

**A Model for Supporting Environmental Awareness in  
Higher Education using Social Media**

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# **A Model for Supporting Environmental Awareness in Higher Education using Social Media**

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# **Declaration**

I, Thabo Tlebere, hereby declare that the dissertation for the degree Magister Commercii is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

Thabo Tlebere

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## Summary

University sustainability is a field of research that has been gaining increased interest in recent years. The reduction of environmental impact has become a strategic objective of universities globally. Universities have been prompted to take necessary action to ensure that their environmental impact is at a minimum. The environmental component of sustainability deals with the current conservation of the earth's natural resources so that future generations can also have access to them. Human beings, due to their increasing needs, are accountable for the exploitation of natural resources. They are regarded as the main contributors to imbalances in the natural systems. Environmental concerns such as global warming, deforestations, disposal of wastes, and ozone reduction are the outcomes of the damage caused by humans on the environment.

The aim of environmental education is to acquire remediation of the environment by making individuals aware of the environment and by educating them about how to live a more sustainable lifestyle. Environmental awareness is perceived as knowledge of the factors that affect the environment and having sensitivity towards the environment. Higher Education Institutions (HEIs) bear the responsibility of educating individuals about environmental issues since they provide education to future leaders in society who may have an influence on future conditions in the environment.

Social media are capable of delivering information to a large spectrum of audiences at a low cost. The Pew Internet American Life Project reported that the number of adults who utilise social media has increased by 57% from 2005 to 2011. Several environmental activist organisations utilise social media to carry out environmental awareness campaigns. In this study two environmental awareness campaigns which were powered by social media were conducted to improve environmental awareness of individuals in a higher education environment. A Social media Model for ENvironmental Awareness (SMENA) was developed to facilitate the environmental awareness campaigns. The SMENA includes a website, social media as well as theoretical guidelines for creating environmental awareness campaigns, and for using social media for environmental awareness campaigns.

A case study at the Nelson Mandela Metropolitan University (NMMU) was used to empirically evaluate SMENA. Students at the Department of Computer Sciences of NMMU were exposed to information about environmental issues through social media with the intention of improving their environmental knowledge and awareness. The SMENA website usability was rated positively and students enjoyed the blogs and information distributed by means of social media. The results of the study intervention were positive and showed that social media can be used to improve the environmental knowledge of students. This study provides a valuable contribution to both the field of environmental education and social media usage and acceptance. The guidelines and requirements for using social media to improve environmental awareness provided in this study can be used to assist educators and university management with addressing the problems of reducing environmental impact.

**Keywords:** Social media, uses and gratifications theory, environmental education, environmental awareness, higher education institutions.

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# Chapter 1: Introduction

## 1.1 Background

Awareness of environmental issues is important due to an exponential increase in world population and higher living standards (Haşiloğlu Keleş and Aydın 2011). Paradzayi and Ruther (2002) argue that increasing human demand has led to the exploitation and uncontrolled use of natural resources. In order to deal with these issues, world leaders are gathering at conferences such as the Rio+20 United Nations Conferences on Sustainable Development to discuss the global challenges of the sustainable development framework (Clemencon 2012). Dahle and Neumayer (2001) argue that the issue of sustainable development should not be considered as a matter of concern at a governmental level only, but all institutions including Higher Education Institutions (HEIs) need to play an active role in achieving environmental goals.

Sustainable development is defined as developments that gratify the needs of the current generation without jeopardising future generations' ability to satisfy their own needs (Bruntland 1987; Hilty and Seifert 2005). In sustainable development, scarce economic, social and environmental resources are managed in order to cater for the welfare of present and future generations. Goodland (1995) confirms that a sustainable development should incorporate social, environment and economic sustainability and utilise them to accomplish a more sustainable global development. The term sustainable development was officially defined at the Rio+20 United Nations Conference as a concept that concurrently deals with economic, social and environmental aspects (Clemencon 2012).

Environmental sustainability is focused on enhancing human well-being by conserving the raw material sources that support human needs and by ensuring that human waste levels are not exceeded (Goodland 1995). In other words environmental sustainability is an element of sustainability that seeks to maintain the utilisation of renewable natural resources at a level where they can be regenerated, and to keep consumption rate of non-renewable natural resources at a level that is equivalent to the rate at which substitutes are produced. Environmental sustainability is also focused on monitoring waste emissions to ensure that the amount of waste emitted does not exceed the capacity at which the environment can absorb it.



Environmental education is a programme that is required to elicit individuals' environmental awareness and to educate individuals about sustainable living and active citizenship (Talero 2004; EPA 2013). Pooley and O'Connor (2000) state that environmental education assists individuals to:

- Become more knowledgeable about the environment and its issues;
- Become aware of how they can contribute to solve these issues; and
- Be inspired to provide solutions to environmental issues.

Aminrad *et al.* (2010) suggest that it is important for individuals to acquire knowledge about environmental issues because if individuals are well-informed about these issues they will live a more sustainable lifestyle. Vicente-Molina, Fernández-Sáinz and Izagirre-Olaizola (2013) add that if individuals are not equipped with appropriate environmental knowledge they are more likely to make environmentally inappropriate decisions. The term knowledge includes manifested knowledge of facts and scientific rationale (Krnel and Naglic 2009). Vicente-Molina *et al.* (2013) explain that environmentally knowledgeable individuals are individuals that have the ability to identify aspects and forms of behaviour that can assist with the remediation of the environment.

Hungerford and Volk (1990) state that environmental awareness seeks to assist social groups and individuals to acquire awareness and sensitivity towards the environment as a whole and about issues affecting the environment. Krnel and Naglic (2009) confirm that environmental awareness is perceived as knowing the effects of human activities on the environment and having sensitivity towards the environment. It is important that environmental awareness is instilled within society, especially within the youth (Astalin 2011). Zsóka *et al.* (2013) state that current university students will have a major impact on the future conditions of the environment therefore it is important to incorporate education of environmental issues into HEIs.

In order to improve environmental awareness among individuals, seamless communication is required between the providers (people who provide environmental information) and the consumers (people who consume the information) (Chaineux and Charlier 1999). The interaction between the provider and the consumer should incorporate information that can enhance the consumer's environmental knowledge, skills and knowledge about technologies that can support the environment. This information should also include ways to identify and access environmental information and information sources.

Awareness of environmental issues amongst individuals can be triggered by information-intensive meetings, informal discussions, media reports and news bulletins centred on realism (Chaineux and Charlier 1999). In addition, it is important to explore and to carefully evaluate individuals' local surroundings before producing or developing environmental awareness campaigns, which implies that environmental issues faced by a certain community must be properly understood before an environmental awareness campaign is initiated (Talero 2004). A sustainable implementation of environmental awareness campaigns can assist communities to acquire sufficient knowledge, skills and attitudes to solve global and local environmental issues.

Social media have the ability to improve awareness of environmental issues quickly and cost effectively (Willson 2010). They have the ability to be the driver of sustainable development and can assist in achieving environmental goals (Lively 2011). Jussila, Kärkkäinen and Leino (2011) define social media as web-based applications that are constructed on the concepts and technological foundations of Web 2.0 technologies. Shinton (2012) states that social media is an umbrella term used to classify websites that enable users to interact and form web-based communities. Social media applications allow users to interact by generating and sharing various types of content (text and media) with other users (Jussila *et al.* 2011). The main concept behind social media applications is that individuals have to actively contribute to these social media services (Multisilta 2008). For example, individuals can contribute by posting blogs, images or videos, adding tags and doing other forms of social activities such as commenting or rating the user generated content posted on the services.

The terms Web 2.0 and social media are frequently used interchangeably (Constantinides, Romero and Boria 2008). However, Katajisto (2010) argues that the term social media cannot be used interchangeably with Web 2.0. Katajisto (2010) further explains that social media is derived from Web 2.0 and Web 2.0 includes all types of web-based technologies or applications which may not necessarily incorporate media or social functionalities. A generic definition of Web 2.0 does not exist, however most people agree that Web 2.0 is the new generation of the web (Constantinides *et al.* 2008). O'Reilly (2007) provides one definition of Web 2.0 as a new form of collaborative web, a platform that utilises collective intelligence. Kaplan and Haenlein (2010) confirm that Web 2.0 is a new form of interaction between individuals and web-based applications. Initially web-based content and applications were static and were created by specified responsible individuals. The birth of Web 2.0 introduced features that enable all users to continuously modify content in a participatory and collaborative manner. Constantinides *et al.* (2008) state that Web 2.0 provides users with the ability to create informal networks, which enables the exchange of ideas and knowledge through the creation, distribution, sharing and modification of web-based content.

Social media are more focused on social aspects such as communities, participation, openness, conversations, and connectedness while Web 2.0 provides platforms that enable the use of social media (Katajisto 2010). Van Zyl (2009) confirms that social media incorporates Web 2.0 technologies in order to make the collaboration and interaction between individuals simple, cost effective and easy to maintain. In order for Web 2.0 to function effectively, it requires certain components, which include Adobe Flash, Real Simple Syndication (RSS) and Asynchronous Java Script (AJAX) (Kaplan and Haenlein 2010). Adobe Flash is an application that enables the adding of animation, interactivity between users and the streaming of audio and/or video files on webpages. RSS is used to update information frequently, such as news headlines in a standardised format and AJAX, a strategy used to pull data asynchronously from web servers, which also enables web-based content to be updated without interfering with the display and behaviour of the entire page.

Kaplan and Haenlein (2010) state that social media applications can be grouped under several categories, which are: collaborative project, blogs, content communities, social network sites, virtual game worlds, and virtual social worlds. The usage of social media has become common amongst individuals over the past few years, due to the fact that these applications enable social interaction between people around the world (Kriek 2011). The Pew Internet American Life Project reported that the number of adults who utilise social media has increased by 57% from 2005 to 2011 (Mergel *et al.* 2012).

Van Zyl (2009) states that organisations that use social media effectively for business purposes can reduce costs and improve profits. Social media have been credited for their ability to expand the social contact of an organisation, accelerate business processes, improve customer relations, recruit high-calibre staff cost effectively, and improve morale, motivation and job satisfaction among employees (Mankoff *et al.* 2007).

Mergel *et al.* (2012) argue that it is important for organisations to incorporate social media in their communication strategies. Social media provides organisations with a communication platform that enables organisational members to collaborate and exchange information with internal and external stakeholders (Meredith 2012). Social media is also essential for marketing operations (Kirtiř and Karahan 2011). It assists marketing professionals with creating a brand through social media users since users' behaviour and comments on social media have the potential to promote a product or service. Khang, Ki and Ye (2012) confirm that marketing professionals are adopting social media to carry out their campaign strategies.

Social media has also become a common means of communication amongst students and universities are using it to communicate with current and prospective students (Falahah and Rosmala 2012). In HEIs social media are used inside and outside the classrooms (Hrastinski and Dennen 2012). Students use social media outside the classroom for socialising, networking and organising. Higher Education Institutions (HEIs) use social media outside the classroom to distribute information, for networking and to offer support services. Lecturers are adapting social media in the classroom to support and/or enhance the traditional teaching processes. For example, using blogs as a learning portfolio and enabling students to interact about course related topics outside the boundaries of the institution.

Social media are also being adopted by environmental activists to conduct environmental initiatives that seek to foster sustainable behaviour, to get petitions signed, to provide news, and to provide motivation (Willson 2010). Mankoff *et al.* (2010) argue that studies have been conducted on the use of social media to create environmental awareness, and to improve peoples' attitudes and behaviours towards the environment. However there are limited studies providing empirical evidence of how social media can be used in HEIs to support environmental awareness.

Various environmental Internet applications such as "*I am Green*" and "*StepGreen.org*" have been developed. "*I am Green*" is a Facebook application which allows people to interact by sharing information and ideas in order to improve each person's environmental behaviour (Langley and Van den Broek 2010). "*StepGreen.org*" is a website which intends to encourage people to save energy by encouraging them commit some environmentally friendly actions in the real world (Mankoff *et al.* 2010). The main focus of these systems is to change the behaviour of individuals towards the environment, whereas, this study is focused on improving the environmental knowledge and awareness of individuals through the use of social media.

## **1.2 Project Relevance**

Higher Education Institutions (HEIs) are influential and resourceful institutions capable of taking a leadership role in promoting sustainable development (Dahle and Neumayer 2001). Since these institutions provide education to some of society's future leaders, they have the potential to provide environmental education to these leaders of tomorrow. Clugston and Calder (1999) add that HEIs carry the responsibility of increasing the awareness, knowledge, technologies and tools required to create a more environmentally sustainable future.

Environmental education is considered one of the most important strategies that can assist with promoting sustainable development and enhancing the ability of individuals to address environmental and developmental issues (Clugston and Calder 1999). Maibach (1993) states that in order to solve environmental issues it is important to carry out information-intensive environmental awareness campaigns that seek to educate individuals by disseminating environmental information about the need to protect and improve the environment.

Barr (2003) confirms that providing information and distributing knowledge have the ability to improve environmental awareness. The contribution of this study to environmental education literature is a comprehensive model which can be used to create environmental awareness in HEIs by using an environmental awareness campaign that utilises social media. The environmental awareness campaign is information intensive and information and knowledge about environmental issues will be distributed to individuals through social media.

Social media are selected as methods of information distribution due to the fact that they have become popular and they possess the potential to provide seamless communication between individuals quickly and cost effectively (Kriek 2011; Willson 2010). Social media sites have also proven to be powerful marketing tools and have been adopted by marketing professionals to conduct marketing campaigns (Khang *et al.* 2012). Social media usage is common amongst students in HEIs where students use social media for socialising, networking and organising (Hrastinski and Dennen 2012). In this regard, the study will focus on the usage of social media in HEIs and on the aspects of social media usage for the purpose of communication and marketing.

The main outcome of this study is the Social media Model for ENvironmental Awareness (SMENA), which is a comprehensive model that can be used to support environmental awareness by using social media in HEIs. This model will be designed by assembling components which are identified in literature and confirmed by empirical studies. The SMENA will be implemented by facilitating environmental awareness campaigns which will be carried out at the Nelson Mandela Metropolitan University (NMMU) in order to improve environmental knowledge and awareness of students. A conceptual model for environment awareness campaigns, which depicts the manner in which the campaigns will achieve their goals will be extracted from an existing model and will be confirmed by literature. The SMENA will be evaluated after completion of the environmental awareness campaigns and the results of the evaluation will be used to update the conceptual model for environmental awareness campaigns and to provide recommendations as to how the SMENA can be improved.

### **1.3 Problem Statement**

The needs of human beings have increased and the increasing developments, technologies and unrestrained use of natural resources have imposed a negative impact on the elements of the environment (Haşiloğlu *et al.* 2011). Anderson *et al.* (2007) state that environmental issues are no longer seen as low priority factors, they are increasingly being perceived as a direct threat to human health and welfare. It is important for people to be aware of environmental issues and to find solutions for these issues. If these issues are not considered then future generations will not find the earth habitable. Krnel and Naglic (2009) confirm that environmental awareness is important since it provides individuals with knowledge about human activities that impact the environment and provides sensitivity towards the environment. According to some studies (McKenzie-Mohr 2011; Hungerford and Volk 1990) improvement of environmental awareness does not necessarily lead to sustainable behaviour, but, environmental awareness is one of the phases which are required to change the behaviour of individuals towards the environment.

However, there is limited evidence in literature studies about a comprehensive model which supports the effective use of social media to support environmental awareness (Mankoff *et al.* 2010; Langley and Van den Broek 2010). The following problem statement was therefore formulated:

*There is no comprehensive model for the effective use of social media for supporting environmental awareness in higher education.*

### **1.4 Thesis Statement**

Social media can be used by higher education institutions to disseminate environmental information to students. Furthermore, the usage of social media driven environmental awareness campaigns can assist these institutions to provide students with sufficient environmental information which will in turn improve their environmental knowledge and awareness. Based on this notion the following thesis statement is proposed:

*A comprehensive model for supporting environmental awareness in a higher education environment can be designed to disseminate environmental information through social media in order to improve students' environmental knowledge which will in turn improve their environmental awareness.*

## **1.5 Research Objectives**

The aim of research objectives is to describe what the study intends to achieve. This study will address the following objectives in order to achieve the predefined goals.

### **Main research objective**

MRO: To propose a model for supporting environmental awareness by using social media in Higher Education Institutions.

### **Secondary research objectives**

RO1: To identify factors that influence environmental awareness.

RO2: To identify the strategies that can be used to carry out a successful environmental awareness campaign.

RO3: To investigate the most prevalent social media applications.

RO4: To identify the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions.

RO5: To investigate factors that influence usage and acceptance of social media.

RO6: To investigate the usage and acceptance of social media by students in a higher education institution.

RO7: To identify the components of the Social media Model for ENvironmental Awareness (SMENA) in a Higher Education Institution.

RO8: To determine the extent to which the levels of environmental knowledge amongst students have improved as a result of the implementation of SMENA.

RO9: To determine the usability of SMENA social media.



## **1.6 Research Questions**

### **Main research question**

MRQ: What comprehensive model can be used to support environmental awareness by using social media in Higher Education Institutions?

### **Sub-Research questions**

RQ1: What are the factors that influence environmental awareness?

RQ2: What are the strategies that can be used to carry out a successful environmental awareness campaign?

RQ3: What are the most prevalent social media applications?

RQ4: What are the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions?

RQ5: What are the factors that influence social media usage and acceptance?

RQ6: To what extent is social media used and accepted by students in a Higher Education Institution?

RQ7: What are the components of a Social media Model for ENvironmental Awareness (SMENA)?

RQ8: What is the improvement in environmental knowledge for students using SMENA?

RQ9: What is the usability of SMENA social media?

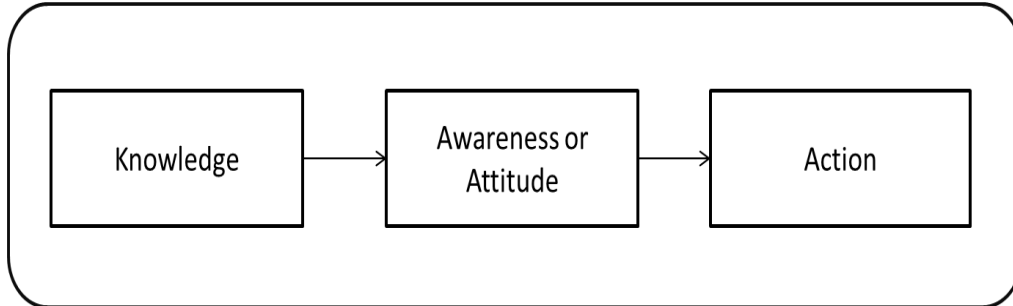
**Table 1.1: Research questions, strategies and chapter deliverables**

Sub- research questions	Research Strategy	Chapters
RQ1: What are the factors that influence environmental awareness?	Literature review	Chapter 2: Environmental Awareness in Higher Education Institutions (Literature review)
RQ2: What are the strategies that can be used to carry out a successful environmental awareness campaign?		
RQ3: What are the most prevalent social media applications?	Literature review	Chapter 3: Social Media (Literature review)
RQ4: What are the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions?		
RQ5: What are the factors that influence social media usage and acceptance?		
RQ6: To what extent is social media used and accepted by students in a Higher Education Institution?	Surveys and case study	Chapter 4: Research Design and Model Proposal
RQ7: What are the components of a Social media Model for ENvironmental Awareness (SMENA)?	Literature review, surveys and case study	
RQ8: What is the improvement in environmental knowledge for students using SMENA?	Surveys, case study and field experiments	Chapter 5: Evaluation of Model
RQ9: What is the usability of SMENA social media?		

