour for him: “I’m in IT… Every time I do something it’s on the computer”. Participant 19 came across some difficulty in completing one of the tasks on the computer. He resorted to asking the researcher for assistance. However, he realised on his own that he could complete the task on paper instead. He opted to complete the rest of the tasks on paper. He later explained that he found it difficult to complete tasks on the computer: “For me things feel easier and more comfortable when I write things down than typing. For me it’s an effort to use the computer”.

In light of conceptualisation, it is dependent on an unconscious, online cognitive process that cannot be modified or manipulated at will by the participant. In the conceptual task, participants responded instinctively to the given categories and did not have the opportunity to consider their responses.

When the distributions of both the behaviour and conceptualisation variables are compared, the extreme distribution of the behavioural tasks’ results could signify that routine behaviour may affect conceptual processes. The Spearman rho correlation tests confirmed that individuals, who exhibit primarily computer/technological behaviour in an office space, are more likely to conceptualise categories related to the computer in a technological manner, while
individuals with a tendency to complete tasks on paper seem to maintain a lower number of technological conceptualisations.

The nature of the behaviour and conceptualisation data in the present study has to be considered in terms of metaphoric value. With regard to the DMMB, the more extensive and prolonged the computer exposure, the lower the level of metaphoric conceptualisation. Consequently, if computer exposure was limited, the conceptual process would maintain a high metaphoric value. The effect that extensive, prolonged computer-based behaviour seems to have on conceptualisation is that this behaviour may lead one to conceptualise more in terms of technology, instead of real-world objects, causing conceptualisation of computer-related categories to lose metaphoric quality and possibly become conventionalised blends. This postulate is supported by the results of the Mann-Whitney U test, and by the positive correlations between the variables. The discussion in Chapter 4 supplements this idea.

Various social variables emerged as dominant themes from the qualitative analysis of the interviews (in Chapter 4). However, only one of the observed social variables, namely early exposure (access), significantly correlated with behaviour and conceptualisation. There were no significant association between the other social variables (early home exposure (age), current exposure % (/24 hours), interests, skills/abilities at school level and parental support) and behaviour and conceptualisation. This could possibly be attributed to the small size of the sample. Another possibility is that human cognition is a complex system. The embodied mind is constantly loaded with external input, and it is in no way possible to measure or define this input in full in one research study. This research study deals with a relatively homogeneous group of participants, but no study can dispense with individual idiosyncrasies. To account for this limitation, one should study a bigger sample using a wider range of research tools (for example, a Likert Scale questionnaire could be used to capture more of the complexity of human cognition).

The significant correlations between early exposure and behaviour and early exposure and conceptualisation are indicative of the effect of prolonged exposure
on behaviour and conceptualisation. On the basis of these positive correlations, one could conclude that an increase in early exposure will lead to an increase in computer-based behaviour and technological conceptualisation. While the positive correlations clearly prove that there is an association between the above mentioned variables, it is not possible, given the limitations of the present study, to argue that early exposure to the computer causes specific behavioural and/or conceptualisation patterns. The reason for this is that, due to the small sample size, it was not possible to conduct a regression analysis. Hence, it is speculated that a person, who has been exposed to the computer at an early age, will instinctively select the computer to execute tasks and, after regular and prolonged exposure, their cognitive processing will follow suit to the extent where their conceptualisation of the DMMB has a low metaphoric quality. Figure 5.7 below illustrates the relationship between these variables, as determined by the quantitative analysis:

![Diagram](image)

**Figure 5.7** The relationship between the exposure variable and the behaviour and conceptualisation variables.

Exposure is considered as the external factor, emergent from the immediate and long-term environment and social context of the participants that has the power to influence both an internal, but conscious selection to behave in a particular manner as well as an internal, but unconscious inclination to conceptualise in a certain manner.
In order to better understand the impact that early exposure may have on *behaviour and conceptualisation*, the sample group was divided into two groups, namely a low-exposure group and a high-exposure group. A comparison of the group means (using a Mann-Whitney U test) confirmed that early exposure has a significant effect on how participants tend to behave and conceptualise in later life. The group that experienced low exposure to the computer during childhood was less likely to select the computer to complete tasks and is also less likely to conceptualise in a technological manner. The group that was exposed to the computer more often during childhood exhibited a higher level of computer-based behaviour and tended to conceptualise in a technological manner.

It was mentioned earlier that the conceptualisation of individual categories of computers could lead to a better understanding of how a participant conceptualises the DMMB holistically, and whether conceptualisation will be more or less technological. An item analysis, based on the data from the conceptual tasks, was conducted to define more clearly the nature of the participants’ conceptualisations. Generally speaking, the results of the item analysis indicated that computer hardware terms tend to be conceptualised in relation to technology, while newly introduced technological terms, such as *cloud*, are conceptualised more in terms of the actual object (i.e. the cloud in the sky). Theoretically, it is hypothesised that an item, which is predominantly associated with technology, such as *keyboard* for example, is embedded in the mind, in terms of deeply rooted frames and image schemas, to the extent where the mind automatically conceptualises the item in accordance with the COMPUTER TECHNOLOGY frame. The conceptual system does not have to draw a great deal of associations in order to reach the technological conceptualisation of *keyboard*. This means that, in this particular sample of participants, *keyboard* is not understood in terms of an INSTRUMENT or MUSIC frame. The association with the computer desktop has become so strong that they are seldom conceptualised as existing outside of the COMPUTER TECHNOLOGY frame. Thus, participants in this study do not think of a piano within the MUSIC frame when they think about a *keyboard*, because this particular lexical item seems to have primed the COMPUTER TECHNOLOGY frame to the point where the association has become conventionalised. This is keeping with findings by Thibodeau and Boroditsky.
(2011), and Bock (1980), who demonstrated that once a particular frame is activated, participants tend to think within the context of what is expected in that frame – admittedly, even being in a computer training college could have a priming effect too.

This also seems to be the case for the category game, which is conceptualised predominantly as a category belonging to the COMPUTER TECHNOLOGY frame. Participants generally did not respond to this category with real-world concepts, like ‘animals’ or ‘board games’. It can thus be argued that this category also primed the COMPUTER TECHNOLOGY frame to the extent that it is now a conventionalised association, which is activated due to the participants’ immersion in the technology-related context and the extent of their exposure to technology.

Similarly, items that were not conceptualised in terms of the COMPUTER TECHNOLOGY frame (below 50%), such as platform, are conceptualised according to their actual, real-world objects, in this case one can think of a stage. For the participants to understand platform as it relates to the DMMB, they will have to draw associations between the actual object and the computerised version thereof. As a result, the mind calls on a more intricate mapping process in order to construct the relevant meaning for platform. This means that platform has to be conceptualised metaphorically in order to understand it in relation to computers. Consequently, we can then assume that what is considered a technological concept based upon the item analysis, in fact maintains a low metaphoric quality in cognition and vice versa. This is explored in greater depth in the following chapter.

Three main conclusions can be drawn from the item analysis of the conceptual task: Firstly, the conceptualisation of computer hardware related items prove to be more technological than the other lexical items/categories. In this regard, most participants associated items like screen (96%), keyboard (84%) and game (76%) with the computer. Items like browsing (92%) and data (88%) were conceptualised similarly to computer hardware (highly technological). These two items were associated with aspects of the internet.
The presence of the internet in the participants’ daily lives may affect the technological nature of these categories as they are conceptualised. Furthermore, the sample group’s ages (between 18 to 25 years) and their initial exposure also come into play in this regard. The majority of the participants are not only very active on the internet on a daily basis, but they are also not familiar with computer exposure without the availability of the internet. In other words, they may have been too young to remember a time where the internet was not readily available and was a novel technology. This result manifests in the conceptualisation of communication, which is below 50% at 48%. Communication, generally conceptualised as a verbal, face-to-face discourse, was responded to on several occasions in a highly technology related manner, with responses like ‘texting’, ‘Whatsapp’, ‘social networking’, etc. These are all technological phenomena that result from the ubiquity of technology, which is becoming embedded in our social interactions and is influencing the conceptualisation of a particular item, which traditionally was non-technological. This change in conceptualisation may influence the conceptualisation of other items, like data or browsing.

Secondly, desktop related features, like document (48%), word (44%), file (24%) and windows (24%) are conceptualised less technologically. The participants often responded in a more literal manner to these items, like windows, considered in terms of a building or a view of the outdoors. Participants linked other categories mainly to paper-based administrative tasks. Many of the participants mentioned that they envisioned the filing cabinet that typically appears in an office for the item file (24%) and/or storage (28%). They iterated that they considered documents to be papers in typical yellow cardboard folders. The office schema is so ingrained in the general conceptual structure of the sample group that the lone-standing features cannot be fully adopted as technological conceptualisations. However, it is plausible that the combination of these features is what creates the conceptualisation of the computer desktop as a technological conceptualisation. Evidence in support of this appears in the technological status of the category desktop, which was mostly associated with the COMPUTER TECHNOLOGY frame (88% of the time). The category desktop is thus seldom conceptualised as the working space of an actual desk.
Thirdly, non-technological items are either new technological innovations or field-specific terms, such as cloud (24%) or platform (24%); or they are products of immediate exposure to their non-technological counterparts, like diary (4%), clipboard (0%) and page (0%). Since cloud computing is a relatively new addition to software programming, it is still a non-technological conceptualisation (responses often related to ‘nature’ or ‘weather’ aspects). However, it was found that participants, who were in their third year of study (and have cloud computing as a subject at college), associated cloud with ‘computer programme’. Upon regular and immediate exposure to cloud computing, the process of immersion in conceptualisation can be expedited. Platform also proved to be a term, which attains a technological conceptualisation based on regular usage with regard to software programming related vocabulary. Thus, a first year student may consider platform to be a ‘stage’ or a related concept, while a third- or fourth year student considers it to be a ‘coding’ or ‘programming’ concept.