## 1.7 Research Design

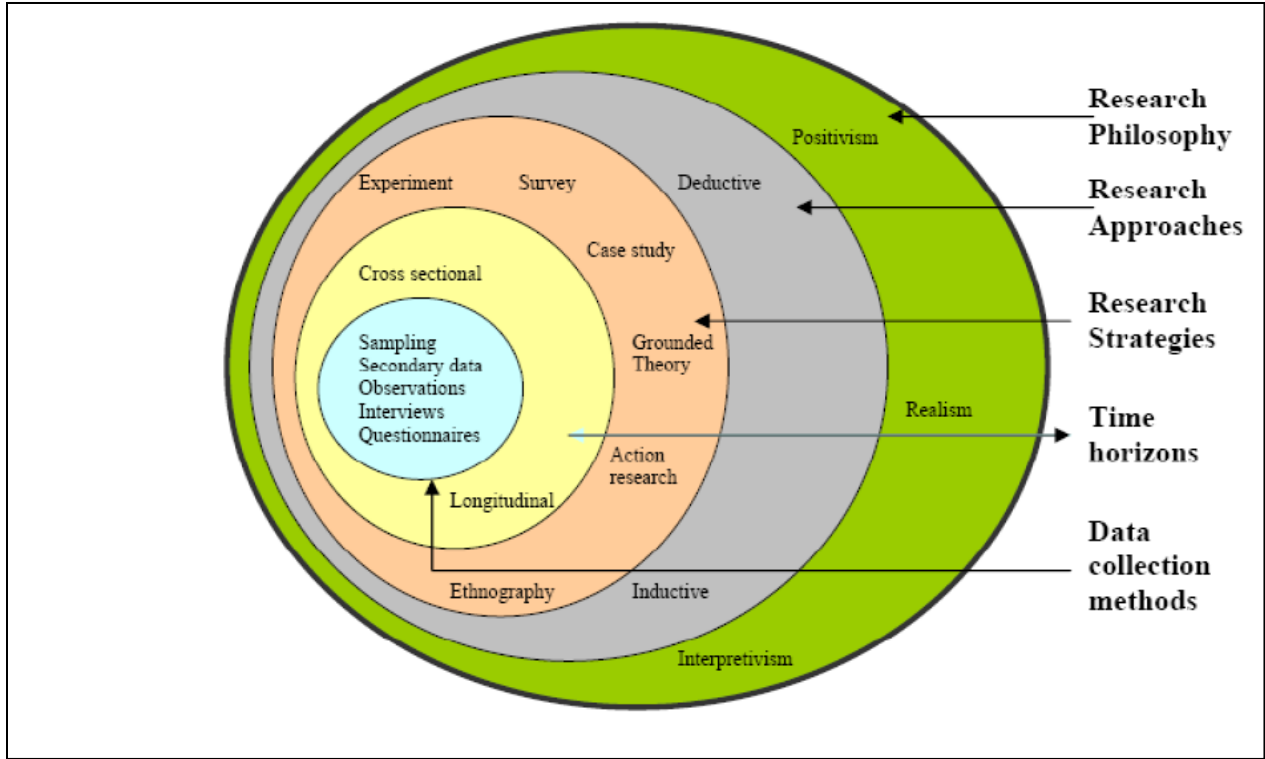
The traditional environmental education field states that in order to influence individuals' environmental behaviour, individuals need to acquire knowledge about the environment and the issues associated with the environment (Hungerford and Volk 1990). This notion is mainly linked to the ideology that if individuals acquire environmental knowledge, they will in turn become aware of the environment and its issues and then become motivated to take responsible actions towards the environment (Figure 1.1).

Ramsey and Rickson (1976) support this argument and previously developed a similar model which illustrates that an increase in knowledge leads to an improved attitude or awareness, which in turn leads to favourable actions that improve the quality of the environment.



**Figure 1.1 Behavioural change system (Hungerford and Volk 1990)**

Other studies (Zsóka *et al.* 2013; Ramsey and Rickson 1976; Hungerford and Volk 1990; Barr 2003) also support the behaviour change system argument where it is believed that an increase in knowledge leads to an increase in awareness. This argument will form the basis of this research study. Furthermore, a comprehensive model (SMENA) that seeks to improve environmental knowledge and awareness will be developed. The model will incorporate one in-house and two commercial social media applications which will be used to distribute environmental information. The in-house social media website will be deployed by the researcher and it will be evaluated by usability experts before it is utilised for the study. The aspects for the research design adopted for this study are structured and discussed according to Saunders, Lewis and Thornhill's (2009) research onion (Figure 1.2).



**Figure 1.2: Research onion (Saunders et al. 2009)**

The research philosophies that will be used for this study are a combination of interpretivist and positivist philosophies. The positivist and interpretivist philosophies are used in combination in this study because this will enable the researcher to utilise a larger pool of quantitative and qualitative research methods and instruments. These philosophies will assist the researcher to address the predefined research questions and to intensively investigate the underlying phenomenon.

The interpretivist philosophy is mainly used for qualitative studies and it is focused on investigating the research questions that seek to understand the underlying phenomena that occur in natural settings and uses verbal data (De Villiers 2005). In this study, environmental awareness campaigns (study interventions) and the evaluation of participants will take place in the natural environment of the participants. Qualitative data will be acquired from this investigation as the participants will be required to provide subjective information regarding the social media tools used for the study intervention.

The positivist philosophy is focused on research that is conducted to produce a clear representation of reality, unbiased and value free (De Villiers 2005). This philosophy is used in conjunction with scientific methods, where knowledge discovery is conducted using controlled empirical means, such as experiments. The positivist philosophy seeks to test the hypothesis and it mainly relies on quantitative research methods, which includes numbers and measurements, and the analysis is conducted using statistical methods.

This study will use the positivist philosophy to design and evaluate experiments that seek to evaluate environmental knowledge of the participants. Quantitative data will be used to measure the environmental knowledge of the participant before and after being exposed to environmental information via social media during the study intervention. Quantitative data will also be used to determine the relationship between the usage of social media during the study intervention and the improvement in participants' environmental knowledge after the study intervention.

The research approaches that will be used for this study are a combination of inductive and deductive approaches. The inductive approach is used when the researcher contributes some findings to the theory that triggered the study (Bryman 2004). This study will use the inductive approach by contributing to theories of environmental education in the form of a comprehensive model that utilises social media to improve environmental knowledge and awareness. In contrast, in a deductive approach the researcher investigates theoretical aspects of a specific phenomenon, and then a hypothesis is derived from the implications aroused by the theory, moreover the hypothesis must be proven by an empirical study (Bryman and Bell 2007). In this study, no hypothesis will be tested. The deductive approach will be used to test the predefined theories and to address the predefined research questions.

Qualitative and quantitative methods will be used for this study (Figure 1.3). These methods are not mutually exclusive, when they are used jointly in a single research study they are called mixed methods (De Villiers 2005; Williams 2007). Qualitative research is mainly focused on non-numerical data (words) while quantitative research is distinguished by its focus on numeric values (Saunders *et al.* 2009). This implies that the researcher will collect and analyse both numeric and non-numeric data in order to address the predefined research questions (Williams 2007).

The research strategies that will be used for this study are surveys, case study and field experiments. Case studies include activities where empirical data is gathered from a single case or several cases where the context of the research problem is the same or similar (Noor 2008). Surveys are research strategies where empirical studies are used to collect information from a large audience and field experiments are experiments which are conducted in real life settings of a particular environment (Saunders *et al.* 2009).

A single case study will be adopted in this study and the Nelson Mandela Metropolitan University (NMMU) will be the case environment where data will be collected. The data collection processes will be conducted in the natural settings of the participants. Two consecutive field experiments (environmental awareness campaigns) will be conducted between two groups of participants, second year students and then third year students. The campaigns will take place over a four week period and they will expose the participants to environmental information through social media. The participants will interact with this environmental information by completing activities on the social media. Survey questionnaires will be used to collect qualitative and quantitative data pre- and post the study intervention. Three knowledge areas will be measured by using the survey questionnaires: social media usage and acceptance (pre-test); environmental knowledge (pre- and post-test); and the usability of the SMENA social media (post-test). Interviews will also be used where clarification of certain issues is required.

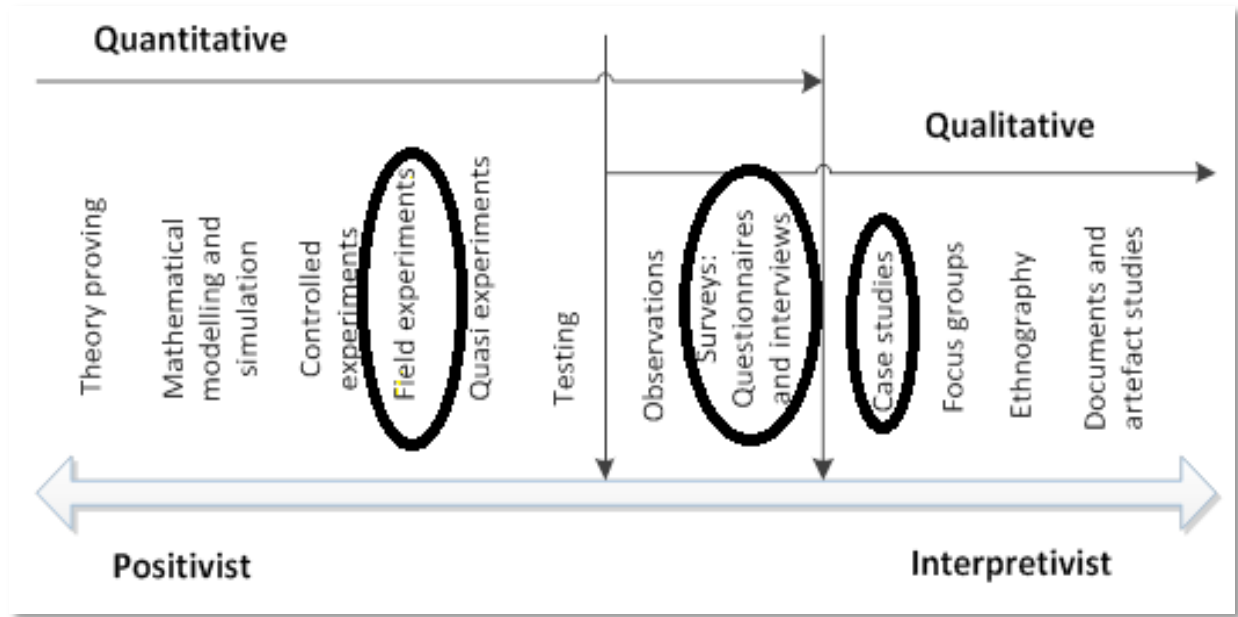


Figure 1.3: Research methods and strategies (De Villiers 2005)

## 1.8 Scope and Constraints

The scope of this research is limited to the investigation of how social media technologies can be used to support environmental awareness in a HEI. Only one case study in one HEI is investigated. This research study will not investigate impact on sustainable behaviour.

The main limitation of this research is that most students do not have sufficient Internet access at all times to access the social media platforms used for the study. Ethical clearance was obtained as the primary participants are NMMU undergraduate students who are considered to be vulnerable human subjects. The ethical clearance reference number acquired for the study from the NMMU Research Ethics Committee (Human) is H12-SCI-CS-020.

## 1.9 Conclusion and Dissertation structure

It was identified that there is insufficient evidence of studies that incorporate a comprehensive model that uses social media to support environmental awareness in HEI. The problem of this study will be addressed over the next six chapters. Figure 1.4 provides the structure of the dissertation.

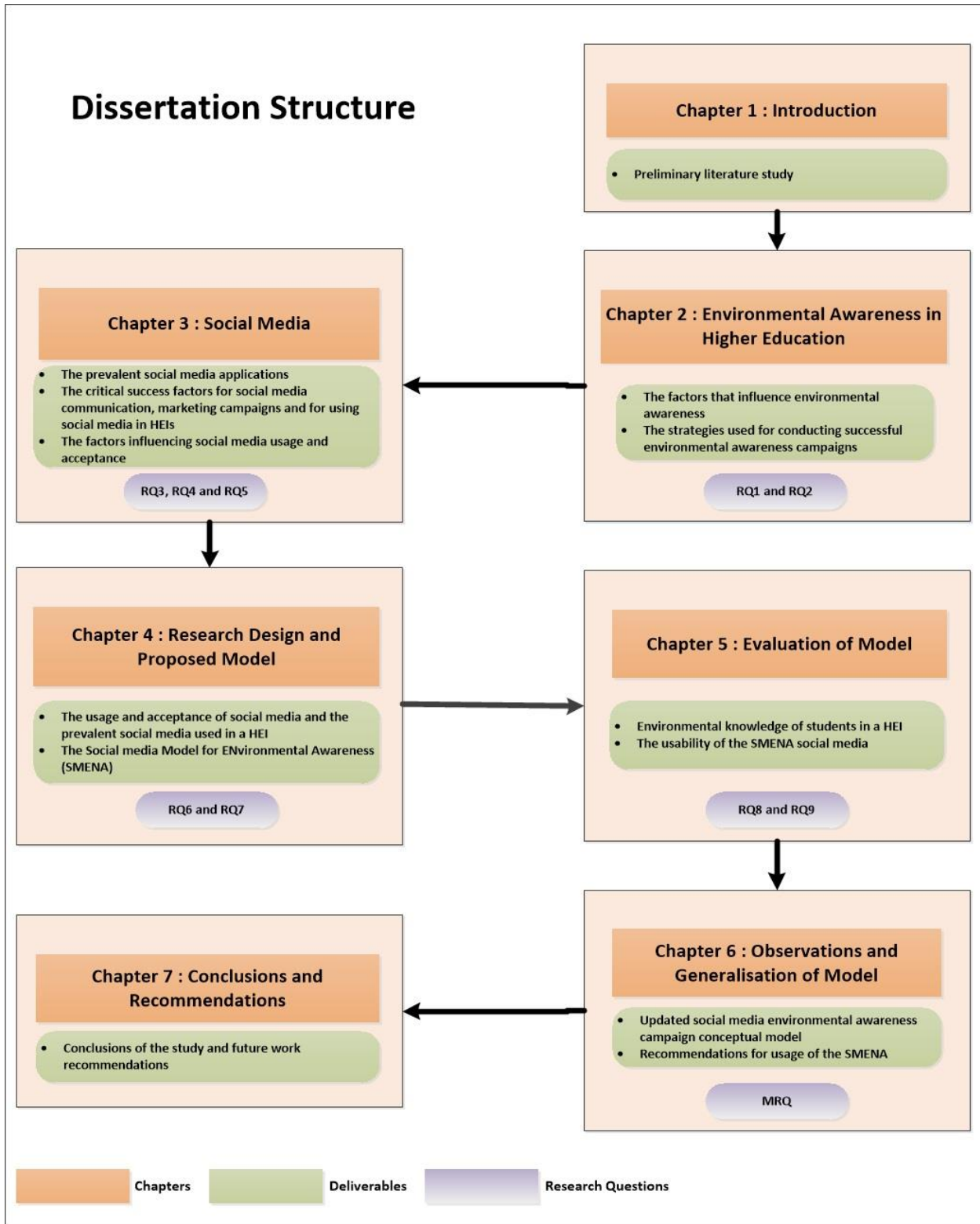


Figure 1.4: Dissertation structure



Chapter 2 seeks to address the following research questions:

RQ1: *“What are the factors that influence environmental awareness?”* and

RQ2: *“What are the strategies that can be used to carry out a successful environmental awareness campaign?”*

This chapter highlights the aspects of environmental sustainability in HEIs. The components environmental education and categories of environmental literacy are discussed. The various factors that influence environmental awareness and the strategies for conducting an environmental awareness campaign are investigated. Several benefits of using social media for environmental awareness campaigns are identified.

Chapter 3 addresses the following research questions:

RQ3: *“What are the most prevalent social media applications?”*

RQ4: *“What are the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions?”*, and

RQ5: *“What are the factors that influence social media usage and acceptance?”*

This chapter provides a detailed review of social media categories and applications. The CSFs for using social media in HEIs and the CSFs for using social media for communication and marketing campaigns are identified. The factors that influence usage and acceptance social media are also investigated.

Chapter 4 includes the research design and the design of the Social media Model for ENvironmental Awareness (SMENA). The results of the pre-intervention social media empirical study and some aspects of the literature gathered in Chapters 2 and 3 which will serve as components of SMENA will be analysed. Therefore, the research questions that will be addressed in this chapter are:

RQ6: *“To what extent is social media used and accepted by students in a Higher Education Institution?”* and

RQ7: “*What are the components of a Social media Model for ENvironmental Awareness (SMENA)?*”

Chapter 5 includes the evaluation results of the SMENA. The aim of the SMENA evaluation is to determine the usage and acceptance of the SMENA social media amongst students; the improvement of environmental knowledge amongst students; the usability of the SMENA website; and the extent to which the SMENA social media were able to increase environmental knowledge. This chapter addresses the following research questions:

RQ8: “*What is the improvement in environmental knowledge for students using SMENA?*”

RQ9: “*What is the usability of SMENA social media?*”

Chapter 6: The evaluation results acquired in Chapter 5 will be used to amend the environmental awareness campaign conceptual model and recommendations will be provided as to how the SMENA can be improved. This chapter addresses the main research question of this study:

MRQ: “*What comprehensive model can be used to support environmental awareness by using social media in Higher Education Institutions?*”

Chapter 7 will provide the conclusions and recommendations to future related research.

# Chapter 2: Environmental Awareness in Higher Education

## 2.1 Introduction

Environmental sustainability is an aspect of sustainability that serves as a solution to prevent the degradation of the environment (Howard and Lubbe 2012). It deals with the current conservation of Earth's natural resources so that they can be available for use to future generations. Environmental issues such as global warming, water pollution, air pollution and fresh water scarcity are some of the factors that cause the degradation of the environment (Strong 1998). The research questions which will be addressed in the chapter are:

*RQ1: What are the factors that influence environmental awareness?*

*RQ2: What are the strategies that can be used to carry out a successful environmental awareness campaign?*

One of the goals of HEIs is to adopt sustainable practices and improve environmental awareness of individuals within its environment (Section 2.2). Environmental education includes processes that provide individuals with a broad understanding of environmental issues and provide them with appropriate skills to make sound environmental decisions. Environmental awareness is component of environmental education and a category of environmental literacy (Section 2.3). There are several factors that influence environmental awareness such as knowledge, people's demographics, time and cost (Section 2.4).

Environmental awareness campaigns are capable of disseminating environmental information and they can provide individuals with knowledge about issues affecting the environment (Maibach 1993; Talero 2004). The strategies that are used to create environmental awareness by using environmental awareness campaigns will be investigated with the intention to address RQ2 (Section 2.5). Mass communication media such as social media have the capability to carry out environmental awareness campaigns effectively (Section 2.6). Social media provide many benefits, one of which is the capability to reach large-audiences at a low cost (Section 2.7).

The main objectives of this chapter are to identify factors that influence environmental awareness and to identify the strategies for creating environmental awareness by using environmental awareness campaigns. The primary outcomes of this chapter are: the factors that influence environmental awareness and the strategies that will assist the researcher to create environmental awareness using environmental awareness campaigns. The structure of the chapter is as follows (Figure 2.1):

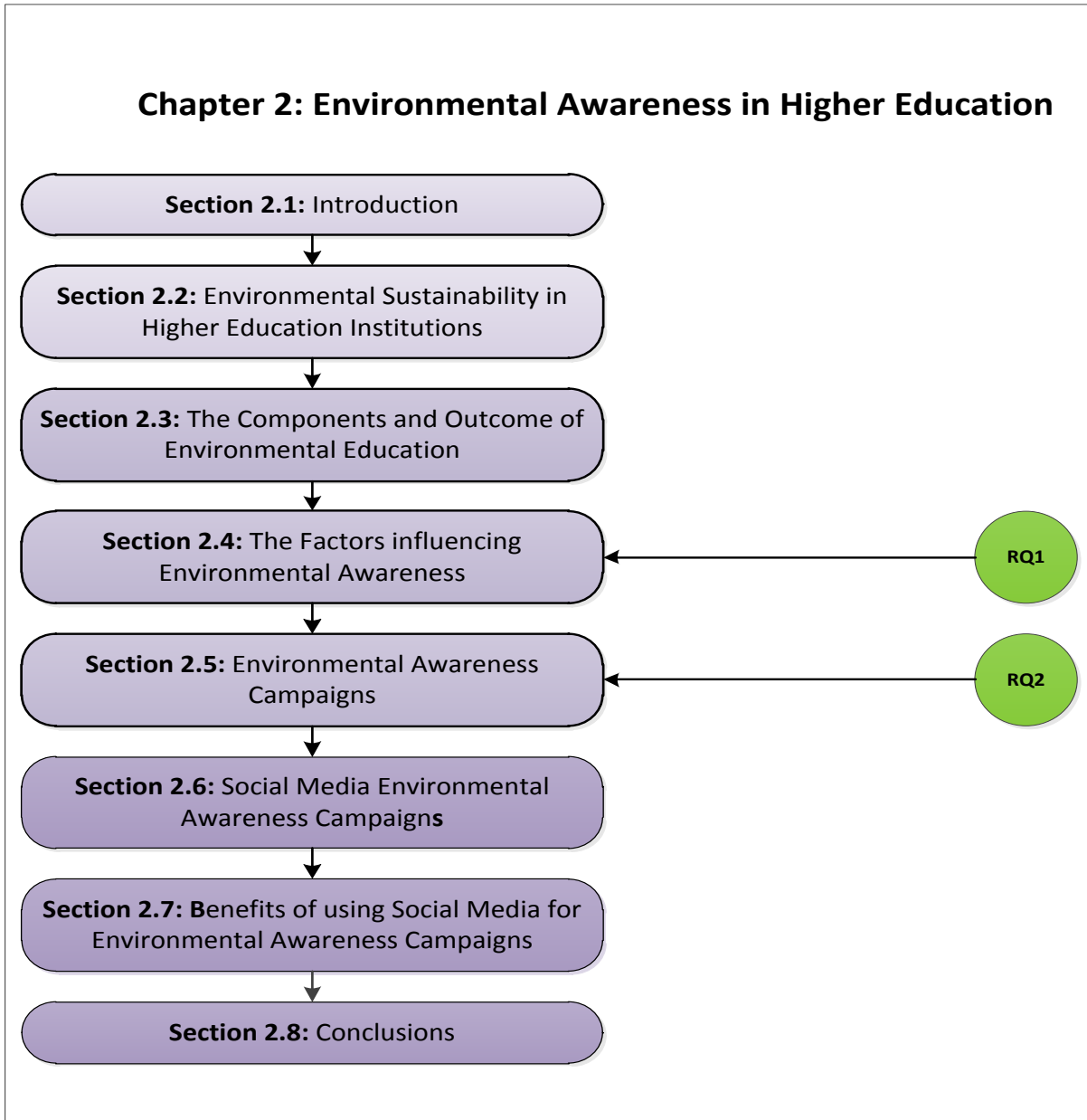


Figure 2.1: Chapter 2 structure

## **2.2 Environmental Sustainability in Higher Education Institutions**

The two key principles of sustainability are intergenerational and intra-generational equity (Howard and Lubbe 2012). The intergenerational equity principle is dependent on the intra-generational equity principle and it seeks equal distribution of resources over to future generations. In contrast, intra-generational equity requires resources to be shared equally between people in the current generation. Inadequate utilisation of resources in the current generation can jeopardise equal distribution of resources in the future.

The environmental aspect of sustainability (environmental sustainability) aims to enhance the systems that maintain human life (global support systems) (Goodland 1995). The source capacities of these systems produce various inputs such as food, water and energy whereas the sink capacities absorb outputs and wastes. The main reason why humans require environmental sustainability is that human beings are dependent on other environmental species for food, shelter, clean air, pollination, waste absorption and life-supportive services that are provided by the environment. Watson, Boudreau and Chen (2010) confirm that environmental sustainability aims to achieve eco-efficiency, eco-equity and eco-effectiveness. Eco-efficiency means satisfying human needs and improving their way of living while reducing negative impacts on the environment and usage of resources to levels that are suitable to the earth's carrying capacity. Eco-equity involves creating equal rights for people in current and future generations to access environmental resources. Eco-effectiveness involves the effective production of environmentally friendly products. For instance, an eco-effective strategy would be a design of a building that relies only on natural lighting.

Howard and Lubbe (2012) add that strong environmental sustainability practice incorporates the following seven principles:

- It prevents the destruction of functions that support human life, such as climate change and ozone depletion;
- It protects life-support functions such as biodiversity;
- It requires efficient and effective utilisation of renewable and non-renewable resources in order to prevent degradation of the associated ecosystems;

- It prevents the exploitation of renewable and non-renewable resources and ensures a balance between usage of these resources and development of substitutes;
- It ensures that precautionary measures for reducing emissions are adhered to;
- It ensures conservation of the natural landscapes that provide amenity function; and
- It eradicates technologies posing a threat to human health and the ecosystem.

The International Organisation for Standardisation (ISO) 14001 is an approach used to achieve practical sustainable development (Foo 2013). It provides permission for the prescription of environment goals, policies, responsibilities, and yearly auditing of its elements. ISO 14000 is a standard referred to as Environmental Management Systems (EMS) which is described as the initiatives taken by organisations to reduce damage to the environment caused by organisational activities. Matuszak-Flejszman (2009) explains that the implementation of EMS within organisations does not only provide benefits for organisations but it also provides benefits for the environment. The main notion behind EMS is pollution prevention. This notion generates concepts such as reduction of material usage, and resource and energy efficiencies, which enable cost reductions.

The standard that is used to assess environmental impact is called ISO 14031 (Matuszak-Flejszman 2009). This standard includes two categories of indicators that are used to measure environmental impact. These indicators are:

- Environmental condition indicators ; and
- Environmental performance indicators – these indicators are used to measure the impact of organisational activities on the environment, they include management performance indicators and operational performance indicators.

The G4 sustainability reporting guidelines report compiled by the Global Reporting Initiative (GRI) provides environmental performance indicators which can be used by organisations to produce sustainability reports (GRI 2013). Sustainability reports are reports compiled by organisations to periodically reveal and distribute sustainability information to stakeholders (Fonseca *et al.* 2011).

The environmental performance indicators provided by the GRI G4 report are divided into twelve different categories, which are: materials, energy, water, biodiversity, emissions, effluents and waste, products and services, compliance, transport, overall, supplier environmental assessment, and environmental grievance mechanism (GRI 2013). Each category includes some metrics which can be used to determine if the indicator is utilised efficiently. For example the water environmental performance indicator includes three metrics:

- EN8: Total volume of water disposed by an organisation;
- EN9: Sources of water which are significantly impacted by disposed water; and
- EN10: Percentage and total quantity of water which is recycled and reused.

Higher Education Institutions (HEIs) are engaging in voluntary and dedicated efforts to include aspects of sustainability within their systems, make clear policies, set goals and targets, strategic planning, and time frameworks to achieve a more sustainable university environment (Foo 2013). Dahle and Neumayer (2001) argue that a sustainable HEI is an institution that enhances environmental awareness of the university community and reduces its negative impact on the environment inside and outside the institution's surroundings. Foo (2013) and Yuan and Zuo (2013) confirm that a sustainable HEI promotes the reduction of sustainability issues regionally and globally, and it carries out: sustainable operations on campus; sustainable research; initiatives to encourage a sustainable lifestyle; and sustainability reporting.

In South Africa, environmental issues are not considered as a high priority during academic discussions since there are more important issues affecting society such as service delivery, economic exclusion and poverty (Schäffler and Swilling 2013). However, the NMMU aims to become the leading university in South Africa that advocates sustainable activities within its operations (Fabricius and Du Preez 2009). The NMMU would like its support for sustainability to be reflected within its business processes, academic activities, operations and physical infrastructure design. In addition, one of the values of the NMMU is "*Respect for the Natural Environment*".

Lillah and Viviers (2010) argue that the NMMU has the opportunity to contribute to a more sustainable environment by incorporating elements of environmental care into the qualifications that they offer and by carrying out sustainable research. This commitment will assist students to acquire knowledge, skills and values required to progress towards a more environmentally sustainable lifestyle. However, the NMMU is already engaging in several sustainability activities within its campuses. For example, some of the energy used at the outdoor research facility is generated by solar panels, it incorporates energy saving devices such as air conditioners, lights, and it engages in designing sustainable buildings (Fabricius and Du Preez 2009). Lillah and Viviers (2010) conducted a study at the NMMU where students were required to provide suggestions on how the NMMU can become a sustainable university. Students suggested that there should be more campaigns that promote awareness of environmental issues and they should be presented with more opportunities to engage in sustainability initiatives such as recycling.

NMMU students consider conservation of the environment a very important issue and they support the NMMU's quest to becoming the sustainability leader amongst South African universities and organisations (Lillah and Viviers 2010). The study of Lillah and Viviers (2010) revealed the following additional findings from the students:

- The students realise that they have an effect on the environment; however, they also have the will to engage in activities that can reduce their impact on the environment;
- The students were already engaging on some sustainable actions amongst their peers at the time of the study; and
- Few students take part in initiatives that promote sustainability on campus. However numerous students stated that they would take part in sustainability initiatives if they were offered incentives.

### **2.3 The Components and Outcome of Environmental Education**

Environmental education is a procedure that provides individuals with the ability to learn about environmental issues, to play an active role in solving environmental problems and to take responsible actions in order to improve the environment (EPA 2013). There are five components of environmental education (Figure 2.2). These components are:

- Knowledge and understanding of the environment and issues associated with it;



- Awareness and sensitivity to the environment and environmental issues;
- Attitudes of caring towards the environment and enthusiasm towards improvement and maintenance of environmental quality;
- Skills for discovering and resolving environmental problems; and
- Participation in activities that encourage individuals to resolve environmental problems.

The outcome of environmental education is environmental literacy. Environmental literacy can be divided into three categories and each category includes several components. This study will focus on two categories of environmental literacy which are knowledge and attitude. The components of knowledge on which this study will focus are knowledge of global and national environmental issues, and the component of attitude on which the study will focus is environmental awareness. These components are enclosed with an ellipse in Figure 2.2.

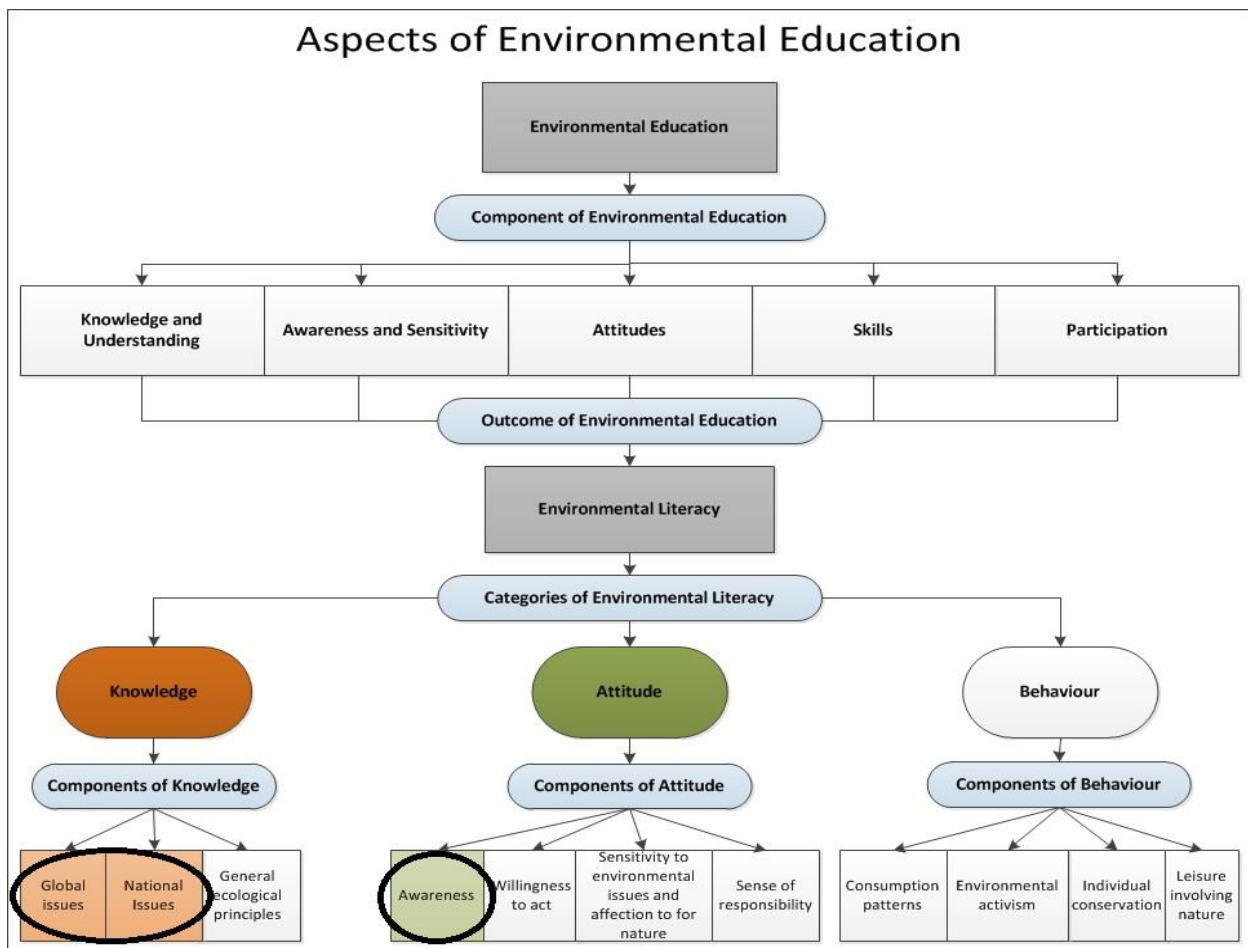


Figure 2.2: The aspect of environmental education (EPA 2013; Negev *et al.* 2008)

The aim of environmental education is to improve individuals' awareness and knowledge of environmental issues and assist individuals to acquire essential skills to make sensible decisions relating to the environment and to act responsibly towards the environment (Potter 2009). Haşiloğlu *et al.* (2011) confirm that environmental education provides individuals with the necessary knowledge, skill and values to perform environmentally responsible actions. In this regard, Morrone, Mancl and Carr (2001) suggest that institutions should encompass environmental education curricula that consist of the following goal levels. The goals of this study are concurrent with the first (Level 1) and second (Level 2) level goals.

Level 1: It should focus on imparting knowledge about the environment and the issues affecting the environment;

Level 2: It should make individuals aware of the impact of their behaviour on the environment;

Level 3: It should provide individuals with the ability to analyse and evaluate issues affecting the environment and to develop solutions that remediate these issues; and

Level 4: It should provide individuals with the necessary skills to take appropriate environmental actions.

Environmental education should provide individuals with objective and scientifically accurate information (Potter 2009). However, it is the responsibility of institutions and other parties involved with environmental education to acquire the scientific information from scientists and present it to the public in a manner that is effective and easy to understand (Talero 2004).

Environmental literacy is the outcome or the final goal of environmental education (Krnel and Naglic 2009). Krnel and Naglic (2009) define environmental literacy as knowledge of the way the world functions and knowledge about how the environment can be preserved and sustained by humans. Environmental literacy takes a long time to achieve as it requires thorough knowledge of information and skills (Coyle 2005).

An environmentally literate individual obtains knowledge of content, skills, and processes that are required in order to lead a sustainable lifestyle (Krnel and Naglic 2009). Loubser, Swanepoel and Chacko (2006) confirm that environmental literacy provides individuals with the competency to identify and understand the conditions of the environment and the capacity to take proper initiatives to maintain, restore, or improve the current environmental conditions.

It is important for individuals to possess environmental literacy because it is a very important factor that can assist in achieving a more sustainable future where resources are preserved for future generations (Krnel and Naglic 2009). Negev *et al.* (2008) argues that there is no formal definition of environmental literacy. However, the common attributes included in most environmental literacy definitions are:

- Environmental and ecological knowledge;
- Awareness of current situations regarding environmental issues;
- Cognitive abilities to evaluate environmental problems; and
- Behaviours that encourage people to reduce their impact on the environment and to participate in initiatives conducted by societies to protect the environment.

The three categories that can be extracted from the various definitions of environmental literacy are knowledge, attitude and behaviour (Negev *et al.* 2008). Pe'er, Goldman and Yavetz (2007) state that environmental knowledge involves understanding the following:

- Environmental principles and effects of humans on the environment;
- The relationship and interaction between social and natural systems;
- The environmental issues that arise as a result of human interactions with the environment; and
- The strategies for environmental action, which involves the ability to classify and assess other means of environmental remediation (eradicating environmental issues).

Armagan and Koksal (2010) add that environmental knowledge is regarded as all the different types of environmental information such as information about environmental issues, solutions to environmental problems and ecologic developments.

Environmental attitude is related to people's feelings towards the environment, which entails feelings and concerns for various environmental issues, and feelings towards taking actions to solve environmental problems (Pe'er *et al.* 2007). Responsible environmental behaviour includes the actual actions that individuals conduct in order to conserve the environment (Armagan and Koksal 2010).

Environmental awareness is a component of environmental attitude (Negev *et al.* 2008). Coyle (2005) defines environmental awareness as simple knowledge of environmental matters which includes proper understanding of environmental issues and implications of environmental matters. Gadenne, Kennedy and McKeiver (2008) state that environmental awareness is one of the main factors that motivate individuals' environmental responsiveness and it is regarded as the knowledge of the shortcomings and benefits associated with environmental issues. Coyle (2005) argues that more complex knowledge of environmental matters includes both awareness and actions that encourage individuals to take initiatives that improve the environment such as saving electricity.