Categories, like clipboard, diary and page were mostly non-technology related. The repeated, current exposure to these items in their actual forms stunts the conceptualisation in terms of metaphoric value and consequently maintains a non-technological status. This causes the participant to call upon more associations to familiar representations of the item, which results in highly metaphoric cognitive associations in order to bring forth the necessary cognitive schema for the conceptualisation of these features as computer-based. For example, participants mainly responded to clipboard with semantic associations, like ‘paper’, ‘brown’, ‘writing’, and so forth. If these participants are required to think of the clipboard as a tool that is featured on the computer, the cognitive process will inevitably need to make an association between their literal understanding of the clipboard (as a non-technological item) and the new definition of clipboard (as a technological category of the DMMB). In order to do this, the mind generates associations between features of the NON-TECH clipboard in order to link them to the TECH clipboard. In essence, the more mappings between concepts, the more it is conceptualised as a metaphor, and conversely, less mappings denote a concept with ‘lower metaphoric value’, perhaps even denoting a conventionalised blend.
Current exposure clearly has some influence on conceptualisation of technology related items. Thus, various aspects of exposure play a role in both conceptualisation and behaviour. Current exposure as a social variable did not prove to have a statistical bearing on the results, but this can be attributed to conceptualisation as driven by current exposure being a very individualistic phenomenon. Furthermore, the size of the sample is small and, if a bigger sample is tested, significant correlation for current exposure may be found.

5.6. Conclusion

This chapter deals with the quantitative aspect of this study: It considers the need for quantitative research within this study. The materials, namely the conceptual task (word association) and the behavioural task (controlled observation experiment) and methods of data collection are illustrated. Furthermore, the quantitative statistical test methods, including the frequency of distribution, the test for normality (Kolmogorov-Smirnov test), the item analysis, the correlations (Spearkman’s rho correlation test), and the Mann-Whitney U test based on the grouping of the sample into a high-exposure and a low-exposure group, and results of these tests are presented in the analytical framework and, finally, the results are discussed.

The results that emerged from the quantitative analysis of the data, and that are particularly relevant to this study’s research problem are (i) that there exists a statistically significant relationship between behaviour and conceptualisation; and (ii) that behaviour and conceptualisation maintain a relationship with early exposure; (iii) that the metaphoric value of participants’ behaviour and conceptualisation in this study seems to be determined by early exposure; (iv) that behaviour may have the capacity to affect conceptualisation; (v) that conceptualisation may evolve according to regular and prolonged computer-related behaviour; (vi) that current exposure may have bearing on conceptualisation of lexical categories; and (vii) that individual features of the computer desktop are conceptualised as non-technology-driven, but the holistic image of the desktop is highly technology-driven.
In the following chapter, the results from the quantitative part and the findings of the qualitative part of the study are consolidated, and are examined in light of the theoretical framework as conveyed in Chapter 2. The results discussed in this section are examined in greater depth in relation to the theoretical framework in the following chapter; it is also considered whether the results from both the qualitative and quantitative aspects of this study adequately address the study’s research questions.
Chapter 6

Discussion: Revisiting the Research Questions

6.1. Introduction

The purpose of this chapter is to integrate the findings presented in the last two chapters in order to answer the research questions posed in Chapter 1. Furthermore, the discussion of the findings are consolidated within this study’s theoretical framework, in order to determine the viability of the predictions made by the said theory (i.e. Conceptual Blending with regard to the DMMB – cf. Chapter 2).

First, the overall intent of the study is outlined briefly:

6.2. This study's central research problem

The research problem put forth in Section 1.2 of Chapter 1 contains two main areas of focus: 1) The social variables and their correlation with the participants’ conceptualisation and behaviour, and 2) the manner in which relevant social variables, particularly exposure, affect the generic space of the blend and whether these variables have bearing on the content of the blended space to the extent where it can be defined as more metaphoric or less metaphoric.

In light of Focus Area 1, it was hypothesised that social variables, specifically exposure, will affect the nature of the participants’ conceptualisation of the DMMB and interaction with the electronic computer desktop. Participants, who have been exposed to the computer for a prolonged time on a regular basis, will choose to interact with computerised features instead of paper-related features of the office to perform daily tasks. It was predicted that these participants will conceptualise objects related to the office environment as technological and computerised, instead of literal and paper-based. Conversely, participants who were exposed to the computer erratically and briefly were expected to select the paper-related features of the office environment to execute routine tasks and will conceptualise office-related objects in a literal, paper-based manner.
Regarding Focus Area 2, it was the goal to add to and build on the Conceptual Blending Theory model in order to make it more amenable to relevant social variables. It is postulated here that the generic space not only holds information that is relevant to both input spaces (both the ‘office-based’ input space and the ‘computer-based’ input space), but that it is also a space that holds potential influential social variables that are relevant to the content of the generic space and the blending model in its entirety. Thus, the generic space should be enhanced to accommodate contextual, social variables that generate related generic knowledge which adequately feeds into the two input spaces and projects into the blended space. At present, the standard model does not seem to incorporate social variables into the generic space of the blend, and no input space provides room for social variables; obviously, this precludes mapping of social variables into the blended space. These variables may have the capacity to generate a blend of the computer desktop that is more or less metaphoric. The social variable in question in this study is ‘exposure to computer technology’ and its related social variables.

In order to address the research problem, several research questions were posed in sub-section 1.2.1 of Chapter 1. The research questions are examined in light of the results of this study as sub-parts of the two focus areas identified above in the next section.

6.3. Addressing this study’s focus areas

In this section, the focus areas are scrutinised in greater depth in an attempt to answer each of this study’s research questions:

6.3.1. Focus Area 1

Focus Area 1 pays attention to social variables and whether they correlate with the participants’ conceptualisation and behaviour. This focus area deals with three of the primary research questions, namely Does exposure to computer technology influence the conceptualisation of technological phenomena?, Does exposure to computer technology motivate the behaviour within an office (and computer-related) environment?, and Is there a relationship between conceptualisation and
behaviour? The present study’s results are applied below to discuss their implication on Blending Theory:

6.3.1.1. The implication of the results on Blending Theory

a) Frames as foundational knowledge structures

Frames (cf. sub-section 2.2.1) are schemas that represent knowledge and experience conceptually, and are stored in long-term memory. Frames are rooted in and are subjected to cultural affiliations (Fillmore 1985). In Chapter 2, it was explained that frames are regularly updated according to experience. Based on the definition of conceptual frames, it can be stated that all knowledge related to computers is stored in a COMPUTER TECHNOLOGY frame. The present study presented statistical evidence that conceptualisation is associated with social variables, like ‘early exposure’ to the computer. Barsalou (1992: 21) argues that “frames are dynamic relational structures whose form is flexible and context dependent”. Barsalou (1992) does not argue against the view that frames form a part of long-term memory. Instead, he aims to define content within frames by considering the content in terms of attributes and values. He argues that experience affects the content of a frame, like an event sequence: “For each, a frame’s attributes remain relatively constant, with changes in values capturing changes over time” (Barsalou 1992: 67). The content of frames is dynamic to the extent where a person’s current experience and context may be capable of changing the content of the frame. As explained above, the focus of this study was on the conceptualisation of the DMMB and the interaction towards the computer desktop. Current exposure seemed to alter the participants’ interaction with the desktop. The conceptualisation of the DMMB was also affected, as discussed in Chapters 4 and 5. However, there exists no statistically significant relationship between current exposure and behaviour/conceptualisation, which can be attributed to the small size of the sample group.

It is likely that the content of a frame may be affected by social variables. The earlier an individual’s exposure to the computer, the more defined and content-rich the COMPUTER TECHNOLOGY frame will be. This study verifies that frames are embedded in long-term memory, as the results above show that regular and
prolonged computer exposure affects conceptualisation of technology. However, it does not dispel the notion that the content of frames is flexible and dynamic to better accommodate for experience, since “Frames readily allow people to adapt their knowledge to a changing world” (Barsalou 1992: 66).

It is assumed here that the COMPUTER TECHNOLOGY frame is as a foundational knowledge structure (Barsalou 1992: 21), introduced in long-term memory upon initial exposure to the computer, and the earlier this frame is constructed in the mind of a person, the more it will be populated with related knowledge.

This study’s participants and the manner in which they conceptualise computer technology is an example (cf. Chapter 4): participants’ initial exposure to the computer was usually school- or entertainment-related, which implies that knowledge stored in the COMPUTER TECHNOLOGY frame is also school- and entertainment-related; due to a change in their environments, they now relate computer technology to specialised computer programming knowledge, which means that the COMPUTER TECHNOLOGY frame is ‘updated’ in order to accommodate specialised computer-related knowledge, resulting in a change in the way the computer desktop is conceptualised.

Since frames are susceptible to socio-environmental contexts, Fillmore (1985) further adds that frames are culturally embedded. Frames are constructed both by cognition and by culture, and are cultural constructs as several frames can be shared by people (Kövecses 2006: 69). Culture is “a collection of shared understandings represented by frames, or cultural models”, meaning that frames represent shared knowledge by particular societies, subcultures and social groups (Kövecses 2006: 70). Therefore, the COMPUTER TECHNOLOGY frame would store different content depending on whether a person is exposed to a particular culture. Some people may not possess the conceptual frame COMPUTER TECHNOLOGY, because they form part of a culture where technology is not available, while other people may possess a COMPUTER TECHNOLOGY frame that only contains content related to the culture of the workplace, but not for personal use. These instances of computer exposure can be considered cultural instances that introduce certain content to the COMPUTER TECHNOLOGY
frame. It is thus likely that all people within a particular shared culture, like the workplace, will store knowledge related to workplace computer interactions in a COMPUTER TECHNOLOGY frame.

If culture affects the content of a conceptual frame, then one can consider social variables to play a role in determining the content of the frame. As this study’s results showed, early exposure affects conceptualisation of the [computer desktop] DMMB, and should therefore have some effect on the COMPUTER TECHNOLOGY frame. The influence of social variables on conceptualisation can be explained in terms of work done in neuroscience: humans are born with more neurons than they have in adulthood, as neurons, which are not used, die off within the first few years, as they are metabolically costly. This is partly due to Hebbian learning, which supports the idea that neural pathways are more readily formed in early childhood. Ramachandran and Hubbard (2003: 49) argue that the basis for upper case letters being more salient candidates for synaesthetic effects is the result of Hebb’s Law, because upper case letters are generally “learnt earlier” (Ramachandran and Hubbard 2003: 49). If it is assumed that frames are knowledge structures that result from neural priming, it can be argued that frames resulting from early exposure will be more deeply embedded in long-term memory, and will have a greater influence on the subject’s conceptual structure and behaviour.