## **2.4 The Factors Influencing Environmental Awareness**

According to a widely accepted value system, knowledge and attitude are important factors since they possess the potential to influence behaviour (Zsóka *et al.* 2013). Pe'er *et al.* (2007) argue that there is a positive correlation between environmental knowledge and attitude, which implies that an improvement in knowledge leads to a change in attitude. Traditional environmental education literature introduced a behavioural change system which illustrates that an improvement in knowledge and attitude leads to an improvement in behaviour (Hungerford and Volk 1990; Ramsey and Rickson 1976). However other studies (Zsóka *et al.* 2013; McKenzie-Mohr 2011) argue that an increase in knowledge and attitude does not necessarily mean an improvement in behaviour and a positive behaviour towards the environment does not guarantee reduction of environmental impact. However, behaviour of individuals towards the environment is not within the scope of this study.

Environmental knowledge is one of the most important determinants of environmental awareness (Zsóka *et al.* 2013). Gadenne *et al.* (2008) add that individuals should acquire proper environmental information in order to improve their environmental knowledge. An environmentally knowledgeable individual possesses knowledge and awareness of environmental issues, and possible solutions to environmental issues (Zsóka *et al.* 2013). An improvement in individuals' knowledge of environmental issues increases their environmental concern and awareness (Zsóka *et al.* 2013; Ramsey and Rickson 1976; Hungerford and Volk 1990; Barr 2003).

Time and cost are additional factors which have an influence on environmental awareness, which implies that individuals require sufficient time and financial resources to learn about environmental issues and to enhance their environmental awareness (Gadenne *et al.* 2008). Demographic factors such as gender, age, and education also have a significant effect on the awareness or attitude of individuals towards the environment (Gokmenoglu, Eret and Kiraz 2011). Studies (Gadenne *et al.* 2008; Ogunbode and Arnold 2012) have shown that females possess a higher level of awareness and a more positive attitude towards the environment than males; older individuals are less aware and possess less positive attitudes towards the environment than younger individuals, and individuals with higher education have a high level of environmental concern. However, it is complicated to determine the effect of age because the relationship between age and environmental awareness is also influenced by factors such as income, education, or cohort effects such as generational differences in socialisation and economic situations (Gadenne *et al.* 2008; Ogunbode and Arnold 2012).

## **2.5 Environmental Awareness Campaigns**

Environmental awareness campaigns are information-oriented sustainability initiatives where the dissemination of information between environmental experts and individuals occurs in non-formal settings (Monroe, Andrews and Biedenweg 2008). Environmental awareness campaigns are important because they improve the protection of natural resources, they promote proper use of these resources, and they assist communities to accomplish a sustainable future (Talero 2004). Moreover, environmental awareness campaigns also assist individuals to acquire the necessary knowledge, skills and attitudes to solve issues affecting the environment.

Environmental awareness campaigns are dependent on media channels such as mass media communication therefore, it is essential that these media channels focus on disseminating information that promotes environmental remediation instead of information that contributes to the deterioration of the environment (Maibach 1993; Talero 2004). Stamm, Clark and Eblacas (2000) add that mass media and personal communication are key factors that can assist with the enhancement of peoples' understanding of environmental issues.

In this regard, proper communication with the target audience is vital in order to effectively carry out an environmental awareness campaign (Talero 2004). McKenzie-Mohr (2000) confirms that mass media communication tends to enhance people's knowledge and attitudes but they do not necessarily change their behaviours.

Madruga and Da Silveira (2003) state that there are two approaches to improve individuals' environmental awareness. The first approach is to relate to the natural environment with positive emotions such as happiness, pleasure and hope. Individuals will in turn get excited about nature and add personal value to the conservation and protection of the environment. The second approach is to emphasise negative environmental aspects and experiences such as environmental catastrophes. The fear of risk to the environment aroused within individuals will compel them to take some form of action. These approaches do not ensure changes in the behaviour of individuals however they are important since they increase individuals' concern about the environment and enable them to take responsibility for the conservation of the natural environment. The strategies that can be followed in order to improve peoples' environmental awareness and commitment through environmental awareness campaigns include:

- **Targeted Effort:** Knowing the target group that can be used to achieve the goals of environmental education (Madruga and Da Silveira 2003). Most environmental awareness campaigns are successful when they are focused on a certain group or audience (UNEP 2013).
- **Local Outreach:** Reaching out to different tribes, religions, and community leaders can assist an environmental activist to educate communities about environmental issues (UNEP 2013).

- **The Media:** Using resources such as computers and television (Madruga and Da Silveira 2003). The use of different types of media such as print, broadcast and Internet media can assist with the improvement in environmental education (UNEP 2013).
- **Education:** Targeting education sources such as education from parents to children, schools and university curricula (Madruga and Da Silveira 2003). Educating children and adolescents about environmental issues is important for success in the long-run because when they become adults they will assist with remediation of the environment (UNEP 2013).

All these strategies will be used for this study expect for local outreach since this study is focused on creating environmental awareness in a HEI. Target effort, the media and education strategies will serve as guidelines for the implementation of an environmental awareness campaign which will be implemented as part of this study.

Behaviour change cannot be accomplished by the distribution of information only (McKenzie-Mohr 2000). Social marketing is a concept that can be used to foster behaviour change. Some approaches that have been proven to change people's environmental behaviour are: obtaining commitments, setting goals and influencing social norms (Brewer, Lee and Johnson 2011).

Making an initial tiny commitment can actually later motivate a much bigger commitment (Brewer *et al.* 2011). For example, a commitment could be if an individual is requested to place a banner that reads "Keep our Town Clean" in his or her front yard since commitments that are made public are more effective than private commitments. Setting goals is perceived as objectively measurable commitments, which can also be used to provide feedback. For instance a goal can be a pledge made by individuals to reduce electricity usage by 20% for a specified duration of time.

Lastly, social norms are considered as a way in which an individual's behaviour is influenced by the behaviour of others (Brewer *et al.* 2011). Social norms can be divided into two components which are descriptive norms and injunctive norms. Descriptive norms are perceived as the way things are, and injunctive norms are seen as the way things should be. Individuals are actually influenced by what other people do, for example, if an individual sees another individual litter they are more likely to litter as well.

## 2.6 Social Media Environmental Awareness Campaigns

Thackeray *et al.* (2008) confirm that the costs of social media marketing are minimal when compared to the cost of traditional social marketing strategies. However, the largest cost associated with social media marketing is the cost of the time and effort required to participate in generating and sharing content on social media. Different social media tools can be used in various ways to raise awareness of environmental issues (Idumange 2012). The following are ways in which some social media tools are used to raise environmental awareness:

### *Blogs*

Blogs can be used to raise awareness amongst individual groups in a specific location by posting comments such as facts about ways in which water can be conserved in a particular region (Idumange 2012).

### *Facebook*

Facebook can be used for discussions about environmental issues and to give users the opportunity to share their opinions and provide guidance on how people can assist to conserve environmental resources (Idumange 2012). Facebook enables users to communicate by using pictures, videos and sharing links, therefore it has the capability to distribute environmental information in many different ways.

### *Twitter*

Twitter can be used by environmental professionals in a specific region to provide information and carry out discussions on ways to solve environmental problems that are being faced by that particular region (Idumange 2012).

### *YouTube*

YouTube can be used to address environmental issues such as increased carbon footprint due to waste emissions (Idumange 2012). The environmental situation can be communicated to people by means of videos. The visual nature of explaining the situation is more appealing to individuals than written explanations.



*Social Book Marking sites (Delicious)*

Social book marking sites can be used to raise awareness in various ways such as posting links of content from reliable references that focus on environmental protection (Idumange 2012).

An example of a social media green initiative is “*I am Green*” (Figure 2.3). “*I am Green*” is a Facebook application that provides people with environmental consciousness the platform to communicate and share ideas online (Brewer *et al.* 2010). This application encourages environmentally friendly behaviour by providing users with action statements such as “*Most of my lights are compact fluorescent*”. The users are in turn required to report whether they conducted the particular action in the real world.

The users are also required to make a pledge that they will perform the action and that they will share the statements with other users. Users can also add new statements to the list of statements already available.

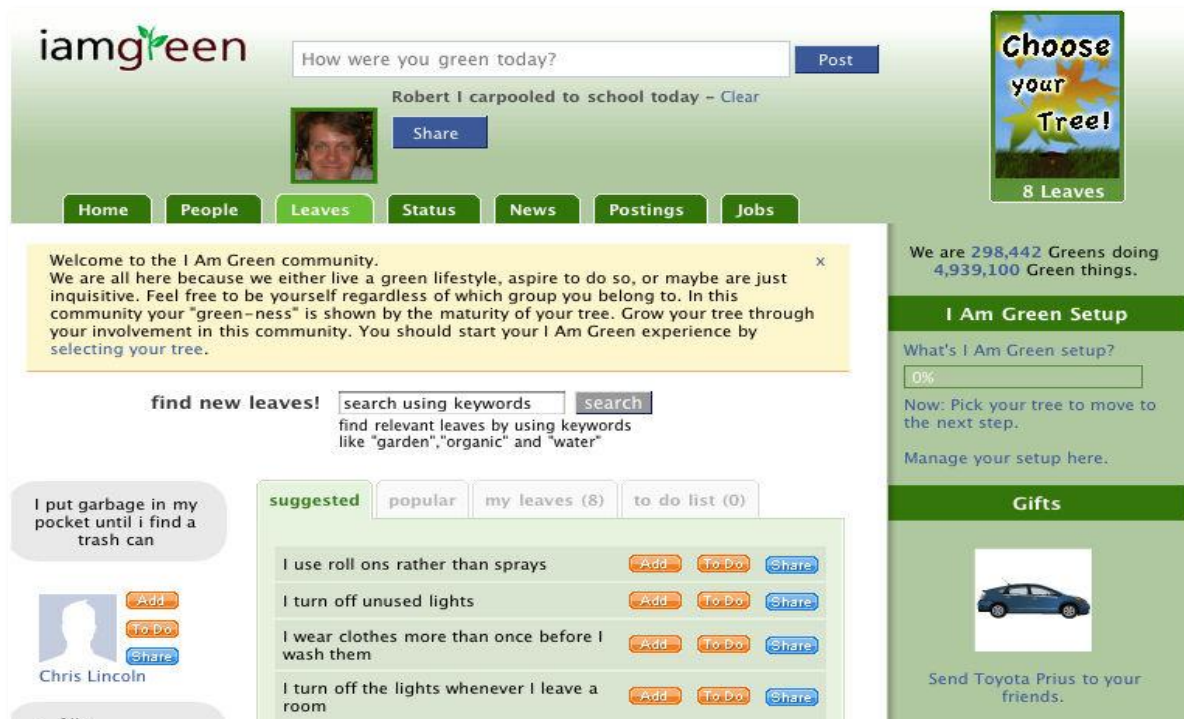


Figure 2.3: “*I am Green*” application (Brewer *et al.* 2010)

Social media sustainability initiatives can draw large numbers of audience over a period time and they can acquire enough support from the audience to compel organisations to transform to more sustainable operations (Langley and Van den Broek 2010). For example Greenpeace activists launched a YouTube campaign which informs people that the palm oil that Nestlé uses to make KitKats is not environmentally friendly. The palm oil is produced in Indonesia and forests that serve as natural habitats for orang-utans are destroyed to make provision for trees that produce this palm oil. This campaign included a YouTube video where a man opens the packaging of a KitKat and removes the finger of an orang-utan and calmly chews it. In this case Greenpeace used the weight of customers who watched the YouTube video to force Nestlé to switch to more sustainable activities. Nestlé declared within a month that it will switch to a more environmentally friendly palm oil by 2015.

Other examples of technologies and websites that provide support for various environmental initiatives include (Mankoff *et al.* 2010):

- **The Powerhouse** which is a web-based game that focuses on improving the knowledge and attitudes of teenagers towards the environment.
- An **animated polar bear** which is used at the Dartmouth College and responds to electricity usage in order to encourage residents to preserve electricity.
- **Fish receipt** which is a web-based application that influences individuals' attitudes and actions towards the environment by providing them with indirect messages.
- **Green.yahoo.com** which is a website that encourages individuals to carry out energy saving actions and to commit to those actions. However, this website does not provide feedback about whether individuals have fulfilled the particular actions in the real world.
- **Energyrace.com** which is a web-based application that utilises competitions to encourage individuals to carry out energy saving actions.
- **GreenNexus.com** which is a social website that provides information about events and allows individuals to discuss and share ideas related to the environment.

## 2.7 Benefits of using Social Media for Environmental Awareness Campaigns

Traditional conventional environmental awareness campaigns rely heavily on information in order to change the attitudes or awareness of individuals towards environmental issues (Mooney, Winstanley and Corcoran 2009). Alternative strategies that use concepts and tools to communicate more effectively have to be considered in order to make environmental activism more appealing. A study conducted by Ali (2011) reports that social media such as Facebook can be used effectively as conventional face-to-face tools to increase awareness of environmental issues. Social media sites have the ability to create environmental awareness because they contain benefits such as wide-reach, speed, cost, easy accessibility, usability and learnability, immediacy, permanence, and sustainability.

- **Wide-reach:** Social media have been transformed from communication and entertainment tools to information platforms that disseminate information to a large spectrum of individuals (Namrouga 2012). Several studies (Idumange 2012; Willson 2010; Namrouga 2012) confirm that social media tools have the ability to reach a large audience. Their structures are more decentralised, less hierarchical and they are available at numerous areas where they can be utilised.
- **Speed:** Willson (2010) states that it takes much time and a lot of effort to influence public consciousness without the use of social media. Social media accelerates information distribution processes and the disseminated information is accessed by a larger spectrum of individuals. Viglianisi and Sabella (2011) confirm that social media are the fast drivers of circulation and diffusion of information.
- **Cost:** Willson (2010) and Idumange (2012) argue that social media have the ability to raise awareness of environmental issues very quickly and at a low cost.
- **Easy accessibility:** Users can easily access material on social media that provide them with information about issues and useful facts and figures (Idumange 2012; Namrouga 2012).
- **Usability and learnability:** Social media usage does not require any training or special skills (Idumange 2012). It only requires reinterpretation of available skills hence, any individual that can access social media tools can use them accordingly.

- **Immediacy:** Social media enables users to get responses in an instant (Idumange 2012). However the participants hold the power to determine the delay of responses.
- **Permanence:** Social media are flexible as they allow instant modification of information by means of comments and editing (Idumange 2012).
- **Sustainability:** Namrouga (2012) claims that the use of social media limits the use of posters and brochures, which reduces the use of paper and cost of printing.

## **2.8 Conclusions**

Higher Education Institutions (HEIs) are incorporating sustainability initiatives (such as enhancing environmental awareness of individuals) in their strategies in order to achieve a more sustainable university environment. Environmental awareness is important as it makes people knowledgeable about issues that harm the environment and it encourages them to use natural resources responsibly.

The main objective of this chapter is to address RQ1 and RQ2. In order to address RQ1 environmental knowledge was identified as a key factor that influences environmental awareness (Section 2.4). Environmental knowledge has a positive influence on environmental awareness which implies that an increase in environmental knowledge leads to an increase in environmental awareness. Furthermore, other factors that influence environmental awareness are time and cost, and demographics such as age, gender and education level. However, these factors are beyond the scope of this research study since the study seeks to enhance individuals' environmental awareness by improving their environmental knowledge. Environmental knowledge will be included as a factor that influences environmental awareness in the environmental awareness campaign conceptual model.

There are several strategies and approaches that can be undertaken in order to promote environmental awareness (Section 2.5). This study will follow the approach where the researcher highlights the issues that negatively impact the environment to promote fear of environmental risk within individuals which will in turn increase their awareness of environmental issues.

The strategies that will be adopted for creating awareness using an environmental awareness campaign in this research study, which answers RQ2, are:

- **Targeted Effort:** Providing environmental education to a certain target group;
- **The Media:** Using different types of media such as the Internet; and
- **Education:** Providing environmental education within and outside an educational institution.

The main benefits of using social media to disseminate environmental information in order to create environmental awareness are the ability to reach a wide audience at a low cost and also accessibility and low learning curve (Section 2.7). The next chapter (Chapter 3) will provide a more detailed discussion about social media. It will highlight various aspects of social media sites, the usage of social media in HEIs, the usage of social media for communication and marketing within organisations, and the factors that influence the usage and acceptance of social media.

# Chapter 3: Social Media

## 3.1 Introduction

The previous chapter (Chapter 2) explored the problem of creating awareness of environment issues amongst students in HEIs. The main deliverables of Chapter 2 are the strategies for creating environmental awareness campaigns and the key factor that influences environmental awareness. The main objective of this chapter (Chapter 3) is to determine the most prevalent social media; the Critical Success Factors (CSFs) for using social media in HEIs, the CSFs for social media communication and marketing, and the factors that influence individuals' usage and acceptance of social media. The following research questions will therefore be addressed in this chapter:

RQ3: *What are the most prevalent social media applications?*

RQ4: *What are the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions?*

RQ5: *What are the factors that influence social media usage and acceptance?*

Gikas and Grant (2013) explain that the term *social* in social media implies that these applications are used in a social space for entertainment and/or professional purposes and they rely on social connections developed by individuals. In addition, the term *media* implies that the interaction between individuals is facilitated through the use of social networks, digital networks and digital devices. Kaplan and Haenlein (2010) add that social media can be divided into distinct categories (Section 3.2) and each category includes various social media applications (Section 3.3). The social media applications which are regarded to be the most prevalent globally will be identified in order to address RQ3.

Dhume *et al.* (2012) argue that social media are commonly used by students in HEIs (Section 3.4). Students use social media for social purposes and to access academic information. In addition, social media are also utilised by innovative organisations to improve communication, information sharing and collaboration, which could in turn enable the creation of innovative and thorough business practices.

Khang *et al.* (2012) state that advertising and marketing professionals have taken advantage of social media since they realised their potential to run marketing campaign strategies. Neti (2011) confirms that organisations' marketing departments have realised the advantages of social media and they are increasingly implementing social media initiatives. The CSFs for using social media in HEIs and for using social media for communication and marketing campaigns will be identified in order to address RQ4.

Meredith (2012) argues that social media are communication platforms that organisations can use to share information and interact with stakeholders. Michaelidou, Siamagka and Christodoulides (2011) adds that social media assists organisations' marketing strategies since it supports their brands by creating and improving relationships between the organisation and its stakeholders (Section 3.5). However, usage of social media also comes with certain challenges such as having a negative influence on the productivity of employees (Section 3.6). The factors that influence usage and acceptance of social media will be investigated in order to address RQ5 (Section 3.7). The chapter structure is illustrated in Figure 3.1.

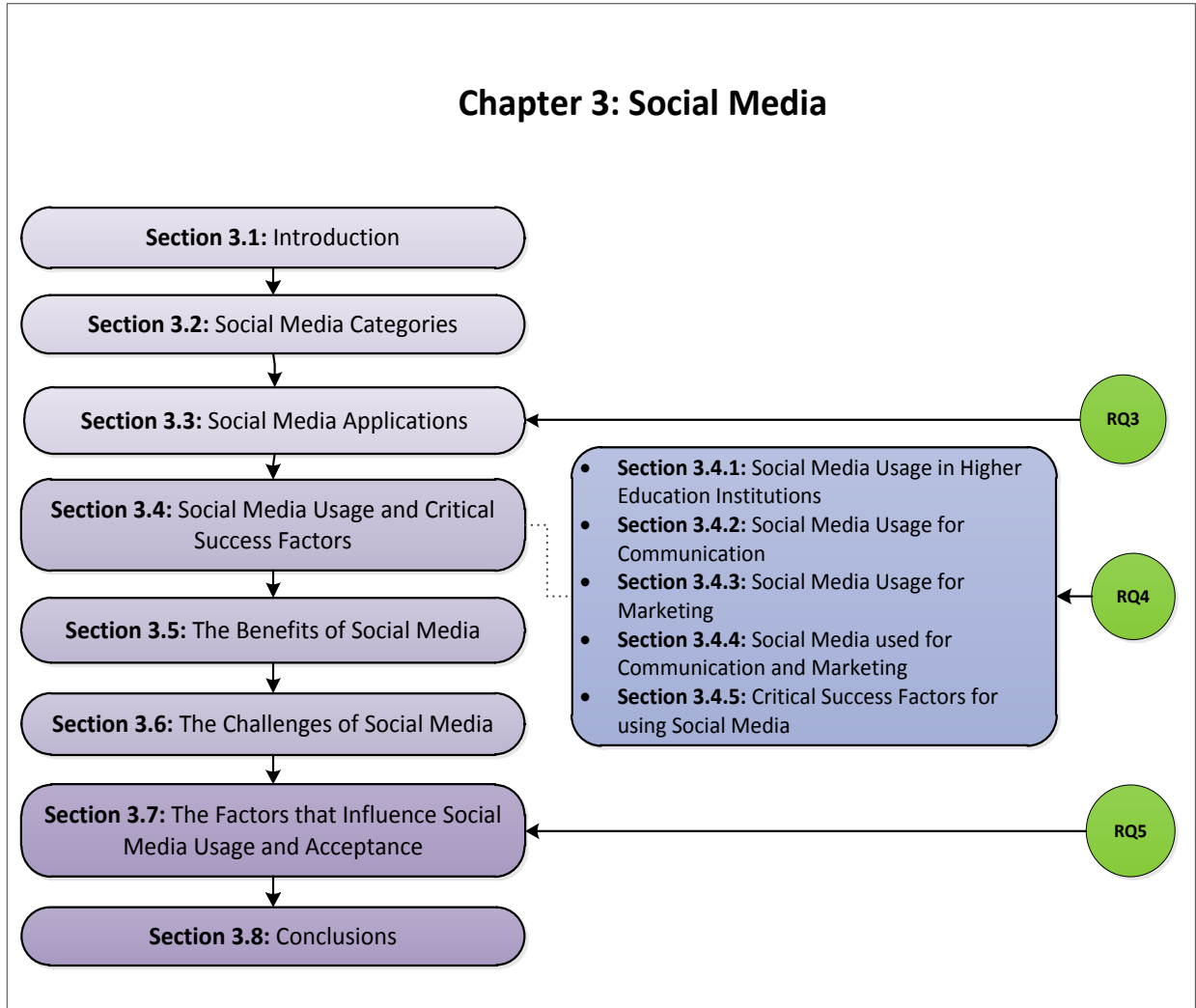


Figure 3.1: Chapter 3 structure

## 3.2. Social Media Categories

Social media can be grouped into several distinct categories and each category incorporates various social media applications (Table 3.1). Most of these categories identified Kaplan and Haenlein (2010) and Katajisto (2010) overlap each other. However, Katajisto (2010) includes an additional category named Add-ons in the list of categories.



Table 3.1: Social media categories

Kaplan and Haenlein (2010)	Katajisto (2010)	Applications
1. Collaborative projects	1. Collaborative producing	1. Wikipedia, Social bookmarking, and Delicious
2. Content communities	2. Content sharing	2. YouTube, Flickr, Wikipedia, and Slideshare
3. Blogs	3. Content creation and publishing	3. Blogs, wikis and podcasts
4. Social Networking sites	4. Social networking	4. Facebook, My Space, LinkedIn, and Twitter
5. Virtual game worlds and Virtual social worlds	5. Virtual worlds	5. Second life, World of Warcraft, Aion, Eve Online, and Habbo Hotel
	6. Add-ons	

#### *Collaborative projects/Collaborative producing*

Collaborative projects allow end-users to jointly and simultaneously create content (Kaplan and Haenlein 2010). Katajisto (2010) refers to this concept as collaborative content creation/producing. The main ideology behind content creation is that shared efforts by individuals can create more value than a single individual's effort (Kaplan and Haenlein 2010). The most popular collaborative sites are wikis and social book marking applications. Wikis are websites that enable users to remove, add and change web-based content. An example of a wiki is the online encyclopaedia Wikipedia ([www.wikipedia.com](http://www.wikipedia.com)) which is available in more than 230 different languages. Social bookmarking applications are Internet applications that enable group-based collection and rating of Internet links or media content. An example of a social book marking application is Delicious ([www.delicious.com](http://www.delicious.com)), an Internet service that enables storing and sharing of web bookmarks.

### *Content communities/Content sharing*

The main concept of content communities/sharing is the sharing and circulation of content amongst users (Kaplan and Haenlein 2010). Constantinides *et al.* (2008) confirm that content communities enable the organising and sharing of a particular type of content. In content communities users are usually not requested to create a profile page (Kaplan and Haenlein 2010). User information captured on these websites includes basic details such as date joined and number of uploads. Some of these websites are YouTube (which is used for video sharing), Flickr (which is used to share photos), Wikipedia (which is an encyclopaedia that can be edited by Internet users) and Slideshare (which enable sharing of PowerPoint presentations).

### *Blogs/content creation and publishing*

Katajisto (2010) explains that the collaborative producing category has some similarities with this category (content creation and publishing). The difference between these two categories is that in the latter many individuals are responsible for content creation and in the current category only one individual is responsible for content creation. Kaplan and Haenlein (2010) confirm that the current category is managed by one individual but it also enables other individuals to interact as it provides a platform where other users can add comments. Blogs/content creation and publishing applications usually display and arrange user content in a sequential order based on the time in which an entry was posted. Examples of these applications include Blogs, wikis and podcasts.

### *Social networking sites*

Boyd and Ellison (2007, p. 211) define social network sites as “*web-based services that allow individuals to construct a public or semi-public profile within a bounded system, articulate a list of other users with whom they share a connection, and view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site*”. Individuals are responsible for the management of their profile page, this page includes user details, photos, videos, audio and blogs (Kaplan and Haenlein 2010). The main function of social networks is to enable users to keep in touch with old contacts and build new networks. Some examples of social network sites are Facebook, My Space, LinkedIn and Twitter (Katajisto 2010).

### *Virtual Worlds*

Kaplan and Haenlein (2010) define virtual worlds as applications that simulate a three-dimensional habitat where users can take up a persona as avatars and interact with each other as they would in a real environment. Katajisto (2010) adds that virtual worlds are platform where users can play games and get real life experience on a virtual environment. Virtual game worlds are virtual environments where users interact with each other while complying with specific rules in the context of a massive, multiplayer, online role-playing game. Some examples of virtual worlds include Second life, World of Warcraft, Aion, Eve Online and Habbo Hotel.

### *Add-ons*

Add-ons are applications that add value to other sites such as Google maps and mashups (Katajisto 2010).

## **3.3 Social Media Applications**

Social media applications became popular due to web services such as Blogger, Facebook, Flickr and YouTube (Multisilta 2008). Khang *et al.* (2012) confirm that mid-year 2011 Facebook had more than 750 million active members registered from all over the world. Half of these members visit the Facebook page on a daily basis. During this time (mid-year 2011) the video sharing Internet site YouTube, reported that thirty-five hours of video content is posted every minute by users. In addition, the photograph sharing platform Flickr, made more than six billion photographs accessible to its users. The most common types of social media sites include: Facebook, LinkedIn, Flickr, YouTube and Twitter (Kaplan and Haenlein 2010; Tess 2013).

Facebook was developed in 2004 and it is still the most dominant social network site with more one billion active users worldwide (Tess 2013; Xu *et al.* 2012). It is mainly used for friends and network management (Kaplan and Haenlein 2010). It allows users to engage themselves on an online community where they can meet friends, share information, electronically converse with other users, and develop professional and personal relationships (Flynn 2012).

LinkedIn is a business orientated social media site that enables professional networking (Flynn 2012). LinkedIn is mainly dependent on personal referrals, which implies that a user can only create “connections” with people they already know. Tess (2013) confirms that LinkedIn is mainly focused on professional networking and enables people to create connections with people they know and trust. In this case, individuals are required to have a pre-existing relationship or some form of mutual contact with individuals they want to connect with.

Twitter is one of the most popular micro-blogging social media and it limits users’ blog messages (tweets) to 140 characters (Flynn 2012). This limitation to blog characters makes twitter a relatively fast mode of communication (Tess 2013). Twitter users that follow or get access to the tweets of a specific user are called “*followers*” (Flynn 2012).

YouTube is a content sharing social media used to share videos (Kaplan and Haenlein 2010). It allows users to upload, tag, describe, share, find, watch and comment on videos uploaded by other users (Flynn 2012).

Flickr is social media that provides users the ability to share photos (Kaplan and Haenlein 2010). It also allows for the sharing of videos that have a maximum length of ninety seconds (Flynn 2012). However, Flickr only accepts personal photos and videos. Content that is used for advertising and other business related issues is not allowed on the site.

### **3.4 Social Media Usage and Critical Success Factors**

Social media sites are mostly used for entertainment and professional purposes (Monnonen and Runonen 2008). The following are properties which make social media suitable for both entertainment and professional use:

- They include a flexible design, creative reuse, and user centred content;
- They provide a rich user interface;
- They include a collaborative content creation;
- They create social networks of people with common interests; and
- They help to gather collective intelligence.

The usage of social media increases daily and the use of these sites has significantly changed people's behaviours and lifestyles (Xu *et al.* 2012). It is reported that connection with family members and keeping in touch with new and old friends are the main reasons for social media adoption amongst social media users (Smith 2011). Other reasons for social media usage include connection with other users with common interests or hobbies, making new friends, reading comments by public figures and finding a potential romantic partner (Online Dating). Social media sites are used mostly by people between the ages 18 and 49, and most of these people possess some form of a university degree (Smith 2011) (Section 3.4.1).

Social media sites have also become an important form of communication amongst business professionals (Harris 2011) (Section 3.4.2). Organisations are taking advantage of social media sites because they have the ability to create business opportunities for both online businesses and traditional businesses (Xu *et al.* 2012). Social media are used within organisations for connection and collaboration among employees, and also for business and marketing strategies (Harris 2011) (Section 3.4.3). McAfee (2010) also confirms that organisations use social media for marketing, sales, customer services, public relations, human resources (mainly for recruitment), and information technology solutions. There are various social media which can be used for communication and marketing purposes within organisations (Section 3.4.4). However, organisations and HEIs should consider certain CSFs and guidelines before incorporating social media usage in their environments (Section 3.4.5).

### **3.4.1 Social Media Usage in Higher Education Institutions**

Dhume *et al.* (2012) argue that the use of social media is common amongst university students and students use them during their leisure time. Students use social media to view, interact and to activate existing personal and professional networks. Students also use social media sites to connect with people in different geographic regions. Tess (2013) confirms that social media are widely available and mainly accessed at universities where they are used by students for communication, collaboration and learning.

Gikas and Grant (2013) argue that the use of social media for learning in HEIs makes learning more student-centred. Tess (2013) adds that including social media in higher education learning can improve the effectiveness of communication. However, most students that have social media accounts rarely use social media for educational purposes; instead they mostly use it for communicating with friends and career networking. A social media study conducted by Hussain (2012) confirms that students mainly use social media for enjoyment, accessing their academic information and current affairs.

### **3.4.2 Social Media Usage for Communication**

Communication channels such as emails and instant messaging systems have the ability to distribute digital information but this content is only visible to a limited number of people (McAfee 2006). Van Zyl (2009) adds that communication media such as telephones and meetings are time consuming, interruptive and can reduce productivity and communication tools such as emails are usually not used effectively. Walther (2010) argues that social media will take the place of emails as the popular drivers of interpersonal communication for 20% of business individuals.

Due to the discrepancies of traditional communication media, organisations are adapting social media tools within their business environment which is a new trend, called Business 2.0 (Burrus 2010). This innovation includes using social media in ways that will improve teamwork, customer relations, collaboration with external stakeholders, and make the interaction communication amongst employees and managers more efficient.

Coca-Cola and Deloitte have incorporated social media in their business activities (Deloitte 2010; Mayes 2011). Coca-Cola engages on numerous social media sites to interact with its stakeholders (Mayes 2011). Coca-Cola's website contains links that direct users to the company's social media pages which include: Flickr, Twitter, Facebook, and YouTube. Facebook and Twitter enable the company to communicate with stakeholders. Latest videos are posted on YouTube by the company on a daily basis. Flickr provides the ability to post pictures of the company and pictures of the company's sponsors.

Deloitte has introduced a micro-blogging application called Yammer ([www.yammer.com](http://www.yammer.com)) which is the internal equivalent of Twitter (Deloitte 2010). Yammer enables collaboration and communication between employees. Deloitte employees use Yammer for knowledge sharing and problem solving. It serves as a platform where employees can ask questions, evaluate ideas and get feedback in real time. Deloitte also employs Facebook, Twitter, LinkedIn and YouTube for recruitment activities. For example, the company developed a Facebook application called “*JoinMe@Deloitte*” which is used as part of the company’s referral programme.

### **3.4.3 Social Media Usage for Marketing**

Social marketing is defined as a strategy that uses commercial marketing aspects to change behaviour while seeking to enhance the well-being of individuals and society (Dibb *et al.* 2012). Social marketing is focused on achieving changes by addressing issues such as improving sustainable behaviour (for example, increasing recycle rates), encouraging people not to smoke, getting drivers to adhere to speed limit laws and many other social issues. It was discovered that in order for social marketing to address all these issues successfully, it is important that people who are targeted by the social marketing campaigns actively participate in the campaign process.

Social media marketing on the other hand includes the use of social media to promote a company’s products and services (Neti 2011). Social media marketing is a strategic process that seeks to develop the organisation’s influence, reputation and brand within communities of prospective customers and other stakeholders.

Organisations are adopting online social media marketing programmes and campaigns in order to get into contact with a large audience of customers on the Internet (Hanna, Rohm and Crittenden 2011). Social media enables the generation and distribution of content through interactive communication and it is regarded as a useful tool in a business context (Kirtiş and Karahan 2011). Therefore, marketing departments are incorporating social media into their strategies in order to realise lower costs. Khang *et al.* (2012) confirm that the use of social media has become popular in professional practice and social media tools are being used respectively in areas such as marketing to create brand communities such as established marketing campaigns. Kim and Ko (2012) add that organisations that have not incorporated social media into their marketing strategies are missing the opportunity of reaching a larger base of customers.

Organisations that use social media as part of their online marketing strategy are Gucci and Dolce and Gabbana (Kim and Ko 2012). As part of a campaign to market sunglasses that are targeted at online customers, Gucci introduced a multicultural social media site called “*Gucciweb.com*”. Gucci also uses commercial social media sites such as Facebook and Twitter. They update their Facebook status more or less than three times a day and they constantly update tweets on Twitter. Dolce and Gabbana mainly use social media to get instant feedback from its customers with regard to their fashion shows. For example, fashion bloggers update the events of the fashion show on Facebook and Twitter, and then the customers provide immediate feedback on these updates which in turn creates purchase intentions in real-time.

#### **3.4.4 Social Media used for Communication and Marketing**

The social media which are commonly used by marketing professionals are Twitter, YouTube Facebook and LinkedIn. However, these social media, together with Wikipedia, are also commonly used by organisations to enhance organisational communication strategies.

- **Facebook:** It can be used to create a connection between organisational stakeholders and all employees (Burrus 2010). This will in turn improve external and internal business relationships and enhance collaboration. Facebook is commonly used by marketing individuals to create online communities in order to support organisational brands (Kirtiş and Karahan 2011).
- **Twitter:** It is usually used by organisations to address problems responsively (Burrus 2010). For example airlines use twitter to respond to traveller’s needs. Twitter is commonly used by organisational marketing department to communicate with stakeholders about organisations’ products in real-time (Kirtiş and Karahan 2011).
- **YouTube:** Organisational stakeholders can use YouTube or create the business version of YouTube to facilitate training and education (Burrus 2010). Organisations can also use YouTube for marketing purposes by posting humorous videos in order to attract users’ attention while creating product awareness (Burrus 2010).



- **LinkedIn:** Some insurance companies use LinkedIn to network with their independent sales representatives (Burrus 2010). Professionals in different job categories use LinkedIn to share best practices. Organisations use LinkedIn to market the company in order to attract prospective employees (Kirtiř and Karahan 2011).
- **Wikipedia:** Organisations can use an internal version of Wikipedia for problem solving and collaboration by sharing information (Burrus 2010). Some organisations use Wikipedia for education and training.

### 3.4.5 Critical Success Factors for using Social Media

The usage of social media amongst students depends on their age, ethnicity and level of income (Dhume *et al.* 2012). Falahah and Rosmala (2012) add that the intensive use of social media in HEIs depends on the following CSFs:

- **User background:** Determine the background and social media usage behaviour of users;
- **Internet usage:** Identify the institutions' policies of Internet usage and access;
- **Communication structures:** Investigate the structure of communication and the communication media used at the institution;
- **Social media communication:** Determine the role and rule of social media in daily communication at the institution; and
- **Attitudes:** Determine the attitudes of students towards social media.

Organisations require guidelines that can assist with the successful deployment of social media within the business environment in order to improve their communication strategies (Roberts 2010). Roberts (2010) proposes four CSFs and guidelines for implementing social media for communication in organisations, namely:

- **Goals and objectives:** Identify business objectives and goals for implementing social media and closely match them to the actual implementation;
- **Social media selection:** Select a social media tool that best matches business objectives and that allows employees to carry out work in ways that are common to them;
- **Readiness and change management:** Evaluate an organisation's readiness and construct a change management policy that portrays an organisation's culture; and

- **Value metrics:** Identify metrics that will determine the value of social media tools within the organisation.

The CSFs for social media marketing campaigns are iterative, therefore, the distinctive aspects of the campaign have to fit each other, and the objectives of the entire campaign have to be clearly defined (Walther 2010). Thackeray *et al.* (2008) adds that in order to conduct a successful social media marketing campaign the scope of the programme should consider certain factors. Two of the CSFs for implementing social media in organisations were also identified as CSFs for social media marketing campaigns, namely:

- **Goals and objective:** Identify the type of objectives being considered (processes, impact outcomes) and provide a short biography about the objectives of the campaign (Thackeray *et al.* 2008; Walther 2010); and
- **Social media selection:** Identify the social media that is going to be used (Thackeray *et al.* 2008).

The following are additional CSFs and guidelines identified for social media marketing campaigns.

- **Duration of programme:** Identify the duration of the programme (Thackeray *et al.* 2008);
- **Target audience selection:** Identify the target audience which the programme intends to target (Thackeray *et al.* 2008);
- **Frequent information updates:** Provide frequent information updates on the social media site (Walther 2010);
- **Involvement of users:** Allow users to get involved and give a reason why they should participate (active listening) (Walther 2010); and
- **Authenticity:** Conduct the campaign with honesty and authenticity (Walther 2010).