The uniformity in the groups’ social characteristics regarding exposure was evident upon analysis of the comparative tests of the low- and high-exposure groups, which showed that conceptualisation and behaviour are subject to exposure, and are therefore different between the two exposure groups. These results can define the COMPUTER TECHNOLOGY frame to some extent for each exposure group, but can also identify that different social contexts have the capacity to determine the content of the frame.

Consequently, this study’s results verify what has been assumed by scholars, like Fillmore (1985) and Barsalou (1992), namely that the content of the COMPUTER TECHNOLOGY frame is culturally orientated, is dynamic due to its dependence on context, and, as shown in this study, is susceptible to the influence of social variables, like early exposure. This also means that the COMPUTER
TECHNOLOGY frame cannot be identical for each person as each person’s socio-cultural context may differ, even if slightly.

b) Embodied Realism in light of this study’s results

According to Lakoff and Johnson (1999), metaphors in general, and metaphorical blends specifically, are dependent on our experiences and environments. This means that our conceptual system does not function in isolation from our physical existence in our surrounding environments. Our existence in these environments requires particular physical interactions, which appear to automatically and dynamically affect conceptualisation to the point where meaning can be constructed in the mind (Lakoff and Johnson 1999: 90).

The theme current exposure is one such instance of how the environment affects the contents of the conceptual system, a claim Lakoff and Johnson (1999: 96) seem to support unequivocally.

In the present study, many participants’ conceptualisation of the COMPUTER TECHNOLOGY frame seemed to gradually evolve to include content that is less rooted in actual objects (such as bin or trashcan to refer to a container for rubbish), but is changing to become more rooted in technology-related objects (such as keyboard as a member of the category COMPUTER HARDWARE). Also, objects, which are initially stored in a non-technology related frame (such as cloud as a prototypical member of the category NATURE) can now be stored in the COMPUTER TECHNOLOGY frame as well (i.e. when cloud is conceptualised as a member of the SOFTWARE PROGRAMMING category). The role of the environment is evident since participants in this study tended to react more naturally towards the computer, perhaps as a habitual result of being embedded in an IT environment, and such behaviour is obviously informed by the COMPUTER TECHNOLOGY frame. As such, these facts are consistent with the assumptions made by the embodied realists, namely that “concepts do change over time” (Lakoff and Johnson 1999: 96).

It is evident that upon entering an academic IT environment, the content of the COMPUTER TECHNOLOGY frame be enhanced, since new knowledge and new
skills will have to be developed, over and above recreational computer-related activities, like surfing the internet or gaming.

The correlation between high exposure to computers, and the preference for using computers to complete office related tasks, can be supported by a theory which claims that priming takes place on a neurological level. It has been demonstrated that a phenomenon, known as ‘long-term potentiation’ (LTP), whereby groups of neurons are trained to fire more readily if they are constantly caused to do so via exposure. This happens because there is “a marked increase in neuronal firing that occurs during repetitive stimulation”, hence the predilection to fire is greater since repeated exposure results in “increased efficiency of transmission” (Lømo 2003: 617). The neural theory of metaphor obviously assumes a neural basis for metaphorical blending making an explanation of this sort quite amenable to the data.

\[c\) Categories and prototypes in the COMPUTER TECHNOLOGY frame\]

The question now arises: how is knowledge stored in the COMPUTER TECHNOLOGY frame? Similar patterns were found in this study that led to the identification of two exposure groups, that share similar behaviour and conceptualisation, which suggests that patterns in the content of the COMPUTER TECHNOLOGY frame can be postulated. In Chapter 2, Barsalou’s (1992) explanation of the manner in which knowledge is stored in a frame can be considered. Frames comprise of categories, which can be further divided into sub-categories. Thus, the COMPUTER TECHNOLOGY frame contains further knowledge sub-groupings. The item analysis (cf. sub-section 5.4.4.) was able to identify possible content that the frame can be populated with (categories and attributes of the categories). In the conceptual task, participants’ responses were considered to be concepts related to the categories mentioned above. The item analysis identified that some sub-categories are attributed more often to a specific category in the COMPUTER TECHNOLOGY frame than others. For example, screen, browsing, data, desktop and keyboard were prevalent in the item analysis as features or sub-categories within the COMPUTER TECHNOLOGY frame. Items, like page, clipboard, diary, tools and platform, were less regularly
associated with the COMPUTER TECHNOLOGY frame, and were therefore more likely stored in non-computer technology frames, such as the OFFICE frame.

This study did identify prevalent knowledge stored in the COMPUTER TECHNOLOGY frame (as explained in Chapter 5). Prototype theory is useful in explaining the conceptualisation of the [desktop] DMMB in the COMPUTER TECHNOLOGY frame and of a specific category in this frame. In sub-section 2.4, Prototype Theory and its relevance to this study were explained: there is a prototypical member in each category, which is the most representative of the category in question, and other members are more or less like the prototypical member – those less similar to the prototypical member are seen as marginal members (Evans and Green 2006: 249). In this study, concepts pertaining to computer hardware and the internet seemed more likely to be stored in the COMPUTER TECHNOLOGY frame. These sub-categories included screen, browsing, data, desktop and keyboard, which are the most commonly associated to computer technology. Desktop was more often associated with sub-categories from the COMPUTER TECHNOLOGY frame, and it can therefore be postulated that desktop is a member of the COMPUTER TECHNOLOGY frame.

Prototypical members may not be the same for all participants. Lakoff and Johnson’s (1999) view that our subjective experiences dictate the manner in which we conceptualise particular things seems commensurate with this. Therefore, it is possible that even participants with similar levels of exposure can experience it differently to the point where their conceptualisation is different, since other factors like ‘interest’ and ‘attention’ would have an influence. Since the content of frames is adaptable and constantly updated relating to the environment in which we function, this assumption could be extended to include categories and prototypes.

Some participants categorised platform and cloud as belonging to the SOFTWARE PROGRAMMING category, while other participants categorised platform and cloud as concepts within the STAGE and WEATHER frames respectively. As argued earlier, it is likely that these categorisations are the result of high exposure. Both the high- and low-exposure groups tended to respond to the item desktop with the lexical item computer. In some instances, lexical responses from participants in the high-exposure group varied to include icons.
and Microsoft, while two participants in the low-exposure group responded with *table* and *book* (conceptualising *desktop* within the OFFICE frame). However, *desktop* generally forms a part of the COMPUTER TECHNOLOGY frame, with *computer* being the most often elicited lexical item in this category, possibly due to the effect of a high level of current exposure.

With regard to Prototype Theory, it seems that computer hardware (like *screen*, *desktop* and *keyboard*) tend to be conceptualised as the central members of the COMPUTER category. Fox (2011) considers prototypes to have a highly dynamic quality, since “the prototype differs between individuals and moments, making it contextually variant. A concept might also contain multiple prototypes” (Fox 2011: 154). Hence, it is likely that prototypical members may also be dynamic in nature in this study, making it acceptable to postulate various candidates for prototypicality.

*d) Input spaces as online conceptual constructs*

As explained in Section 2.2, input spaces draw on frames in order to be structured. Input spaces are online constructs that are created as we think and communicate (Fauconnier and Turner 2002: 40). Input spaces are constructs within Conceptual Blending Theory that are used to store content needed to project into and create new meaning in an emergent blended space. In this regard, the COMPUTER TECHNOLOGY frame consists of any knowledge of computer technology that a person has acquired through experiences. Input spaces are capable of accessing particular frames and deriving specific content from those frames in order to store content that is relevant to the construction of complex blends.

Input spaces seem to have the capacity to derive particular content from the COMPUTER TECHNOLOGY frame and present it in a more organised manner that is relevant to the blend. Thus, if the DMMB needs to be conceptualised, the input spaces are tasked with accessing relevant content from the frames in question. When running in the blend, possible relevant content that needs to be projected into the input space (for a particular individual) may include knowledge of a computer as an electronic device, computerised icons, functions of a computer, particular computer software and hardware; while mapping of non-
relevant content (for the same individual) may be blocked (meaning that marginal knowledge structures like games, software programming, internet features may not be projected). According to the findings, the non-relevant content is stored in the COMPUTER TECHNOLOGY frame, but may not be essential for the DMMB to run. The conceptual task allowed for some basis to postulate what the contents of the generic space could be, in terms of its relevance for the running of the blend. Input spaces select content from the relevant frame into the generic space, making the mapping from the generic space to the input spaces selective. Thus, the input spaces may access content that is particularly relevant for the DMMB to run.

Fauconnier and Turner (1998: 139) explain that the generic space “contains what the inputs have in common”, which allows for commensurability and counterpart connecting to take place between them. This is possible because the input spaces are tasked with “activating” (Fauconnier and Turner 2002: 40) particular knowledge in the frame and storing it in the input spaces to allow further blending to occur. Input spaces are “typically structured by frames” (Fauconnier and Turner 2002: 40), and frames play a role in constructing mental spaces that are employed in blending – these are referred to as “background frames” (Fauconnier and Turner 1998: 142). Input spaces may have a sorting and organising function in order to derive knowledge that is not shared from the generic space from the relevant “background frames”.

Thus input spaces derive relevant content from the COMPUTER TECHNOLOGY frame in the generic space in order to organise it for further blending to take place. The results showed that several other background frames were activated in order to run the blend. For instance, it may also access content in frames like the NATURE or WEATHER frame (for the conceptualisation of cloud) or from the CONSTRUCTION or BUILDING frame (for the conceptualisation of platform, tools, windows and storage) in the office-based input space. In light of this, input spaces are capable of identifying the relevant content in the relevant frame, accessing this content and organising it within the input space so that commensurability can be established between them before information can be projected to the blended space. Figure 6.1 illustrates a rudimentary schema of this process (where the smaller circles represent the background frames that connect to the input spaces):
Fauconnier and Turner (2002) explain that input spaces are connected to frames: “Mental spaces are connected to long-term schematic knowledge called ‘frames’, [...] and to long-term specific knowledge, such as memory” (Fauconnier and Turner 2002: 40). It can therefore be determined that input spaces connect with frames to derive knowledge and store this knowledge temporarily in order to further project it onto the blended space to enhance the construction of meaning. This is one attempt to explain how projection from the generic space is restricted, and the psychological reality of over-projection (Turner 2014: 64-66) lends credence to the idea that some content is indeed ‘blocked’ for the majority of people.