In this research study, the CSFs and guidelines for using social media in HEIs and the CSFs for social media communication and marketing will be used to provide guidance to the social media environmental awareness campaigns in HEIs. The CSFs for using social media in HEIs which will be used in this study to plan for the social media environmental awareness campaigns are “User background” and “Internet usage”. These two CSFs are selected for the study since they can be easily measured by the researcher. The CSF “Attitudes” can be included in “Readiness and change management”, whilst “Social media communication” can form part of “Social media selection”, therefore these two CSFs are not included in the consolidated list. Table 3.2 shows a consolidated list of CSFs and the related guidelines which will be used in this study for planning social media environmental awareness campaigns in a HEI.

**Table 3.2: CSFs for social media environmental awareness campaigns**

<b>Factors</b>	<b>Guidelines</b>	<b>Purpose</b>
<b>1. Internet usage</b>	Identify the university policies for Internet usage and access (Falahah and Rosmala 2012)	Higher Education
<b>2. User background</b>	Determine the background and social media usage behaviour of users (Falahah and Rosmala 2012)	
<b>3. Goals and objectives</b>	Identify the goals and objectives for using social media and closely match them to the goals and objectives of the campaign ( Roberts 2010; Thackeray <i>et al.</i> 2008; Walther 2010)	Communication and Marketing
<b>4. Social media selection</b>	Select social media applications that best match the campaign’s objectives and that allow students to carry out work in ways that are common to them (Roberts 2010; Thackeray <i>et al.</i> 2008)	
<b>5. Readiness and change management</b>	Evaluate students’ readiness and construct a change management strategy (Roberts 2010)	Communication
<b>6. Value metrics</b>	Identify metrics that will determine the value of using social media for the campaign (Roberts 2010)	
<b>7. Duration of programme</b>	Identify the duration of the campaign (Thackeray <i>et al.</i> 2008)	Marketing
<b>8. Frequent information updates</b>	Provide frequent updates on the social media site (Walther 2010)	
<b>9. Involvement of users</b>	Allow users to get involved and give a reason why they should participate (active listening) (Walther 2010)	
<b>10. Authenticity</b>	Conduct the campaign with honesty and authenticity (Walther 2010)	

### 3.5 The Benefits of Social Media

Organisations can easily adopt social media and receive the benefits associated with using these applications. Most employees are already using social media sites for personal use therefore they do not require training to learn how to use social media sites (Harris 2011). Van den Dam, Nelson and Lozinski (2008) report that a survey conducted by AIIM market IQ in 2008 shows that 69% of organisations state that social media increases collaboration, 56% state that it raises awareness of the organisation and enhances agility or responsiveness and 55% state that social media usage makes communication faster. Van Zyl (2009) provides the following benefits of social media sites:

- **User Profiles:** They enable users to maintain their profiles and to keep their contact details up-to-date;
- **Recruitment:** They are used as a source to identify experts, opportunities and potential business partners;
- **Productivity:** They provide an opportunity to improve productivity levels and workflow efficiency. The increase of virtual reputation improves employees' motivation and sense of community;
- **Knowledge source:** They retain organisational knowledge and experience in a manner that makes them easily accessible;
- **Communication:** They provide effective, appropriate and efficient use of computer-mediated communication within organisations; and
- **Marketing:** They provide an opportunity to improve organisation brands and perceptions because they improve customer relations, viral marketing and innovations.

Social media sites can improve cost efficiencies of organisations by enhancing productivity and by massively improving their competitive advantage (Andriole 2010). Van Zyl (2009) adds that social media provides organisations with the ability to expand social contacts, accelerate business processes, improve business customer relations, recruit staff at a lower cost, and motivate and increase staff morale and satisfaction.

Tredinnick (2006) confirms that social media serves as an online storage that contains all the knowledge that accumulates within the organisation. Van den Dam *et al.* (2008) argue that organisations are transforming their communication strategies and incorporating social media applications which enable them to improve coordination and communication with the customers, employees and partners. Social media enhances organisations' communication by:

- Improving teamwork, customer relations (Burrus 2010);
- Collaboration with external stakeholders (Burrus 2010); and
- Providing more efficient interaction and communication between employees and managers (Burrus 2010).

The fact that users control interactions on social media sites improves the promotional efforts of social media marketing campaigns (Thackeray *et al.* 2008). Social media applications also improve the effectiveness of viral marketing as they enable users to share experiences and opinions with larger audiences at an exponential rate. The following are the benefits of social media marketing (Stelzner 2012; Neti 2011):

- Improved awareness of business;
- Increased traffic (subscribers);
- Partnership with new business;
- Increased search rankings;
- Generating qualified leads; and
- Reduces marketing expenses.

### **3.6 The Challenges of Social Media**

Van Zyl (2009) provides the following drawbacks and challenges of social media:

- User profiles contain user information which is easily accessible to social engineering attackers;
- They provide spammers and virus-writers with an opportunity to set up false profiles;
- Spending too much time on social media sites can affect the productivity of employees;
- User generated content can be unreliable therefore organisations are at risk of losing personal and sensitive organisational information;

- Use of social media within organisations wastes resources such as bandwidth, server and network utilisation; and
- Social media marketing makes organisations more exposed to reputation damage through intentional acts of vandalism or misinformation and through negligent acts or omissions.

Organisations can also face challenges if they decide to include or exclude social media from their business strategies (Mortleman 2011). For instance if organisations restrict the use of social media, they will forgo the opportunity to enhance their social media knowledge, to improve business agility and to become more innovative. Moreover, putting restrictions on social media usage can also create problems for the information technology department and managers because they will not be able to monitor and control the use of social media.

In contrast, there will be complications within the organisations if employees are allowed total access to social media without a policy and guidelines of social media usage in place. In order to successfully implement social media within organisations it is important to have a clear vision that indicates what the organisation intends to achieve by using social media. Organisations must also ensure adequate protection of sensitive organisational data and educate users about social media policies (what one should and should not do on social media) in order to prevent information breaches and damage to reputations.

### **3.7 The Factors that Influence Social Media Usage and Acceptance**

The value of social media sites is primarily dependent on the interaction between users. Therefore, if the number of interactions between users increases value also increases (Xu *et al.* 2012). Jussila *et al.* (2011) confirm that social media are UGC orientated applications where user content and activities have a substantial influence on their value. This implies that it is important to understand social media users' behaviour (why people use social media) and the manner in which they use social media (usage patterns within social media sites) (Xu *et al.* 2012).

The Technology Acceptance Model (TAM) is a very common model in information systems research, and contains theories that explain user acceptance of information systems (Xu *et al.* 2012). Dhume *et al.* (2012) argue that several models exist which can be used to determine the reasons why users accept or reject information systems. These models include Diffusion of Innovative Theory Model and Concept Based Adoption Model. Nevertheless these models are perceived to be too complex while TAM is more simple and robust as a model.

TAM is adapted from the Theory of Reasoned Action, which is intended to determine the way individuals construct behaviour (Lee, Xiong and Hu 2012). The original TAM model is focused on two factors that affect users' behavioural intentions regarding the acceptance of new technologies. These factors include perceived ease of use (PEOU) and perceived usefulness (PU). PEOU is the extent to which users find a system easy to use, whereas PU is the extent to which users believe that using a specific system will enhance their productivity.

Although TAM is the most commonly used model for information systems' research, it does not accommodate the recent context of technology use (Xu *et al.* 2012). Several aspects such as perceived enjoyment and subjective norms are not included in TAM hence it is not significant for examining social media adoption. An alternative to TAM is the systems Uses and Gratifications theory (U&G) from the field of study of communications. This theory includes the study of gratifications that attract and retain users on a particular type of media and the type of content that satisfies their social and psychological needs (Dunne, Lawlor and Rowley 2010). Xu *et al.* (2012) confirm that the U&G theory is more significant to evaluate social media adoption as it intends to understand the socio-psychological needs of users that actually attract and retain them on particular media and its contents. Dunne *et al.* (2010) state that due to the fact that the Internet has become an interactive mass media platform it is suitable for evaluations conducted through the U&G approach.

The U&G theory explains that users take charge of selecting the media they prefer and they select the media with reference to the gratifications they want to achieve (Xu *et al.* 2012). These gratifications could be instrumental (for example, information seeking) or non-instrumental (for example entertainment oriented).

The gratifications factors which are defined by Xu *et al.* (2012) as the most applicable factors to determine social media usage are coordination, immediate access, social presence, affection and leisure. These factors are listed in order of importance.

- **Coordination:** Asserts that people use social media to arrange social events and distribute information;
- **Immediate access:** Asserts that people use social media to access people in different geographical areas;
- **Social presence:** Is the extent to which people feels a sense of human contact on the social media;
- **Affection:** Asserts that people use social media to express their emotions to friends; and
- **Leisure:** Asserts that people use social media for entertainment (fun and pleasure) and relaxation (relieve stress and boredom).

Table 3.3 shows the gratification factors which will be used in this study to determine usage and acceptance of social media. Social media will be used to distribute environmental information since this study is focused on sharing information and knowledge about environmental issues. The goal-oriented factors (coordination and immediate access) are selected for this study since Xu *et al.* (2012) suggest that they have a stronger impact on social media usage and acceptance than affection and leisure which are pleasure-orientated factors. Xu *et al.* (2012) also proposes that social presence is significant for measuring social media usage and acceptance because of the social nature of social media.

**Table 3.3: Factors influencing social media usage and acceptance (Xu *et al.* 2012)**

Factors	Relevant to this study
Coordination	✓
Immediate access	✓
Social presence	✓
Affection	✗
Leisure	✗



### 3.8 Conclusions

Social media have changed the way in which people communicate by providing effective communication channels that can be used globally. Social media are divided into categories and each category includes different types of social media applications. Social media provide benefits that bring value to organisations, such as effective and efficient communication and improvement in organisational brands. However, there are also some drawbacks and challenges associated with social media usage within organisations such as reduction in productivity rate of employees and exposure to reputation damage. There are several social media which are regarded as the most prevalent globally. In order to address RQ3 the prevalent social media identified from literature are Facebook, YouTube, Twitter, LinkedIn and Flickr.

Social media are commonly used by students within HEIs. Students mainly use social media for social purposes such as to communicate and collaborate with peers. Organisations are also using social media to improve marketing campaign strategies and communication processes. The CSFs for using social media in HEIs and the CSFs for social media communication and marketing were identified in order to address RQ4. These CSFs and the related guidelines are used to deploy social media in HEIs, to assist organisations to improve usage of social media for communication purposes and to assist organisations to carry out successful social media marketing campaigns. This study will adopt social media for environmental awareness campaigns. The CSFs and guidelines which can be used for the social media environmental awareness campaigns are:

1. **Internet usage:** Identify the university policies for Internet usage and access;
2. **User background:** Determine the background and social media usage behaviour of users;
3. **Goals and objectives:** Identify the goals and objectives for using social media and closely match them to the goals and objectives of the campaign;
4. **Social media selection:** Select social media applications that best match the campaign's objectives and that allow students to carry out work in ways that are common to them;
5. **Readiness and change management:** Evaluate students' readiness and construct a change management strategy;
6. **Identify metrics:** that will determine the value of using social media for the campaign;

7. **Duration of programme:** Identify the duration of the campaign;
8. **Frequent information updates:** Provide frequent updates on the social media site;
9. **Involvement of users:** Allow users to get involved and give a reason why they should participate (active listening); and
10. **Authenticity:** Conduct the campaign with honesty and authenticity.

The metrics that can be used for social media usage and acceptance are the U&G theory gratification factors. In order to address RQ5, the U&G theory gratification factors which will be adopted for this study are:

- Coordination;
- Immediate access; and
- Social presence.

These factors will be used to determine the participants' usage and acceptance of the SMENA social media. These factors will also be used in the pre-intervention empirical study to determine the participants' usage and acceptance of social media in general. In the next chapter (Chapter 4), the prevalent social media in the case of the study sample, the CSFs and guidelines for social media environmental awareness campaigns, the social media usage and acceptance factors as well as the deliverables from Chapter 2 will be combined to design the Social media Model for ENvironmental Awareness (SMENA) and to produce a conceptual model for environmental awareness campaigns.

# Chapter 4: Research Design and Proposed Model

## 4.1 Introduction

Chapters 2 and 3 assisted with the construction of theories that can be used to support the design of the Social media Model for ENvironmental Awareness (SMENA) which will be used to facilitate the social media environmental awareness campaigns. The factors that influence social media usage and acceptance (RQ5) and the key factor that influences social media (RQ1) will be part of the conceptual model for the environmental awareness campaigns which depicts how these factors interlink in order to achieve the goal of the environmental awareness campaigns (Section 4.2).

The research approaches and methods adopted for this study will be highlighted in Section 4.3. The research strategies which will be used to carry out this study will be highlighted (Section 4.4). The selection of participants and the instruments which will be used to collect data will be discussed (Section 4.5). The data analysis techniques which will be used to analyse qualitative and quantitative data acquired from the data collection instruments will be discussed in Section 4.6. The activities which will be conducted within the case environment (NMMU) during this study will be elaborated on in Section 4.7. The main aim of this chapter is to address the following research questions:

RQ6: *“To what extent is social media used and accepted by students in a Higher Education Institution?”* and

RQ7: *“What are the components of a Social media Model for ENvironmental Awareness (SMENA)?”*

The most prevalent social media (RQ3) and the factors that influence social media usage and acceptance (RQ5) were identified in Chapter 3 from theory and will be included in the pre-intervention social media empirical study in order to address RQ6. This empirical study will be used to determine the participants’ social media usage and acceptance, and the most prevalent social media amongst the participants. The participants will select the prevalent social media from the list of social media identified from theory.

The prevalent social media which are selected by the participants and the literature (RQ2 and RQ4) identified in Chapter 2 and 3 will serve as components which will be used to design the SMENA in order to address RQ7 (Section 4.8). The proposed model (SMENA) (Section 4.9) will include the strategies for creating environmental awareness by using environmental awareness campaigns (RQ2) in the strategic development phase. The CSFs for using social media for environmental awareness campaigns (RQ4) will be incorporated into the planning phase of the SMENA. The implementation phase of the SMENA will include the social media identified by the participants during the social media empirical study and the activities of the environmental awareness campaigns which will be conducted by using these social media. Figure 4.1 depicts the structure of this chapter.

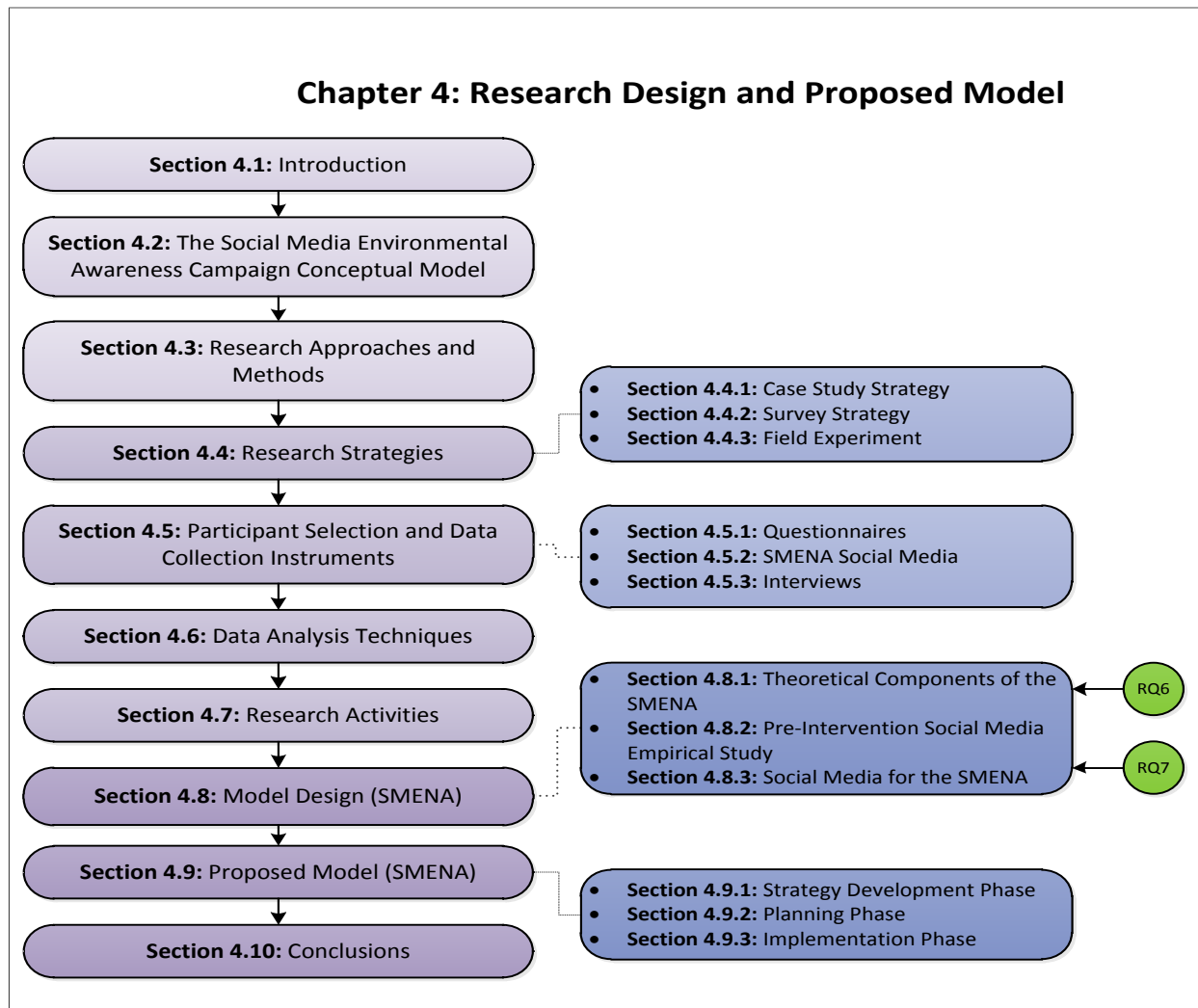


Figure 4.1: Chapter 4 structure

## 4.2 The Social Media Environmental Awareness Campaign Conceptual Model

The primary objective of an environmental awareness campaign is to improve environmental knowledge of the participants by using social media. The U&G theory gratification factors will be used to determine the usage and acceptance of the social media used for the study (SMENA social media) (Section 3.7). These factors include: coordination, immediate access and social presence. The goal-orientated factors (coordination and immediate access) were selected for this study because they are suggested to have a stronger impact on social media usage than pleasure oriented aspects such as affection and leisure. In addition, social presence will also be used for this study because of the social nature of social media. The SMENA social media will be used during the campaigns to distribute environmental information and the participants will be encouraged to use these social media in order to acquire environmental knowledge. Furthermore, statistical analysis will be conducted to determine if usage of the SMENA social media during the campaigns improved the participants' environmental knowledge.

Literature studies (Zsóka *et al.* 2013; Ramsey and Rickson 1976; Hungerford and Volk 1990; Barr 2003) show that there is a positive relationship between environmental knowledge and awareness, which implies that an increase in knowledge of issues implies an improvement in environmental awareness (Section 2.4). The preliminary model (the behavioural change system) extracted from traditional environmental education literatures also depicts that knowledge has a positive influence on awareness (Section 1.7).

This environmental education model was modified to create a conceptual model for environmental awareness campaigns by including the three U&G gratification factors that influence social media usage and acceptance and environmental knowledge which was confirmed to be a factor that influences environmental awareness (Figure 4.2). The model depicts that if the SMENA social media provides its users with a gratifications such as immediate access, coordination and social presence, their usage of these social media will increase. An increase in usage of the SMENA social media will increase the users' environmental knowledge which will in turn improve their environmental awareness.

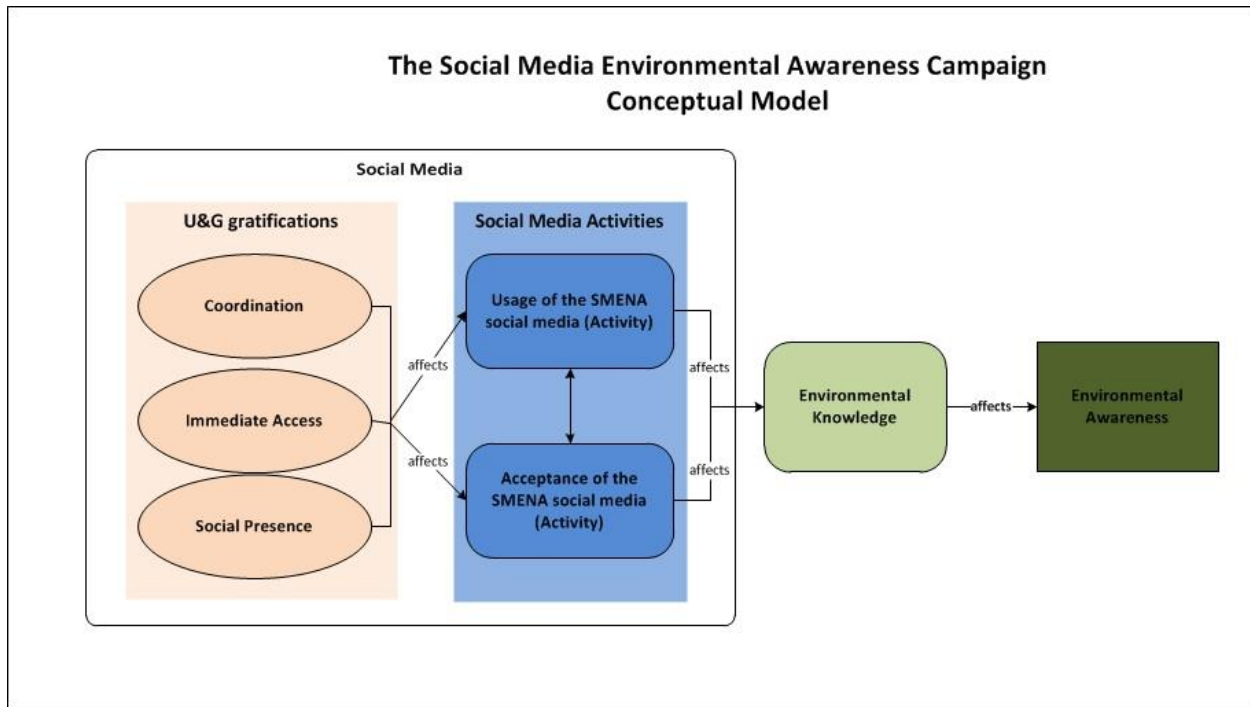


Figure 4.2: Social media environmental awareness campaign conceptual model

### 4.3 Research Approaches and Methods

The research design aspects of this are based on the research onion by Saunders *et al.* (2009) (Figure 1.2). A deductive and an inductive research approach will be followed in this research study. An inductive approach will be used since the empirical results of this study will be induced into theory (Saunders *et al.* 2009). The preliminary model (behavioural change system) of the study is derived from the theory of environmental education (Section 1.7). The preliminary model was amended by using theory to produce a conceptual model for environmental awareness campaigns (Section 4.2). Environmental awareness campaigns will be implemented within a HEI using the SMENA with the intention of improving the environmental knowledge of students. After the implementation process, the aspects of the SMENA used for the campaigns will be evaluated by participants. The evaluation results will be used to amend the environmental awareness campaign conceptual model and to provide recommendations about how usage of the SMENA can be improved. The amended environmental awareness campaign conceptual model, the SMENA, and recommendations for usage of the SMENA will serve as contributions to environmental education theories.

A deductive approach starts with the investigation of theory and determining research questions that need to be addressed (Hayes 2000). In this study, literature will be studied in order to understand the phenomena under investigation and empirical investigations will be carried out using research strategies to collect data that will assist the researcher to address the predefined research questions.

Quantitative and qualitative research methods will be used in this study. These research methods will be used jointly in order to improve the strengths and reduce the weaknesses associated with these research methods (Williams 2007). Saunders *et al.* (2009) add that combining these methods enables researchers to easily address research questions and it improves the validity of research results. The research strategies which will be adopted for this study are the case study strategy which is a qualitative research method, the survey strategy which is a quantitative and qualitative research approach, and field experiments which are predominately quantitative research methods. Therefore, the data collection instruments (Section 4.5) which will be adopted will produce both qualitative and quantitative data and qualitative and quantitative data analysis methods will be used to analyse the data.

## **4.4 Research Strategies**

This research study will adopt three research strategies, namely: the case study strategy (Section 4.4.1), the survey strategy (Section 4.4.2) and field experiments (Section 4.4.3). A single case study approach will be adopted and the NMMU will serve as the case environment. Field experiments will be conducted within the case environment in order to expose participants to environmental information with the intention of improving their environmental knowledge. Surveys will be used to collect qualitative and quantitative data from the participants.

### **4.4.1 Case Study Strategy**

A case study is described as a research process where a programme, an event, an activity, a process or various human subjects are investigated in depth (Creswell 2003). Nabukenya (2012) adds that a case study is an empirical review that studies a specified phenomenon within its natural settings. The case study strategy is usually used in situations where the limitations between phenomenon and context are not clearly evident.

It is categorised as a qualitative and observatory research strategy that intends to address predefined research questions. Researchers can decide whether to examine a single case study or multiple case studies (Cavaye 1996). A single case enables the researcher to study the phenomenon intensively which allows the researcher to get a rich description and reveal the actual structure of the phenomenon. Multiple data collection methods such as observations, interviews, documents, physical artefacts and auto-visual material can be used in a case study.

A single case study will be conducted within the NMMU as part of this research study. This implies that all the activities of the research study, which will occur before, during and after the environmental awareness campaigns will be conducted within the NMMU amongst undergraduate students from the Department of Computing Sciences. A case study approach is used because it will assist the researcher to better understand the phenomenon under investigation. In this study the researcher seeks to understand if environmental awareness campaigns facilitated by the SMENA can improve the environmental knowledge of individuals in a HEI.

The case study will investigate the study phenomenon within its natural settings. The participants (students) will be requested to incorporate usage of the SMENA social media into their daily lifestyle. Usage of these social media will assist the participants to improve their environmental knowledge while they are carrying out their daily activities. The data collection methods which will be used in this case study are the SMENA social media, questionnaires and interviews (Section 4.5).

#### **4.4.2 Survey Strategy**

A survey involves conducting an empirical study that intends to gather information from a large audience (Saunders *et al.* 2009). Pinsonneault and Kraemer (1993) confirm that a survey is an approach that intends to collect information from a large group of people or population. This information usually describes the characteristics, actions and/or opinions of individuals. Survey research is conducted to improve scientific knowledge.



In the case of this study, survey questionnaires will be distributed to a large number of participants (second year and third year students at the NMMU). The survey questionnaires will provide the researcher with knowledge about the usage and acceptance of social media and the prevalent social media amongst the participants. The results acquired from the questionnaires will assist with designing the SMENA.

The survey questionnaires will also provide the researcher with knowledge about the participants' environmental knowledge before and after the study intervention. This knowledge will assist the researcher to determine if usage of the SMENA social media during the study intervention improved environmental knowledge of the participants. The researcher will also acquire knowledge about the participants' perceptions about the SMENA social media they will use during the environmental awareness campaigns. This knowledge will be used to update the conceptual model for campaigns and provide recommendations for future usage of the SMENA.

#### **4.4.3 Field Experiment**

The main aim of experiments is to determine if there is a relationship between different variables (Saunders *et al.* 2009). In this study, the researcher seeks to identify whether a change in a certain independent variable is related to a change in another dependent variable. Experiments conducted in laboratory settings tend to examine the investigated phenomenon in a more controlled environment (Pinsonneault and Kraemer 1993). The researcher exposes the independent variables to an intervention (or manipulation) and detects the effects of the intervention on the dependent variables. Field based experiments are also deployed in a similar context but in natural settings instead of a controlled environment (Benbasat, Goldstein and Mead 1987). Saunders *et al.* (2009) argue that in contrast to laboratory experiments, field experiments tend to directly relate to the real world and can be generalised to a much higher extent.

Field experiments will be used for this study since the researcher aims to improve environmental knowledge of the participants by exposing them to environmental information. During the study intervention, the participants will be encouraged to perform activities (independent variable) on social media used for this study in order to improve their environmental knowledge (dependent variable). Two similar four week field experiments will be conducted sequentially in natural settings with two different groups of participants, second year and third year students. The details of the field experiments will be discussed in Section 4.9.3.

#### **4.5 Participant Selection and Data Collection Instruments**

The participants of this study will be selected from second year ( $n = 72$ ) and third year ( $n = 15$ ) undergraduate students in the Department of Computing Sciences at NMMU. The computing sciences courses in which these students have registered do not have outcomes related to environmental science moreover this research study was not part of their course requirements. These two groups of participants will be tested separately in two sequential empirical studies which will be conducted for this study. Quantitative and qualitative data analysis will be performed on data acquired from the second year group. However, the researcher will only acquire qualitative data from the third year group since the sample size ( $n = 15$ ) of this group is insufficient to perform quantitative analysis.

Students are selected as participants because the NMMU will act as the case environment since the focus of this research is on HEIs. The selected participants will possess a mobile phone that can access social media and will be frequent users of social media. The participants will contribute to the study by completing various questionnaires that are tailored specifically for the study (Section 4.5.1), by conducting activities on the SMENA social media during the environmental awareness campaigns (Section 4.5.2), and by participating in interviews conducted by the researcher (Section 4.5.3).

### 4.5.1 Questionnaires

A questionnaire is valid if it enables collection of correct information and it is reliable if it enables consistent information collection (Saunders *et al.* 2009). Face validity of a questionnaire is acquired if the measurement questions are extracted and approved in literature. Content validity helps to determine the extent to which each measurement question is useful or essential and can be established by means of a pilot study.

In this study, the content validity of all the questionnaires was established by a pilot study which was undertaken during November and December 2012 by five NMMU Computing Sciences postgraduate students. The face validity of these questionnaires was also established since the questionnaires were derived from literature studies (Uzunboylu, Cavus and Ercag 2009; Xu *et al.* 2012; Tullis and Albert 2008). The following are the questionnaires which will be completed by the participants during this study:

SMQ: The social media questionnaire (pre-test only) (Appendix A);

EQ: The environmental questionnaire (pre- and post-test) (Appendix B); and

UQ: The usability questionnaire (post-test only) (Appendix C).

The same participants have to be used during the study for SMQ, EQ and UQ for consistency purposes and therefore, identification details (Student number and name) of the participants will be requested on each questionnaire to enable the researcher to link the various questionnaire responses. The participants will also be requested to use their credentials to register on the SMENA website and to include their names on their Facebook and Twitter accounts. This will assist the researcher to monitor each participant's social media usage and to determine the activity rate of each participant.

The first questionnaire (SMQ) is divided into three sections. Section A is the biographical details of the participants. Section B includes questions regarding social media usage such as frequency of social media usage. The third section (Section C) includes 5-point Likert scale questions about factors that influence social media usage and acceptance.

The first section (Section A) of the environmental questionnaire (EQ) and the usability questionnaire (UQ) requests the name and student number of the participants. Section B of the EQ includes questions regarding environmental issues and serves to test the participants' environmental knowledge. The UQ includes the usability evaluation of the SMENA website (Section B) and the evaluation of usage and acceptance of all the SMENA social media (Section C). Section D includes questions that determine the extent to which all the SMENA social media assisted the participants to acquire environmental knowledge. Table 4.1 maps the research questions to the research instruments used, data analysis techniques as well as the groups of participants.

**Table 4.1: Mapping research questions to research instruments**

Research Questions	Research Instruments	Sections in Research Instruments	Data Analysis	Participants
RQ6: To what extent is social media used and accepted by students in a Higher Education Institution?	Social Media Questionnaire (SMQ): Pre-test only	<b>Section C:</b> Social Media Usage and Acceptance	Descriptive statistics	Second year students
RQ7: What are the components of a Social media Model for ENvironmental Awareness (SMENA)?	Social Media Questionnaire (SMQ): Pre-test	<b>Section B:</b> Social Media Usage		
RQ8: What is the improvement in environmental knowledge for students using SMENA?	Environmental questionnaire (EQ): pre- and post-test	<b>Section B:</b> Environmental Knowledge Questions		
RQ9: What is the usability of SMENA social media?	Usability Questionnaire (UQ): post-test only	<ul style="list-style-type: none"> <li>• <b>Section B:</b> Website Evaluation</li> <li>• <b>Section C:</b> Social Media Usage and Acceptance Evaluation</li> <li>• <b>Section D:</b> Social Media for Environmental Knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive statistics</li> <li>• Qualitative thematic analysis</li> </ul>	Second and third year students

The social media questionnaire (SMQ) is based on the work of Xu *et al.* (2012). It will be used to determine the social media which are most prevalent amongst the participants and the factors that influence the participants' usage and acceptance of social media. The factors that influence usage and acceptance of social media are based on the Uses and Gratifications (U&G) theory for social media usage and acceptance (Xu *et al.* 2012). The social media questionnaire will only be distributed once off (pre-test) and it will be completed by the second year group since it does not include qualitative data.

The environmental questionnaire (EQ) will serve as a pre- and post-test questionnaire. This questionnaire which is based on the work of Coyle (2005) will evaluate the participants' environmental knowledge before and after the study intervention. Quantitative data analysis will be used to determine the environmental knowledge of the participants therefore this questionnaire will be completed by the second year group of participants and not the third year group since the sample size ( $n = 15$ ) of group is not large enough to perform quantitative statistical analysis. The usability questionnaire (UQ) will be used to evaluate three areas of the model:

1. The usability of the SMENA website;
2. The usage and acceptance of all the SMENA social media; and
3. The extent to which the SMENA social media were able to assist the participants to obtain environmental knowledge.

The SMENA website usability evaluation is based on the System Usability Scale (SUS) questionnaire (Tullis and Albert 2008). The gratification factors by Xu *et al.* (2012) will measure the usage and acceptance of the SMENA social media. The criteria used to measure the ability of social media to improve environmental knowledge are based on studies by Uzunboylu *et al.* (2009). This questionnaire (UQ) includes qualitative and quantitative data therefore both groups of participants will complete this questionnaire.

### 4.5.2 SMENA Social Media

The participants will conduct activities on the SMENA social media as part of the environmental awareness campaigns and the data regarding these activities will be collected and analysed accordingly. The participants will complete activities every week during the four weeks of each campaign. The researcher will distribute information about environmental issues to the participants via the SMENA social media with the intention of improving their environmental knowledge. The participants will in turn interact with the information and complete the following activities:

1. Post comments about the effects of environmental issues and provide solutions to environmental issues,
2. Post blogs and/pictures about environmental issues and
3. View videos and blogs about environmental issues.

The environmental information that will be posted on the SMENA social media by the researcher will be divided into eight categories of environmental issues (Appendix H). These categories include: energy, water pollution, global warming, fresh water scarcity, waste disposal, hazardous household waste, air pollution and renewable and non-renewable resources. The researcher will distribute information based on two of the eight categories each week. This information includes:

- The effects of environmental issues;
- The solutions to environmental issues;
- The instructions requesting participants to post blogs and pictures about environmental issues; and
- Videos and blogs about environmental issues.

This environmental information correlates with the questions of the environmental questionnaire (EQ). This will assist the researcher to determine if the usage of the SMENA social media assisted in improving environmental knowledge of the participants. The data that will be captured from SMENA social media upon completion of the environmental awareness campaigns includes the total number of activities completed by each participant during the campaigns.

The participants will be requested to complete three activities per category, therefore, in order to determine the total activities per participant per week, the number of activities (three) is multiplied by the number of categories per week (two) which implies that the total number activities per week is six. The duration of each campaign is four weeks therefore the total number of activities per participant is twenty four.

### **4.5.3 Interviews**

Interviews are discussions that are conducted between two or more individuals (Saunders *et al.* 2009). The objectives of the interviews should be aligned with the research questions, objectives and other strategies that the study seeks to accomplish. In this study the interviews will occur when the researcher finds them necessary for clarification purposes.

Semi-structured interviews will be conducted between the researcher and the participants who will be selected by the researcher based on their responses to the questionnaires for clarification purposes. Semi-structured interviews are interviews where the researcher asks the interviewee questions from a list of predefined questions (Santiago 2009). In this type of interview the researcher also has the freedom to clarify the responses of the interviewee by asking additional questions. The researcher will conduct these interviews in closed settings using a voice recorder to capture the responses of the participants.

### **4.6 Data Analysis Techniques**

This study will predominantly use qualitative data analysis since an in-depth case study strategy will be deployed and since the sample size of the third year group is too small for quantitative analysis. Qualitative data analysis techniques will be used to analyse all the open-ended questions included in the questionnaires and the data acquired from the interviews. The responses to open-ended questions in the questionnaires will be analysed for both groups of participants (second year and third year students). In case of interviews, participants will be selected randomly within the second year group.

Thematic content analysis was selected as the method that will be used to analyse the qualitative data of this study (Saunders *et al.* 2009). The themes will be extracted from the responses of the participants and the frequency appearance of each theme will be recorded. A qualitative data analysis tool called ATLAS.ti 7 will be used to carry out these analysis processes.

Quantitative data analysis techniques will be used since the questionnaires include questions that produce numeric data. Descriptive statistics, Analysis of Variance (ANOVA), and regression analysis will be conducted for the quantitative responses. The analysis of quantitative data will only be completed for responses acquired from the second year group of participants since the third year group's sample size is too small for quantitative statistical analysis. A data analysis software tool called STATISCA 7.1 was used to conduct these statistical calculations.