In summary, relevant insight is provided into the necessary cognitive operations leading up to conceptual integration in this section, and can to some extent verify the important function of frames, the content of frames, prototypes and categories, and how these frames affect the conceptual integration process.

In the next section, Focus Area 2 of this study is addressed and the implication of the results on the Conceptual Blending model is examined.

**6.3.2. Focus Area 2**

This focus area deals with Blending Theory, and how the results can contribute to enhancing particular aspects of the theory. It was hypothesised that social variables, like exposure, may have an influence on conceptualisation of the
DMMB. The contents and the nature of the generic space ought to be refined to accommodate for potentially influential social variables that may have an impact on the input spaces, and therefore on the blended space. The relevant research question was \textit{How does exposure to computer technology influence the contents and cognitive processes of the DMMB?}

\textbf{6.3.2.1. The implication of this study's results on Blending Theory}

The standard blend is made up of four spaces (cf. sub-section 2.3.3), namely the generic space, the two input spaces, and the blended space. The generic space contains information that is shared by both input spaces. Information in the generic space is selectively projected into two input spaces, namely the office-based input space and its features (input space 1) and the computer-based input space and its features (input space 2). Information in these input spaces connects to each other via counterpart connections, and project onto the blended space, which generates new information, in this case the DMMB.

\textit{a) Social variables in the generic space}

It is evident that exposure to computer technology plays an important role in the nature of the conceptualisation of the DMMB. This result has to be accounted for in the theoretical model. Based on the findings, the generic space needs to be more well-defined in terms of social variables, which can affect the emerging knowledge housed by the blended space. To date, standard blending theory is vague about the nature and contents of the generic space – and sometimes, it is dispensed with altogether (as is the case in Figure 17.2 in Fauconnier and Turner 2002: 377).

The generic space projects shared information into the two input spaces. It thus contains information that is relevant to both of the input spaces. Consequently, without access to the relevant social variables, the DMMB will not run in the blended space, implying that meaning construction will not take place because the relevant information will not be available to be projected onto the blended space. To account for the possibility that meaning construction will not take place without the identified social variables in the generic space, the generic space should be enhanced to store social and experiential knowledge that project into a shared
knowledge basis in the generic space and, as a result, project into the relevant input space. Incorporating these aspects will refine the model, providing a more accurate account of how the blend is formed. In the case of the DMMB, the generic space should store information about exposure to computer technology (in its various forms), which then projects into knowledge shared by both input spaces (i.e. knowledge of the office, and technological, environment and its features). This information then projects into the input spaces and into the blended space to construct meaning successfully.

It was briefly identified in Chapter 2 that “backward projection” is also a possible occurrence in the blend. This implies that, not only can content be projected from the generic space into the input spaces and then into the blended space, but that knowledge can possibly project out of the blended space into the input spaces and back into the generic space, causing the conceptual integration network to be interactive as each space in the network is constantly adjusted in light of experience. Evans and Green (2006: 410 — bolded in original) explain that “A further consequence of conceptual blending is that any space in the conceptual network can, as a result of the blend, undergo modification”. In order for backward projection to “contribute to the encyclopaedic knowledge system of the addressee”, backward projection occurs not only from the blend into the inputs, but also from the inputs into the generic space (Evans and Green 2006: 410).

The implication of backward projection on the DMMB can be relayed as follows: When the emergent blend is constructed, it brings forth new knowledge, in this case the example of the desktop being a computerised user interface. As a result, this blended space projects back into the input spaces, but seeing that it is a computer-based blend, it is likely that backward projection will occur more prominently into the input space that holds computer-based knowledge, than into the input space that holds paper- and office-based knowledge. This will possibly cause further backward projection into the generic space, thereby adjusting the knowledge in the generic space to be more technology-orientated than non-technology orientated. This implies that whenever the DMMB is conceptualised, it will be conceptualised as a computerised user interface that contributes knowledge to the computer-based input in order to affect encyclopaedic knowledge in the generic space. Evidently, the exposure to the desktop will be
considered as technological computer exposure instead of office-based exposure, thereby strengthening the links between the computer-related mappings in the blend as a whole, which explains why current exposure causes participants to behave and conceptualise in a more computer-orientated manner.

Theoretically, it is also possible that the DMMB can then “become conventionalised within a speech or cultural community” if it is found to be “salient and useful” (Evans and Green 2006: 410). This matter is returned to in (b) and (d) later in this sub-section.

b) Counterpart Connections

The DMMB is a double-scope blend (explained in sub-section 2.3.3.7). It is likely, from the results of this study that this double-scope blend allows for the dominance of mappings from one input space. Turner (2008) does not stipulate how much mapping will occur from each input space in a double-scope integration network, though it is evident that mapping does occur from both input spaces, unlike with single-scope blends. In fact, Turner (2010: 57) says that there are no “pure single-scope networks, because human beings […] immediately start running the blend and produce double-scope structure”. This, in part, motivates the idea that metaphors in general, understood as tantamount to single-scope ‘blends’, are essentially manifestations of conceptual integration, leading to more complex integration networks, or “advanced blending” (Turner 2014: 39).

For example, if a participant had prolonged and regular exposure to the computer since childhood, they are more likely to conceptualise in a more technological manner. Thus, in order for the blending model to account for exposure and the effect that this has on conceptualisation, the details regarding the mapping from the generic space into the input spaces needs to be reconsidered/refined. This could be explained as follows: if the generic space holds a high amount of exposure to computer technology, it should lead to a lesser degree of conventionalisation of the DMMB, implying that computer and technology-related knowledge are in less need of representation in order to be conceptualised in the mind of a person. This means that more information is projected from the generic space into the computer-based input space and, as such, into the blended space,
while less mapping occurs into the office-based input space, which then projects less into the blended space.

In this regard, it is argued that the blending model should account for input dominance due to the amount of mapping onto the input space from relevant and well-defined social and experiential knowledge in the generic space. Essentially, one input space (in the above example, it would be the computer-based input space) is richer in terms of the content that is projected into it, which causes it to be dominant.

Conceptual Blending Theory accounts for counterpart connections between two input spaces. Essentially, these spaces interact with one another by matching content from one input space with its analogue in the other input space. Fauconnier and Turner (2002: 105) explain that counterpart connections can take place either by connecting corresponding content between one input space and another due to the similarity in topologies or by matching input spaces via the internal relations that they share. For example, if the office-based input space contains ‘trash can’, it will connect with its virtual counterpart in the computer-based input space, namely the ‘recycle bin’. Counterpart connections are established due to mapping from the generic space into both spaces. Evans and Green (2006: 406) explain that “the generic space facilitates the identification of counterparts in the input spaces by serving as a ‘template’ for shared structure”. The present study acknowledges the presence of shared knowledge in the generic space, which is projected onto the input spaces in order for counterpart connections to be made, which may be projected into the blended space. However, the shared knowledge is generated due to social and experiential knowledge which informs shared knowledge.

Input dominance may be further enforced by the possibility that there may not be commensurable analogues for some items in the input spaces. This means that one input space contains features that are saturated, without an analogue in the other input space. For example, words which have technological meanings, but have no meanings outside of the technology frame are *clipart* and *screenshot*. The input space containing content with no counterpart content would then project more readily and quickly into the blended space, because it bypasses the
counterpart connections that happen across input spaces. Consequently, more content would be projected into the blended space from one input space and less content from the other input space, causing dominance of, for example, the computer-based input resulting in a technological blend.

Scholars assume that one input space can become so dominant that it can ‘cancel out’ the other input space. This may lead to the blend becoming conventionalised to the point of not being a blend or a metaphor any longer. This study’s results do not show conventionalisation of the DMMB to that extent. It seems like content is still projected from both input spaces, but it is plausible that content is generally projected more from one input space than from another. The results indicate that, though input dominance takes place, the office-based input space is deeply embedded in the minds of the participants, meaning that it is unlikely that the office-based input space will no longer be needed to construct the DMMB. The blend may, due to the nature of exposure in the generic space and the deeply-rooted conceptualisation within the OFFICE frame, never become fully conventionalised.

c) Metaphoric quality in input spaces

The input spaces consist of the office-based features (input space 1) and the computer-based features (input space 2), in this instance. The features of one input space are connected to their relevant counterparts in the other input space, despite features, which do not share counterparts in the other input space, as argued in (b) above. For example, paper files in the office-based input space project onto the folders icon in the computer-based input space and vice versa. Thus, these features interact with one another to the extent where the counterpart connectors between the two input spaces is argued to be metaphorical to some extent.

In Chapter 2, Black’s theory of interactive metaphors is discussed to explain the effect that counterpart connections have on input spaces. Fauconnier and Turner’s (1998) work can be considered a more detailed expansion of the theory of interactive metaphors. Black’s main premise is that “some of the ‘associated commonplaces’ themselves suffer metaphorical change of meaning in the process of transfer” (Black 1954: 289). Relating this to Blending Theory, when counterpart
connections take place between input spaces, it is likely that such input spaces are amended in order to better suit the particular blend that they inform. It is argued that the notion of structural changes of the content in the input spaces due to counterpart connections generate a metaphoric quality within the input spaces.

The structure of the input spaces needs to be reconsidered in the conceptual blending model. In this study, it is often the case that input spaces are in need of better defined parameters in terms of how they are structured and how they function in relation to one another in the model as an entirety. This study does not endeavour to any great extent to set these parameters, but it is likely that the theoretical model is in need of further exploration in this regard. However, to better understand the metaphoric nature of content in the blend, metaphoricity not only resides in the blended space, but may already emerge in the input spaces due to counterpart connections that tend to interact in a manner that is, essentially, not clear yet. The results show that metaphoric quality generated by counterpart connections between the input spaces is likely to be dependent on current exposure and context.

This study’s results seem to suggest that metaphorical quality of content in the input spaces may be dependent on current exposure: items like platform, clipboard and page most likely belong to the OFFICE frame, and would therefore be content of the office-based input space. Nevertheless, those participants, who conceptualised these concepts as categories of the COMPUTER TECHNOLOGY frame, were exposed to those items in an IT context. For example, some of the participants work with platforms in software programming, while others work with pages and clipboards in web development. It could be assumed that, due to the imperative role that current exposure plays, the same participants would conceptualise these items differently in a situation outside of the college context. Despite neural conditioning that enforces predominantly computer-based behaviour, it is likely that the change in context may activate a different frame, and different neural bindings. Consequently, participants would then behave differently. The participants, who conceptualised these items as office-based, are all exposed more often to their literal counterparts (as they make use of clipboards and pages to take notes, while the lecturer stands on a platform to present a lecture). Should these participants spend more hours doing work on their
computers, it is likely that they will conceptualise these items as knowledge of the COMPUTER TECHNOLOGY frame.

If a counterpart feature does not exist in the other input space, counterpart connecting cannot take place, lowering the metaphoric quality of the input space as a whole, because the feature does not contribute any metaphoric quality to the input space. In this case, the computer-based input space is likely to keep deriving content from the COMPUTER TECHNOLOGY frame, like computer hardware or internet features, because some of these items do not have counterparts that are used often in a non-technological environment (items like data and browsing were found to be associated mainly with the computer and are rarely used outside of the technological setting). In this case, these features may not have counterpart features in the other input space and counterpart connecting cannot occur. The influence of this on the computer-based input space that contains these features is that the input space’s metaphoric quality is lowered.

In this study, the focus is on the metaphorical quality that these features have once counterpart connection occurs in the DMMB integration network. Once these features are activated by means of counterpart connecting in the DMMB, it is argued that they add metaphoric quality to an extent to the conceptual integration network model. It is assumed that, since these features are deeply embedded non-metaphorical features, they will maintain metaphorical quality after counterpart connecting in the DMMB integration network occurs, but the metaphoric quality will be lower. It is thus acknowledged that they have no metaphorical quality in non-technological contexts, since counterpart connecting in the desktop integration network provides these features with metaphorical quality.

\textit{d) Proposed conceptual integration networks based on this study’s results}

In Section 4.4.2, two participants’ data were analysed as they represent typical examples of members of the high-exposure group (members who select computer-based behaviour and tend to conceptualise technologically) and the low-exposure group (members who select paper to complete tasks and tend to conceptualise non-technologically). Participant 12 was a member of the high-exposure group, while Participant 21 was a member of the low-exposure group. The distinctions between the two participants were not only drawn according to
their differences in behaviour and conceptualisation, but also according to the presence of the *exposure* variable in their data. These participants’ data were used to populate the conceptual integration network models below (Figures 6.2 and 6.3) in order to present the manner in which the DMMB is formed for members of the high-exposure and the low-exposure groups. The figures also illustrate an expanded version of the conceptual integration network model in order to accommodate all the relevant information that leads to a more likely representation of the conceptual process involved and the emergent blend. Nevertheless, it must be emphasised that these conceptual integration network models are representations of two individuals’ proposed conceptualisation of the DMMB. From the analysis of the data, these participants seem to represent the high- and low-exposure groups’ conceptualisations fittingly. Though, online processing is a very individualistic phenomenon, which varies due to differing levels of exposure, among other possible variables. This study can therefore not claim that these models are true representations of all the participants within the two exposure groups’ conceptualisation. These are simply proposed models of conceptualisation of the DMMB for the high- and low-exposure groups, in light of the findings of the present study.
Current Exposure: 10 hrs p/d
Age of Initial Exposure: 11 yrs
Primary School Exposure: 1.5 hrs p/week
Secondary School Exposure: 10 hrs p/week
Early Access: Unlimited
Parental support received
Study-related TECH interest
Skills/abilities at school level: A for IT subjects
Internet exposure: 5 hrs p/d for study purposes

**Figure 6.2** Participant 12’s conceptual integration network model for the DMMB.
Figure 6.2 presents Participant 12’s data in light of an enhanced conceptual integration network model displaying the relevant social variables and their influence on the model as a whole. Consider the generic space: The dotted rectangular box indicates the scope of the generic space. Within the generic space exists two mental spaces, which are the mental space that consists of social and environmental features, and the mental space that possesses shared knowledge of the content in the two input spaces. A participant of the high-exposure group, such as this participant, stores information in the generic space that relates to a high level of exposure (consider the information in the box on the left side).

The generic space contains social variables, which relate mainly to exposure (as established from the thematic analysis). For a participant from the high-exposure group, these factors are generally highly technologically driven.

Participant 12 has been exposed to the computer from an early age on a regular basis, which has resulted in an interest in computer technology and a skilled knowledge of and interaction with computer-based phenomena. She had little restriction in terms of the exposure that she had to the computer and she was able to interact with the computer in a supportive environment. Furthermore, her motivation for using the computer and the internet emerges from a drive to be successful in her studies. These findings show that the participant is highly technology-oriented to the extent where the knowledge that is housed in the generic space can affect her conceptualisation of the computer desktop.

The arrows between the mental spaces in the generic space (Figure 6.2) indicate that mapping occurs from the mental space housing social and environmental factors into the mental space that contains shared features of the input spaces. As outlined above, the participant’s social features tend to show high computer exposure. Hence, the input dominance featured in the conceptual integration network (the solid black lines show mappings into the dominant input space, while the dotted lines show mappings into the non-dominant input space).

The content of the input spaces was (partially) identified by means of the word association task. As discussed above, the lexical items all relate in some way to the computer desktop or are features of the desktop. However, the items have a
potential metaphoric quality in that they represent actual, real-world objects as well. The features of the computer (as identified in the conceptual task) were included in the input spaces, but the participants’ responses determined whether a particular feature was placed in the office-based or the computer-based input space. Figure 6.2 shows that the participant provided three responses that are stored in the COMPUTER TECHNOLOGY frame and two responses stored in a non-technology-related frame. Participant 12 provided a total of 13 out of 20 responses that could be classified as categories and sub-categories of the COMPUTER TECHNOLOGY frame, and 7 non-technological responses, which shows that the computer-based input space is more populated with the participant’s responses than the office-based input space. This resulted in the dominance of the computer-based input space (indicated with grey in the figure).

Due to the fact that the computer-based input space seems to be more populated in this case, it can be argued that analogue matching between input spaces will not necessarily occur with all features of the computer-based input space (the lines without arrows in Figure 6.2). The assumption is that the office-based input space would be less populated, and therefore there will not be analogous features available in the office-based input space (the underlined open spaces in the input space) that need to interact with counterpart features in the computer-based input space. This lessens the amount of counterpart connectors that occur between the two input spaces, which affects the metaphoricity of the DMMB.

What is evident in this regard is that, despite the tendency for the participant to conceptualise in a highly technological manner due to the exposure variables in the generic space, mapping still occurs into input space 1 (the office-based input) and input space 2 (the computer-based input). The fact that Participant 12 still conceptualises some computer-related concepts outside of the computer-based input space (and rather in the paper-based input space) leads to conclude that conventionalisation of the computer desktop has not happened. Therefore, it still represents the computer with features that likely are in need of representation, thereby making it metaphoric, though possibly to a lesser extent, because of the significant dominance of the computer-based input space.
Evidently, the blend has lost metaphoric quality, but this does not mean that all features of the DMMB are not in need of representation. As argued above and in Chapter 2, the entire conceptual integration network maintains a metaphoric quality. The DMMB may be less metaphoric than it arguably used to be (since its inception), but this study does not provide evidence that the metaphoric nature of the blend can be done away with altogether. Meaning construction of the computer desktop will not occur effectively should the office-based input space and its contents be omitted from the network. Given that, even in the high-exposure group, the DMMB does not seem to be conventionalised, one could perhaps argue that the conventionalisation of the DMMB may never occur (due to the dynamic nature of the individual features in the input spaces). Nevertheless, it can be stated that the integration network model presented above is, what Jurewicz (2014) calls, 'partially conventionalised' (2014: 112). In other words, the blend is based on sociocultural knowledge (participants tend to conceptualise the desktop as a computerised object due to their sociocultural exposure), but is still context-dependent (should participants be outside of this context, the academic IT environment, their conceptualisation may change) (Jurewicz 2014: 112). Thus, the DMMB seems to be a salient computerised concept that is still dynamic, as individual features of the input spaces and the blended space are still affected by context. For instance, should Participant 12 take a break from her studies and spend more time reading books than working on the computer, she may conceptualise word to be a written, paper-based concept, instead of a screen icon.

Participant 12’s conceptualisation of the computer desktop (as displayed in Figure 6.2) emphasises the effect that a high level of exposure to computer technology has on the conceptual integration network model as a whole, including the resulting blend, thereby motivating her (and the other participants in the high-exposure group’s) highly computer-based behaviour and conceptualisation.

Participant 21’s data, as a representative of the low-exposure group, are examined below in light of the conceptual integration network model and its contents (Figure 6.3).
Current Exposure: 8 hrs p/d
Age of Initial Exposure: 13 yrs
Primary School Exposure: 0 hrs p/week
Secondary School Exposure: 3 hrs p/week
Early Access: Controlled 0.5 hrs p/d
No parental support received
Gaming-related TECH interest
Skills/abilities at school level: D for IT subjects
Internet exposure: not daily

**Figure 6.3** Participant 21’s conceptual integration network model for the DMMB.
Figure 6.3 presents a proposed conceptual integration network model for a representative example of the low computer exposure group.

Participant 21 has been exposed to the computer at a later age, but not regularly. This has led to a mild interest in computer technology, with a particular fascination with computer gaming. The participant does not maintain a skilled knowledge of computer-based phenomena due to lack of consistent exposure, and prefers to interact with paper, indicated in the behavioural task’s results, as he is more comfortable with this medium. Participant 21 was restricted in terms of his computer exposure and his parents discouraged him from spending a great deal of time interacting with the computer, possibly because of his tendency to spend that time playing computer games. These findings indicate that the participant is less technologically orientated than Participant 12 to the extent where the generic space contains knowledge that influences his conceptualisation of the DMMB.

Figure 6.3 shows the mapping process (the solid black lines compared to the dotted lines). The grey office-based input space is dominant in that Participant 21’s responses to the lexical items in the conceptual tasks tend to be more non-technological (consider his responses in the input spaces in the figure above highlighted in bold). The office-based input space contains most of the participant’s responses to the lexical items (4 out of 5), while the computer-based input space contains only one participant response. Participant 21 associated 8 of the 20 items with words from the COMPUTER TECHNOLOGY frame, suggesting that some items are stored in this frame. Even so, the majority of the items seem to be stored in other (non-technological) frames. Thus, the office-based input space dominates this participant’s conceptual integration network and he conceptualises more computer technology features in terms of physical objects within the OFFICE frame, than Participant 12.

The office-based input space projects more content into the blended space than the computer-based input space. This generates a blended space that is highly metaphoric, as the computer desktop is a representative of the actual, office-based desk in a real-world office environment. This also has an implication on the amount of counterpart connectors that occur between counterparts in the input spaces, in order for the computer-based input space to be sufficiently populated.
Therefore, the increased connections that occur between the input spaces add to the metaphorical quality of the blend.

The conceptual integration network models in Figures 6.2 and 6.3 are seen as representative models of the conceptualisations of the high-exposure and the low-exposure groups respectively. In consideration of the research question, namely How does exposure to computer technology influence the contents and cognitive processes of the DMMB?, it can be confirmed that exposure and its related features have an influence on how content is presented in the generic space, how content is projected into the input spaces, and how the blend and its content emerges. It can thus be verified that exposure has an influence on an individual’s conceptual integration network as a whole and the resulting blend, particularly of the DMMB. This result should be accommodated in the conceptual blending model, as suggested in the above figures, in order to provide a more accurate account of the manner in which computer technology is conceptualised.

It is therefore proposed that exposure and its related features should be contained in the generic space, as it has an overall influence on the conceptual integration network model. It is further suggested that, despite the DMMB being a double scope blend, which is defined as a blend where different "input frames" project content onto the blended space, in which case more than one frame is employed to draw content from (Turner 2008: 3), input dominance still occurs based on the amount of computer exposure, which results in a more accurate account of the blended space and its contents. In the next section, the secondary research questions are considered in light of this study’s results.

6.4. Considering this study’s secondary research questions

In this section, the secondary research questions are examined and accounted for by means of this study’s results.

6.4.1. Are there particular social variables, besides exposure, that influence technology-related conceptualisation and behaviour?

As discussed in Chapter 4, social variables that were identified in the thematic analysis of this study included Parental Support; Interests; Skills/abilities at school level; Internet and other technological exposure. Although no significant
correlation between these social variables and the conceptualisation of the DMMB were established, the analyses of the high- and low-exposure groups’ data indicated that these social variables are interrelated. Early computer exposure seemed to relate to parental support in that parents are often the ones who encourage computer exposure at home. This, in turn, produces an interest in computer technology, which is put in practice by means of doing regular research on the internet. High exposure and interest seemed to result in improved performance with computer-related subjects at school. Due to the presence and interplay between these variables from an early age, these participants show a preference for making use of the computer instead of paper and can interact comfortably with it. The interrelation between social variables, therefore, seems to influence behaviour and conceptualisation towards the computer. On the contrary, the influence of these variables and the interplay between them can also influence behaviour and conceptualisation to be paper- and office-related instead of computer-related, which was the case for members of the low-exposure group in this study.

Other possible variables, which may have a bearing on conceptualisation, include: Ease of Implementation, Obligation, Technological Training, Goals and Objectives, Communication and Routine Behaviour. However, these variables were not considered for further statistical testing, as they did not appear as prominently in the thematic analysis. With the small sample size, it was predicted that erratic variables in the participants’ data would not produce any statistically significant results. These social variables could be re-evaluated if the present study is repeated with a larger sample. It was also often the case that some of these variables formed part of the relevant variables that were tested (i.e. routine behaviour inevitably associates with exposure variables, as routine was considered to be a result of exposure; obligation was foreseeable considering that participants were already obligated to use the computer in the college setting; and ease of implementation seemed to relate closely to exposure as well, as participants motivated that their choice for selecting a particular medium in the behavioural task depended on what they are most comfortable with and what they consider to be a ‘force of habit’).
This study cannot draw conclusions about the influence of social variables on conceptualisation, when such variables are not related to exposure. Nevertheless, many other variables play a role in meaning construction in blending. For example, if communication is considered as a variable, the growth of social networking and mobile communication may influence what is understood as the computer desktop. The desktop may adopt a different purpose if considered as a tool for socialisation. In the case of technological training, it is arguable that the more training one has, the more one would conceptualise in relation to computerised technology.

Goals and objectives may contribute to a better understanding of the conceptualisation of computer technology in that a person would seemingly expose themselves to the aspect of technology, which they intend to pursue in their future career (i.e. participants, who enrolled for CGI and Animation in order to become concept artists, or participants, who enrolled for software programming in order to become business systems developers). These distinctions would constitute different types of exposure that would inevitably draw on different types of personalities with different interests and talents. It is possible that, should goals and objectives be considered in light of abilities and personalities, interesting implications for conceptualisation of computer technology would result. Future study in this area is recommended.

6.4.2. What is the relationship between the other social variables (like parental support, interests, access, etc.) and technology related conceptualisation and behaviour?

A significant correlation emerged between skills/abilities at school level and interests, but this correlation does not relate directly to behaviour and conceptualisation. The qualitative thematic analysis showed that these variables also related to exposure. It is evident that participants, who performed well in computer-related subjects at school, preferred to make use of the computer to complete tasks, as they attained accuracy and efficiency through interaction with the computer. Participants, who lacked exposure to computers, did not attain high marks for computer subjects at school, or did not take computer subjects at all.
This correlation indicates that a participant’s interest in computer technology may influence their performance in computer subjects at school. Thus, it is the case (in the qualitative analysis’ findings) that participants, who maintained an interest in computer technology, tended to spend more time working on the computer than participants, who foster various other interests, such as outdoor activities, reading and so forth. Again, this can be examined in greater detail, but falls outside the current study’s scope.

6.4.3. What are the relations between the variables identified and the way(s) in which the DMMB is constructed? As in, constructed in the mind when conceptualised.

It cannot be determined with certainty how other variables, that may have bearing on conceptualisation, aside from exposure, will influence the blending model. It is proposed that a separate mental space exists in the generic space that contains social variables that can affect the conceptual integration network model and the blend; this projects onto a generic space, which then projects selectively in order to run the blend, presumably with one input space mapping more than the other. It is speculated that this space, dedicated to housing information related to social variables, has the capacity to house other content, besides exposure and its related variables that are derived from the social and environmental context. Thus, the input space holding social and environmental content is versatile enough to accommodate a variety of social variables that interrelate and are interdependent and influence the blended space.

The focus here is placed on exposure and variables that interrelate with exposure. Nevertheless, it can be assumed that other variables are present and that, if identified as influential to the conceptualisation of relevant technological aspects and the computer desktop, should be accounted for in the conceptual blending model, and the enhanced version of the generic space.

6.5. Conclusion

This study promotes the merger of socio-cognitive approaches to address hypotheses that require focus on both cognitive and social features. This study proposes that reliable and valid results can be attained, when focusing on internal
and external factors of the mind. Results emerged indicating that interaction and interrelation between social variables and conceptualisation of technology make up an inextricable part of what moulds our general conceptualisation. Consequently, a study such as this one provides a more realistic and accurate account of a particular aspect of cognition (in this case the DMMB). Therefore, this study contributes, to an extent, to fulfilling the need for linguistic research that accounts for social variables in order to attain a better understanding of the workings of human cognition; scholars like Croft (2009) and Tomasello (2008) concur in this regard. The study further adopted a usage-based approach to its research, as is the norm within the Cognitive Linguistics paradigm, by identifying and accounting for the presence of social variables that have the capacity to influence conceptualisation and behaviour, in line with Geeraerts (2001). As such, the study contributes to the new hybrid trend in Linguistics that has been promoted and adopted by scholars, like Hollman and Siewierska (2011), Campbell-Kibler (2010), Zener, Speelman and Geeraerts (2012) and Geeraerts and Kristiansen (2014).

The research problem, and its focus areas, was addressed in this chapter by considering this study’s findings in relation to the research questions. Relevant outcomes have been identified relating to the research problem: This study’s findings have confirmed that exposure has the capacity to alter the conceptualisation and behaviour of individuals to the extent where the individual conceptualises the DMMB as a computerised user interface (in little need of representation by means of actual, real-world features) due to regular and prolonged exposure to computer technology; or conceptualises the DMMB as a concept that requires representation through an actual, real-world object due to arbitrary and irregular exposure to computer technology. Thus, this study has shown that exposure determines the metaphoric ‘value’ of the DMMB, in terms of the degree of conventionalisation in the minds of the relevant users. This study also proposed that social variables, such as exposure, be accommodated in the conceptual blending model by means of the addition of a mental space in the generic space that houses social and contextual content related to the blend in question. This content has the ability to affect the manner in which content is projected into the input spaces, and ultimately into the blended space, through
input dominance. Consequently, these findings have confirmed its main hypotheses and addressed its related research questions.
Chapter 7

Conclusion

7.1. Introduction

The final chapter of this dissertation provides an overview of this study. It further emphasises the relevance of this study within the greater field of Cognitive Linguistics. This chapter also serves to explicate the limitations related to this study and, lastly, provides recommendations for future research in related areas of study. Firstly, the main aspects of this study, including its main purpose and objectives, theoretical framework, methodology, qualitative and quantitative analyses, and findings and overall outcomes are addressed.

7.2. An Overview of the Study

This study was situated in Cognitive Semantics and contributed its findings to the new interdisciplinary trend, known as Cognitive Sociolinguistics. The main focus of this study was to examine whether exposure, as a social variable, has an effect on the conceptualisation of the DMMB. What was also examined is the interaction with the computer desktop and the question was posed as to how exposure influences the main theoretical framework, namely Conceptual Blending Theory, in light of the DMMB.

Conceptual Blending Theory was put forth as the main theoretical framework of this study (cf. Chapter 2), and theories related to conceptual metaphor were presented in this dissertation, including Conceptual Metaphor Theory and the Neural Theory of Metaphor. The multi-modal desktop blend was selected as the metaphorical blend of relevance in this study as the setting where data collection took place was a technology-orientated, Information Technology college, which focuses its training on students registered for computer-related courses (i.e. software programming and CGI and Animation). A cross-sectional, between-subjects research design was used in which 25 participants were selected from this setting by means of random purposive sampling (cf. Chapter 3). A mixed method approach was selected to accommodate for the data collection process, which included qualitative testing, consisting of questionnaires and interviews; and
quantitative testing, including a conceptual (word association) task and a behavioural task (controlled observation experiment).

Qualitative analysis of the interview data was done by means of a thematic analysis in order to identify prevalent themes related to exposure in the data (cf. Chapter 4). Relevant themes that were identified included current exposure, early home exposure, early school and secondary school exposure, lack of exposure, early exposure (access), parental support, interests, skills/abilities at school level and internet and other technological exposure. The extent of the presence of these themes in each participant’s interview data was evaluated, and this resulted in the identification of two exposure groups, namely a high-exposure and a low-exposure group. Two participants represented typical example cases of the high- and low-exposure groups. They were selected and their data were examined in greater depth. A clear distinction could be made between participants in the low- and high-exposure groups based on the extent of their exposure to the computer desktop.

The variables identified in the interview data were scrutinised further in the quantitative aspect of this study (cf. Chapter 5). It was the intent to determine whether these variables had any bearing on participants’ conceptualisation and behaviour (conceptual and behavioural tasks’ data). The conceptual task’s data were analysed by means of an item analysis in order to determine whether the sample group associated certain items more often with the computer technology frame and whether certain items were conceptualised as non-technological. The aim of the controlled behaviour experiment was to determine whether the participants preferred to complete routine office tasks on the computer or not. The Spearman’s rho correlation test was used to test whether there exist correlations between the conceptualisation variable, the behaviour variable and the exposure variables. Significant correlations between conceptualisation and behaviour and the social variable, early exposure (access) were found. In an attempt to further explore these findings, the sample group was divided into a high-exposure and low-exposure group based on the extent of the presence of early exposure (access) in the participants’ data. The intent was to determine whether a member of the high-exposure group would conceptualise more content into technology-related frames and if they would interact more readily with the computer than with
paper. The Mann Whitney U test confirmed that conceptualisation and behaviour are varied amongst the groups, and that conceptualisation and behaviour are, in some way, influenced by early exposure (access).

These findings are summarised in the next section.

7.3. The Main Findings of this Study

It was found from the thematic analysis and from the in-depth examination of the representative group members’ data that:

- The themes interrelate with one another in several ways depending on the participant in question and the extent of the presence of these themes in their data;
- Two groups can be identified in the sample group, based on the extent of the presence of these themes in each participant’s data, namely a high-exposure group and a low-exposure group;
- There appear to be typical members of the high-exposure group and low-exposure group, depending on the extent of the presence of the themes in their data;
- The characteristic themes of a member of the high-exposure group include: approximately 8 to 10 hours of current exposure per day; exposure to the computer since the infant/toddler (or primary) phase; the use of computers at both primary and secondary school level (in particular for the purposes of school work); no recollection of a lack of exposure to technology; unlimited access to the computer from an early age; support provided by parents or guardians for their interest in computers; maintaining a personal interest in information technology and achieving high marks for computer subjects at school; and maintaining regular (possibly daily) exposure to the internet;
- The characteristic themes of a member of the low-exposure group include: below 6 hours of current exposure per day; exposure to the computer since the secondary phase; computers were not used at primary school and/or secondary school; a lack of exposure that could have been caused by involuntary situations (such as financial constraints or living conditions); limited or no access to the computer from an early age; parents or
guardians were unsupportive of the participant’s computer interest; lacking an interest in information technology (but, in some cases fostering an interest in computer gaming); performing poorly in computer subjects at school (possibly due to disinterest); and has no regular exposure to the internet.

The quantitative aspect of this study indicated that:

- There exists a statistically significant relationship between behaviour and conceptualisation;
  i. There is a tendency that computer-based behaviour signals low metaphoric conceptualisation and paper-based behaviour indicates high metaphoric conceptualisation of technological phenomena;

- Conceptualisation may evolve according to regular and prolonged behaviour and according to current exposure;

- Current exposure may have bearing on the conceptualisation of lexical items associated with the computer frame;
  i. Lexical items that reflect novel technological innovations or that are field-specific jargon are typically not associated with the COMPUTER TECHNOLOGY frame;
  ii. Lexical items that refer to literal concepts in the participants’ everyday environments are typically not associated with the COMPUTER TECHNOLOGY frame;

- Computer hardware items and internet related items are typically associated with concepts related to the COMPUTER TECHNOLOGY frame, while lexical items relating to computer desktop features tend to be associated with concepts outside of the COMPUTER TECHNOLOGY frame. Even though individual features of the computer desktop are often conceptualised as non-technological, the overall conceptualisation of the desktop is highly technological;

- Skills/abilities related to the computer maintain a relationship with interests.
From the qualitative and quantitative results summarised here, the theoretical framework in question was revisited and further deductions could be made (cf. Chapter 6). This study’s results confirmed that conceptual frames are embedded in cultural and socio-environmental contexts (cf. sub-section 6.3.1.1(a)). Although, frames are products of long-term memory, Barsalou’s (1992) argument that frames are dynamic conceptual constructs was supported. The conceptual frame in question was COMPUTER TECHNOLOGY, and based on this study’s results it was determined that this frame mainly stores knowledge, including computer hardware features and internet-related features. It was speculated whether particular prototypical members of this frame could be identified. However, though this study’s results indicate that there exist patterns of shared knowledge within this frame, it is not possible to identify one prototype for all people’s COMPUTER TECHNOLOGY frames. This is due to the dynamic and individualistic nature of knowledge stored in frames.

The role of input spaces was also discussed as these constructs form a part of the conceptual blending network (cf. sub-section 6.3.1.1(d)). It was questioned how input spaces store content. It was suggested that input spaces have the capacity to access the relevant frames and draw content from these frames in order to put blending processes in motion. It was argued that input spaces may have a sorting and organising function when accessing “background frames” to avoid storing content that is not needed for further blending to take place.

This study’s results further indicated a potential implication for the theoretical framework in question, as it showed that social variables share a significant correlation with the conceptualisation of the DMMB (cf. sub-section 6.3.2.1). These results showed that the conceptual blending model needed to be enhanced in order to accommodate for these variables in the conceptual blending model. It was suggested that a mental space, which houses social variables, be introduced in the generic space, which projects knowledge into the shared knowledge of the generic space, into the input spaces, and into the resulting blend. It was found that these social variables influence the content of the DMMB and cannot be disregarded in the blending process.
It was further speculated that mappings may not be equally distributed in the blending model (cf. sub-section 6.3.2.1(b)). In this case, the study’s results indicated that, in order for the DMMB to be conceptualised, one input space tended to store more information than another input space, as per the influence of the *exposure* variables. The extent of the exposure would determine which input space would dominate the blend by projecting more content onto the blended space. The study proposed that input dominance would further enhance the conceptual blending model. Input dominance was also speculated to affect the metaphoric quality of content in the blended space, while counterpart connections seemed to affect the metaphoric quality of the input spaces. It was further suggested that backward projection may have bearing on the metaphoric quality of the conceptual blending network as a whole in light of feedback as a result of exposure.

As outlined above, this study’s results seem to have important consequences for the conceptual blending model. This study succeeded in identifying potentially influential social variables that contribute to conceptualisation of the DMMB and interaction with the computer desktop. Consequently, it addresses its research problem in that the results support the notion that social variables influence conceptualisation and behaviour to some extent and that a theory of cognition, such as Conceptual Blending Theory, should account for this result by accommodating such influential variables in the generic space of this model. The results further indicate that the blended space is influenced by the presence of social variables to the extent where the blend may be “partially conventionalised”. The results do not show that the DMMB is completely conventionalised or overtly mapped to real-world objects in the minds of the participants, but rather that the conceptualisation of the DMMB may either lean to becoming conventionalised or being mapped to real-world objects due to the nature of their exposure. This, in turn, implicates the metaphoric quality of the blend and the conceptual blending model (i.e. if the DMMB is partially conventionalised, it maintains a lower metaphoric quality).
7.4. The Contribution of this Study

A need for a study of this nature is identified in Chapters 1 and 2 where it was argued that a greater focus should be put on the external social environment and its effects on internal conceptual processes and conceptualisations. The field of Cognitive Linguistics calls for research that draws associations between one’s social environment and conceptualisation in order to gain a better insight into the workings of the mind. This study attempts to shed some light on these aspects by considering exposure and its influence on conceptualisation of the DMMB. Its intent is to contribute empirical research findings that may provide a clearer understanding of the interplay between potentially influential external socio-environmental effects and internal conceptual constructs in the field. Therefore, this study is interdisciplinary in nature and falls into the scope of the Cognitive Sociolinguistics trend.

Furthermore, this study acknowledges the importance of quantitative testing and analysis in Cognitive Linguistics, and proposes a mixed-method methodology in order to show that conceptualisation can be investigated both qualitatively and quantitatively, in order to produce results that are empirically sound.

It is further necessary in Cognitive Linguistics to empirically test the established theories related to cognition. This study considers Conceptual Blending Theory as a cognitive linguistic theory that explains the nature of the conceptualisation of the DMMB. By means of empirical testing, it proposes further additions to the conceptual blending model in order to better account for the presence and effect of exposure, as a social variable, on the conceptual integration network model as a whole, as well as the contents of the blended space. Hence, this study endeavours to provide a more comprehensive and accurate model of Conceptual Blending Theory. It further attempts to account for the manner in which content is projected into relevant mental spaces in order to attain accurate knowledge of the nature of the blend and its metaphoric value. Thus, this study proposes that the conceptual blending model should accommodate external socio-environmental factors in order to attain a more holistic understanding of how the DMMB is constructed and how the nature of the blend is defined in the blended space. As
explained in Chapter 2, little attention has been paid to this area of inquiry and this study suggests that empirical results that have a bearing on theoretical models in the field can be attained and should be accommodated by scholars working in the field of Cognitive Linguistics.

In summary, this study’s contributions are:

i. Methodological, as it applies word-association and behavioural tasks to the study of metaphor and to Cognitive Linguistics in general;

ii. Empirical, by providing data and analysing it to give significant results;

iii. Theoretical, by indicating the following:

- Conceptual Integration Networks from Conceptual Blending Theory can be used to describe metaphors (like the DMMB), and can indicate how different individuals may be processing this metaphor differently with various aspects being more or less dominant;

- These dominance effects can make the blend more or less metaphoric for those individuals (or have higher and lower metaphoric quality);

- Social variables, such as exposure, play a role in technological conceptualisation; and

- In the DMMB conceptual integration network, these social variables can be ‘housed’ in the generic space.

7.5. Limitations of this Study

Despite this study’s relevance in Cognitive Linguistics, it has limitations that should be considered. In this regard, the size of the sample group should be noted. Whilst a group of 25 may suffice in many respects from qualitative and quantitative research norms, a larger, more representative group would allow for more generalisation to the population, and would allow for a wider range of statistical tools to be employed. Furthermore, the focus was on students from a small college, and extending a study of this nature to other contexts could yield greater insights. A mixed method approach is most fitting to this study’s subject of inquiry (cf. Chapter 3). The qualitative aspect of the study required in-depth scrutiny of
individual subjects and their data, which cannot be done with accuracy if a sample group is very large. However, the quantitative aspect of this study required a large sample group in order for statistical tests to provide reliable and verifiable results. Therefore, a sample group of 25 participants was made use of in order to still attain a detailed account of individual subjects’ behaviour and conceptualisation, but to also have the scope to test the sample group’s data statistically. The sample group’s data provided relevant results that speak to this study’s hypotheses, but these results cannot be generalised or assumed to be universal.

Furthermore, the statistical tests that were used in this study depended greatly on the sample size. Consequently, further statistical testing, for example a regression analysis, would have yielded further results that could have shed more light on the relationship between exposure, behaviour and conceptualisation. A larger sample group may also have provided statistically significant correlations between other social variables and behaviour and conceptualisation. Therefore, the size of the sample group is considered to be a limitation of this study.

Besides the sample group, another limitation is the use of one setting in the study. It would have been preferred to use several technology-related colleges as settings for data collection in this study. However, access to these settings were restricted due to the amount of time that the researcher had to do data collection and also due to the amount of time that other settings were able to set aside for data collection. Even so, the researcher acknowledges that the inclusion of other settings would have provided the researcher with a larger sample size for data collection and testing.

7.6. Recommendations for Future Research

It is the recommendation of the researcher that this study should be conducted with other blends, besides the DMMB, in other fields of specialisation. It would be informative to determine if, for example, musical terms, with a metaphoric quality (i.e. ‘keyboard’ as a musical instrument instead of a feature of computer hardware) are more often conceptualised by persons in the field of Musicology as phenomena related to music, and how exposure plays a role in the conceptualisation of the potentially metaphoric terms. It would then be possible to not only study blends, but also conceptual metaphors. It would be valuable to
determine whether the influence of social variables, like exposure, have a bearing on Conceptual Metaphor Theory. It would be a worthy endeavour to determine if and how this theoretical model can accommodate for the presence of such variables.

It is also recommended that a similar research study be done longitudinally with a few participants in order to track their conceptualisation of a particular concept (i.e. the DMMB) over a longer period of time. This could provide an in-depth account of how individuals’ conceptualisation evolves and is dynamically updated to accommodate new knowledge that the subjects may gain due to exposure to different contexts and experiences.

Amended research materials, such as the use of a Likert Scale, may provide further opportunity for the identification of external social variables, besides exposure. With a large sample size, it is likely that more social themes may be identified in the data, which should produce more statistical correlations and provide the opportunity to further explore the relationship between such social variables and conceptualisation by means of further statistical testing (i.e. a regression analysis).

7.7. Conclusion

As outlined in this chapter, this study fulfilled its purpose of examining the effect of social variables on conceptualisation and behaviour by evaluating the Theory of Conceptual Blending and enhancing it to account for social variables that influence the DMMB and the model as a whole. It further set out to determine in what manner the incorporation of such social variables can affect the conceptual integration network and its concomitant mappings to the relevant spaces in the model. This study proposed the inclusion of a separate mental space in the generic space of the conceptual blending network solely dedicated to storing influential social variables and projecting content onto the rest of the model. This study premised the existence of input dominance in the conceptual blending model and speculated as to the impact that this would have on the blended space. It argued that input dominance can affect the metaphoric quality of the DMMB, which was found to not be fully conventionalised in the minds of participants.
Scholars in Cognitive Linguistics have noted the importance of considering the impact of external variables on cognitive processes, but little research has been done in this regard. This study set out to offer empirical findings that show the seemingly profound impact that social variables have on cognitive operations and to further offer a means to account for the influence of some of these external variables on conceptualisation, regarding the conceptualisation of the DMMB. Consequently, the need for research of this kind in Cognitive Linguistics has been salient for some time. This study hypothesises that there is no reason to exclude external variables from the scope of scientific inquiry in the field, as it can produce empirically sound outcomes that can bring us closer to gaining insight into the unique complexities and species-specific nuances of human cognition.
REFERENCE LIST


Lakoff, G. 2004. E-mail on empirical methods in cognitive linguistics, posted on the COGLING email list:

http://listserv.linguistlist.org/cgi-bin/wa?A2=ind0407&L=cogling&D=1&F=&S=&P=2918


Lakoff, G. 2009. ‘The Neural Theory of Metaphor’. Available at SSRN:


APPENDICES

APPENDIX A: Questionnaire of demographic information

For researcher:

Date: ______________________________
Participant Number: ______________________________

Please note that all information shared in this document will remain confidential as you will remain anonymous during the course of this study.

QUESTIONNAIRE: PERSONAL INFORMATION

Please answer each question either by ticking the relevant box or by writing a sentence. Ensure that you answer ALL questions for the purposes of accuracy of data collection.

Age: ______

Gender: Male [ ] Female [ ]

Race: Black [ ] White [ ] Coloured [ ] Asian [ ] Other: ______

Nationality: ______________________

Culture: ______________________

Religious Affiliation: ______________________

Do you belong to any religious organisations? YES [ ] NO [ ]

Relationship Status: Single [ ] Married [ ] Engaged [ ] Divorced [ ]

Dependants: YES [ ] NO [ ] If any, who are they?

Hometown/city and country? ______________________

Home Language(s): ______________________

Additional Language(s): ______________________

Briefly explain your familial circumstances:
________________________________________________________________________________________
________________________________________________________________________________________

Siblings: _____

Briefly explain your situation growing up:
Current Education Institution: ______________________________

Registered qualification: _____________________________

Briefly explain your educational background:

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

Do you have any learning disabilities? YES  NO

If so, what are you diagnosed with? __________________________

Do/did you receive treatment? YES  NO

Do you have a mental illness? YES  NO

If so, what are you diagnosed with? __________________________

Do/did you receive treatment? YES  NO

Current place of Employment: _______________________________

Employee position: ______________________________

Briefly describe your employment history.

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

Do you consider yourself to be financially stable? YES  NO

Please make note of any additional information that you think might benefit this study.

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

Thank You for Your Cooperation!
APPENDIX B: Interview schedule

INTERVIEW QUESTIONS (SCRIPT FOR RESEARCHER)

TIME of immediate exposure

1) Approximately how many hours do you spend working on a computer every day?
2) What do you use the computer for?
3) Approximately how many hours do you spend doing paperwork every day?
4) What paper work do you do?

DAILY ROUTINE

1) When you create a reminder, how do you do this?
2) Do you have a diary/calendar and is it electronic or paper-based?
3) Which medium do you use to communicate with fellow students/colleagues?

PREFERENCE/SKILLS

1) Are you more comfortable working on the computer or with paper and why?
2) Have you had any formal computer training of any sort and what was it?
3) In your daily environment, are you obligated to use the computer/paper-work or both?

EARLY/CHILDHOOD EXPOSURE

1) Did you grow up having a computer at home?
2) As a child, did you use the computer or not?
3) If not, why not?
4) If you did, what did you use it for?
5) How many minutes/hours were you allowed to use the computer every day and why?
6) How old were you when you started using a computer?
7) Did your primary school have a computer lab?
8) If yes, how many hours per week did you spend in the computer lab?
9) Was it compulsory to complete some of your school assignments on the computer?
10) Did you take subjects like Computer Science in secondary school?
11) Did you perform well in these subjects (as in A or B)?
12) Did your secondary school have a computer lab?
13) If yes, how many hours per week did you spend in the computer lab?
14) Was it compulsory to complete some of your school assignments on the computer?

TECHNOLOGY (AND PARTICIPANT’S PERCEPTION)

1) What, in your mind, is technology?
2) Are you interested in technological phenomena?
3) If you are, why?
4) If not, why not?

LACK OF EXPOSURE
1) How were you first exposed to technology?
2) Was there a time when you had no exposure to technology? Please explain.

INTERESTS

1) How did you develop an interest in IT?
2) What do you do in this field?
3) Do you enjoy your work/studies?
4) What do you intend to do in the field?

PARENTAL INFLUENCE

1) Did your parents/family encourage you to use the computer during your childhood?
2) Were you encouraged to enter the IT field, if so by whom?

CURRENT EXPOSURE TO TECHNOLOGY AND COMMUNICATION

1) How much do you expose yourself to technology every day?
2) Do you use the internet regularly and how long every day?
3) Are you active on social networks and how much?
4) Do you email/sms/whatsapp/bbm,etc. and how often?
5) What is your preferred means of communication and why?

OPINION (RELATED TO EXPERIENCE OF STUDY)

1) What was your experience like participating in this study?
2) Why do you think you tend to work more comfortably on the computer or with paperwork?
## APPENDIX C: Conceptual Task (Word Association)

Date: ____________________________

*Participant Number: ____________________________*

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APPENDIX D: Behavioural Task

Participant Number: ____________________ Date: ________________

TASK LIST (STUDY OF INTERACTION PROCESS)

Please check the box next to the task once you have completed the action.

1. Open the folder named FOLDER 1 and search for the document named DOC 1. □
   1: TECH / 2: NON-TECH

2. Place DOC 1 on the desktop. □
   1: TECH / 2: NON-TECH

3. Add today’s date and time to DOC 1. □
   1: TECH / 2: NON-TECH

4. What day was 2 August 2013? Add the day to DOC 1. □
   1: TECH / 2: NON-TECH

5. Open the folder named FOLDER 2 and search for the document named DOC 6. □
   1: TECH / 2: NON-TECH

6. Calculate the equation that appears in DOC 6. □
   1: TECH / 2: NON-TECH

7. Add the answer of the equation to DOC 6. □
   1: TECH / 2: NON-TECH

8. Place the document named DOC 10 in the bin. □
   1: TECH / 2: NON-TECH

9. Copy the reminder that appears in DOC 8 to DOC 7. □
   1: TECH / 2: NON-TECH

10. Find the word ‘interact’ in the dictionary. □
    1: TECH / 2: NON-TECH