Descriptive statistics such as totals, means and standard deviations will be used for all three questionnaires to measure the quantitative responses of the participants. For example, in order to determine the improvement in environmental knowledge, the mean percentage scores of responses acquired from participants in the post-test environmental questionnaire will be subtracted from the mean percentage scores acquired in the pre-test environmental questionnaire. ANOVA will be used to determine statistical differences between participants with a lower activity rate on the SMENA social media and participants with a higher activity rate on these social media. A regression analysis test will be used to determine if the activity rate on the SMENA social media influences a change in environmental knowledge of participants

#### **4.7 Research Activities**

The study will follow a case study approach and NMMU will serve as the case environment. The activities which will be conducted during this research are a literature review, distribution of survey questionnaires before and after the environmental awareness campaign, the design of the SMENA, the environmental awareness campaign, and interviews (Figure 4.3). The review of literatures will be conducted to provide literature components which will assist with designing the SMENA. The pre-intervention surveys will also provide components which will assist with designing the SMENA and they will assist to determine the current environmental knowledge of the participants.



The SMENA will be designed using the predefined components and it will be used to facilitate the environmental awareness campaign. The post-intervention surveys will be used to determine if the environmental knowledge of the participants improved as result of the campaign and to evaluate the usability of components of the SMENA which were used for the campaign. The interviews will be used to validate usefulness of the campaign and to confirm the usability evaluation results, when found necessary by the researcher.

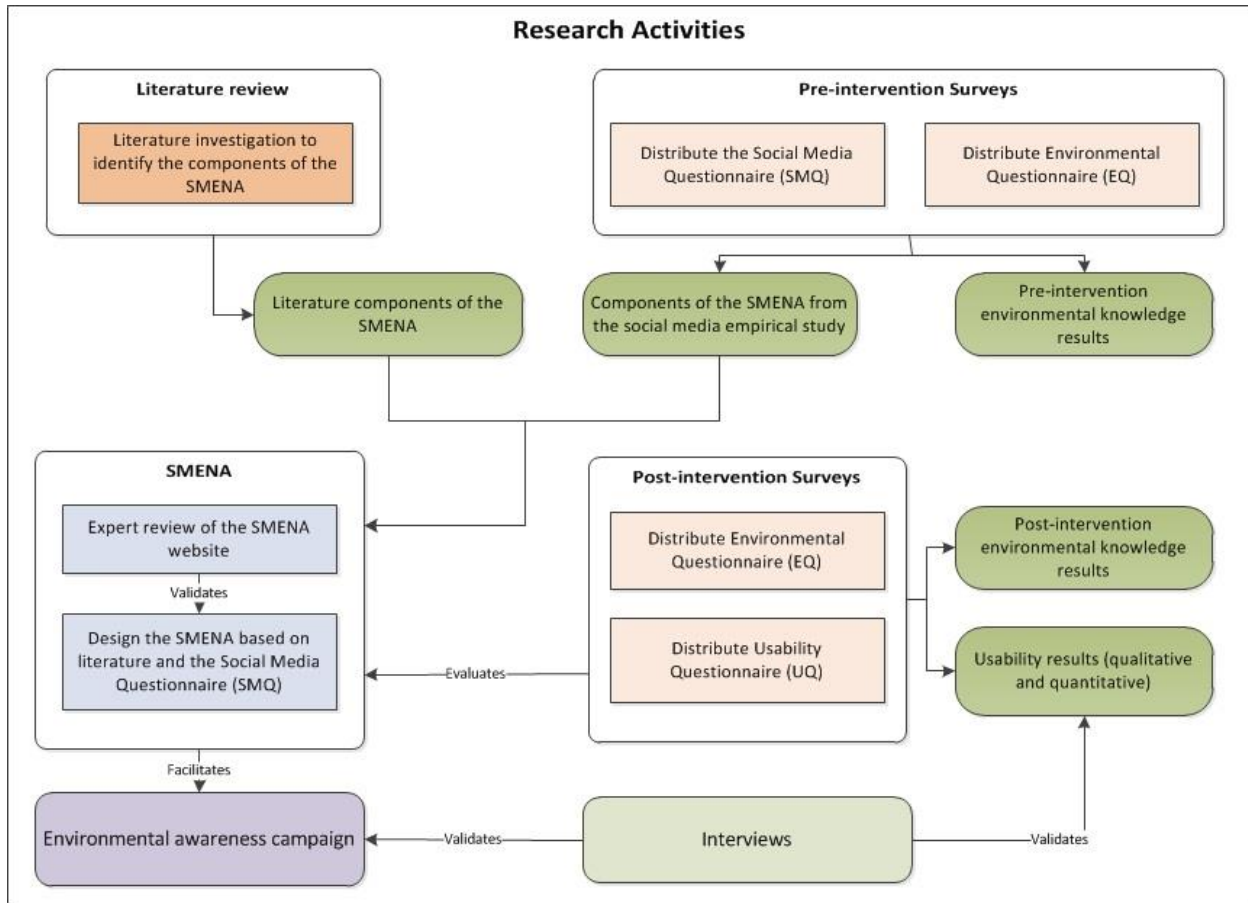


Figure 4.3: Activities of the research

Table 4.2 provides a more detailed discussion of the activities of the case study. The primary purpose, the details, and the constraints of each activity which will be conducted as part of the case study are elaborated.

Table 4.2: Research activities

Activity	Primary Purpose	Details/Constraints
<b>Pre-intervention</b>		
<b>1. Literature investigation to identify the components of the SMENA</b>	The literature components are based on literature and they will be used to design the SMENA.	The components include a list of prevalent social media, the CSFs for social media environmental awareness campaigns, strategies for creating environmental awareness campaigns, factors that influence social media usage and factors that influence environmental awareness.
<b>2. Distribute consent form (Appendix D)</b>	To comply with the ethics procedures of the NMMU.	The participants will be required to sign the consent form.
<b>3. Distribute the Social Media Questionnaire (SMQ)</b>	To determine social media usage and the most prevalent social media amongst the participants.	The social media questionnaire will be used once to determine the prevalent social media and to confirm usage and acceptance of social media amongst the participants. The results will be used as part of the SMENA design.
<b>4. Design the SMENA based on literature and the Social Media Questionnaire (SMQ)</b>	To introduce a model that uses social media to improve environmental awareness.	The SMENA will be designed using the literature components and the results of the social media empirical study.
<b>5. Expert review of the SMENA website</b>	To evaluate the properties of the SMENA website.	The features of the SMENA website will be evaluated by three usability experts prior to implementation.
<b>6. Distribute Environmental Questionnaire (EQ)</b>	Pre-test: To measure the participants' level of environmental knowledge before being exposed to environmental information.	This questionnaire measures environmental knowledge before the study intervention.
<b>Study Intervention</b>		
<b>7. Implement the environmental awareness campaign using the SMENA</b>	To implement the environmental awareness campaign using the SMENA.	The environmental awareness campaign will be implemented within the NMMU case study using the SMENA. Two campaigns will be implemented sequentially, first with the second year students and then with the third year student group.

Post-Intervention		
<b>8. Distribute Environmental Questionnaire (EQ)</b>	Post-test: This questionnaire will determine the participants' level of environmental knowledge after the intervention.	This questionnaire will be distributed to the same group that participated in the pre-test.
<b>9. Distribute Usability Questionnaire (UQ)</b>	Post-test: To evaluate the SMENA by determining: <ul style="list-style-type: none"> <li>• The usability of the SMENA website;</li> <li>• The usage and acceptance of the SMENA social media; and</li> <li>• The extent to which the SMENA social media were able to improve the environmental knowledge of the participants.</li> </ul>	The questions of the usability questionnaire which measured the usability, the social media usage and acceptance, and the ability to improve environmental knowledge will be extracted from questionnaires identified in literature.
<b>10. Interviews</b>	To validate the responses of the participants.	Interviews will be conducted with the second year group if the researcher finds it necessary to validate the questionnaire responses of the participants.

### 4.8 Model Design (SMENA)

The theoretical components of the SMENA were derived from literature reviewed in Chapters 2 and 3, and were validated in the pre-intervention social media empirical study. The SMENA components derived from literature (Section 4.8.1) are: the strategies for creating environmental awareness by using environmental awareness campaigns and the CSFs for social media environmental awareness campaigns.

The U&G gratification factors included in the environmental awareness campaign conceptual model will be confirmed by the pre-intervention empirical study (Section 4.8.2). Additional SMENA components which were extracted from literature and will be validated in the pre-intervention empirical study are the social media which will be used to distribute environmental information during the study intervention (Section 4.8.3).

### 4.8.1 Theoretical Components of the SMENA

The strategies for creating awareness using environmental awareness campaign were identified to address RQ2. The CSFs and guidelines social media communication and marketing campaigns, and for using social media in HEIs were identified to address RQ4. The strategies for creating environmental awareness using environmental awareness campaigns are (Section 2.5):

1. Identify the educational institution;
2. Identify the target audience; and
3. Identify the media.

These strategies will be used to formulate a high level plan which will be used to identify the focus of the environmental awareness campaign in terms of the target audience, the media to use and the education institution to implement the campaign. The pre-intervention empirical study will assist with participant profiling in order to acquire appropriate audiences for the environmental awareness campaign.

The consolidated list of CSFs and guidelines for social media communication and marketing campaigns and for using social media in HEIs will be used to plan the usage of social media for the environmental awareness campaigns (Section 3.4.4). The following are the CSFs and guidelines for social media environmental awareness campaigns:

1. **Internet usage:** Identify the university policies for Internet usage and access;
2. **User background:** Determine the background and social media usage behaviour of users;
3. **Goals and objectives:** Identify the goals and objectives for using social media and closely match them to the goals and objectives of the campaign;
4. **Social media selection:** Select social media applications that best match the campaign's objectives and that allow students to carry out work in ways that are common to them;
5. **Readiness and change management:** Evaluate students' readiness and construct a change management strategy;
6. **Identify metrics:** that will determine the value of using social media for the campaign;
7. **Duration of programme:** Identify the duration of the campaign;
8. **Frequent information updates:** Provide frequent updates on the social media site;

9. **Involvement of users:** Allow users to get involved and give a reason why they should participate (active listening); and
10. **Authenticity:** Conduct the campaign with honesty and authenticity.

It was identified that the main factor that influences environmental awareness is environmental knowledge (Section 3.7). This factor together with the U&G theory gratification factors was included in the conceptual model of the environmental awareness campaign (Section 4.2). This model depicts how these factors influence each other in order to improve environmental awareness.

#### **4.8.2 Pre-Intervention Social Media Empirical Study**

This empirical study satisfies one of the strategies for creating environmental awareness campaigns which is “to identify target audience” and one guideline for usage of social media for environmental awareness campaigns which is “determine the background and social media usage behaviour of users” (Section 4.8.1). This empirical study will assist with profiling the participants of this study who will participate in the environmental awareness campaign (Section 4.8.2.1). The empirical study will determine if the participants possess mobile phones that access social media and if they are frequent users of social media.

The main aim of this empirical study is to address RQ6 which seeks to determine the most prevalent social media amongst the participants and the participants’ usage and acceptance of social media. The participants will be requested to select the most prevalent social media from the predefined list of prevalent social media identified in literature in order to address RQ3. The prevalent social media selected by participants will be included in SMENA and will be used as part of the environmental awareness campaigns (Section 4.8.2.2).

The U&G theory gratifications which were selected as factors that influence social media usage and acceptance (RQ5) will be used to determine the participants’ usage and acceptance of social media (Section 4.8.2.3). The social media questionnaire (SMQ) will be used to collect data in this regard. <sup>1</sup>This questionnaire includes questions measured on a 5-point Likert scale, and therefore the following interval ranges apply: Negative = [1 - 2.6); Neutral = [2.6 - 3.4] and Positive = (3.4 – 5]<sup>1</sup>.

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<sup>1</sup> The brackets mean that the range is inclusive - which implies that the range includes the listed value.  
The parentheses mean that the range is exclusive- which implies that the range does not include the listed value.

#### 4.8.2.1 Participant Profile

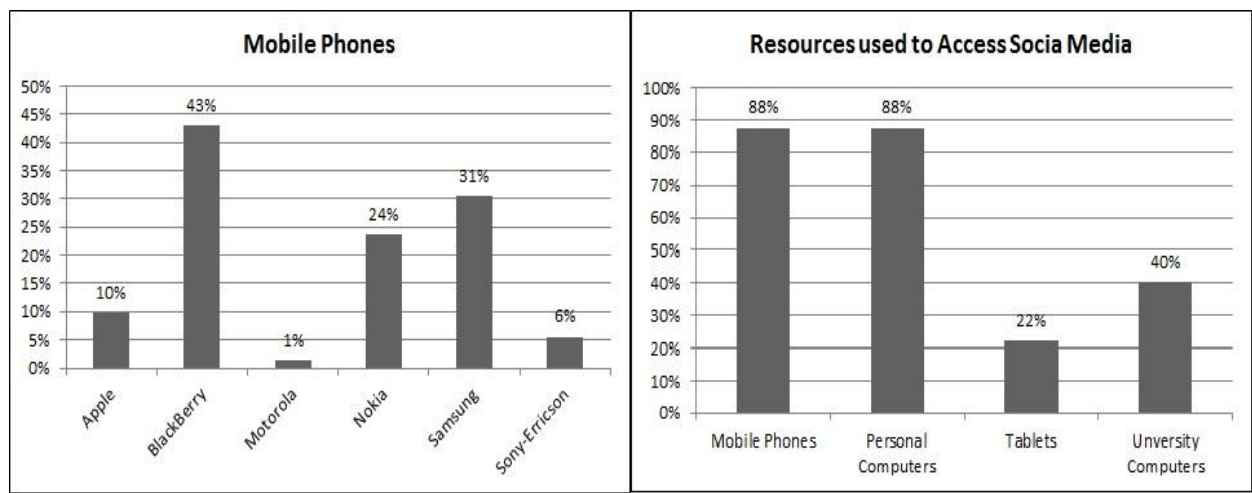
The second year group participants (n = 72) were selected to participate in this empirical study (Table 4.3) since the sample size of this group was large enough to perform quantitative statistical analysis. The majority of participants are male (81%) and most of them are between the age of 18 and 25 (97%). Fifty three per cent of the participants are English speaking. The participants are undergraduate students studying towards a degree in computer science and/or information systems, with the majority (67%) registered for a science degree.

**Table 4.3: Participant profile of second year students (n=72)**

	<b>n</b>	<b>%</b>
<b>Gender</b>		
Male	58	81
Female	14	19
<b>Total</b>	<b>72</b>	<b>100</b>
<b>Home language</b>		
English	38	53
Afrikaans	13	18
Xhosa	12	17
Other	9	12
<b>Total</b>	<b>72</b>	<b>100</b>
<b>Age</b>		
18-25	70	97
26-40	2	3
<b>Total</b>	<b>72</b>	<b>100</b>
<b>Degree</b>		
Bsc	48	67
Bcom	22	30
Other	2	3
<b>Total</b>	<b>72</b>	<b>100</b>

The participants were asked to indicate the types of mobile phones they use and the resources they use to access social media sites. These findings can help identify if the participants' mobile phones are capable of accessing social media and to determine which resources they use most frequently to access social media.

The South African Nielsen report claims that the most popular mobile phone in South Africa is Nokia followed by Samsung and then BlackBerry (Hutton 2011). As illustrated in Figure 4.4 most participants use BlackBerry (43%), followed by Samsung (31%) and then Nokia (24%). The technology resources used mostly to access social media by participants are mobile phones (88%) and Personal Computers (88%).



**Figure 4.4: Mobile phones and resources used to access social media (n = 72)**

The majority of participants (89%) are considered as experienced (more than two years) users of social media (Figure 4.5). The remaining participants (11%) have been social media users from one to two years. The majority (75%) of the participants also stated that they use social media on a daily basis and only one percent of the participants stated that they hardly use social media or use it once a year.

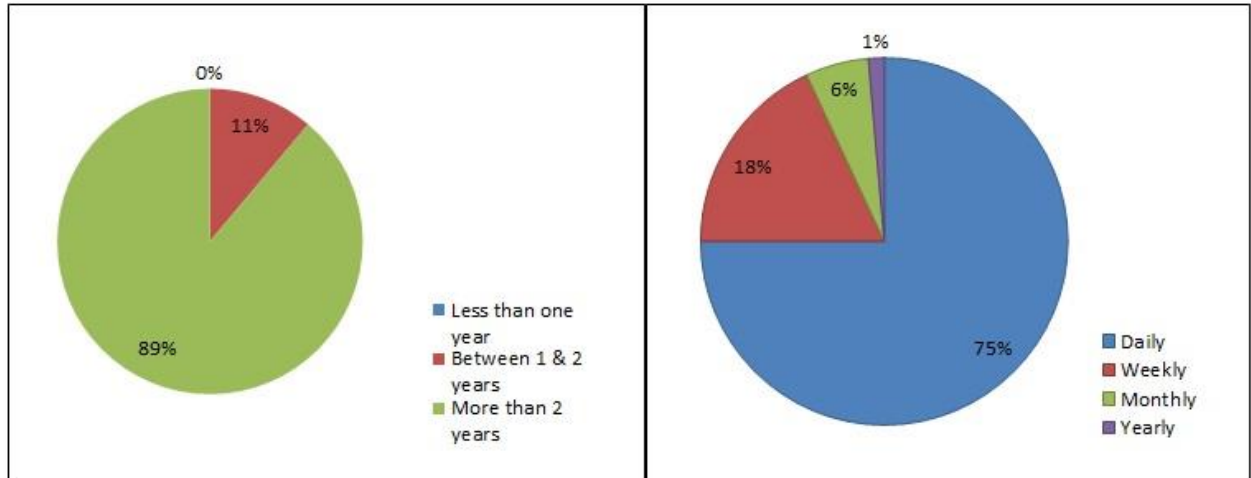
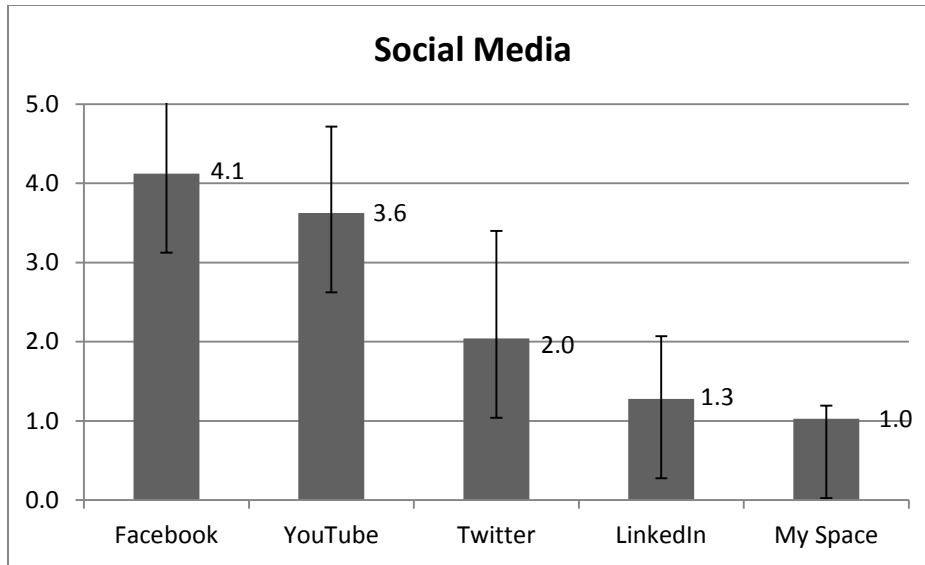


Figure 4.5: Social media usage frequency (n = 72)

#### 4.8.2.2 Social Media Usage Results

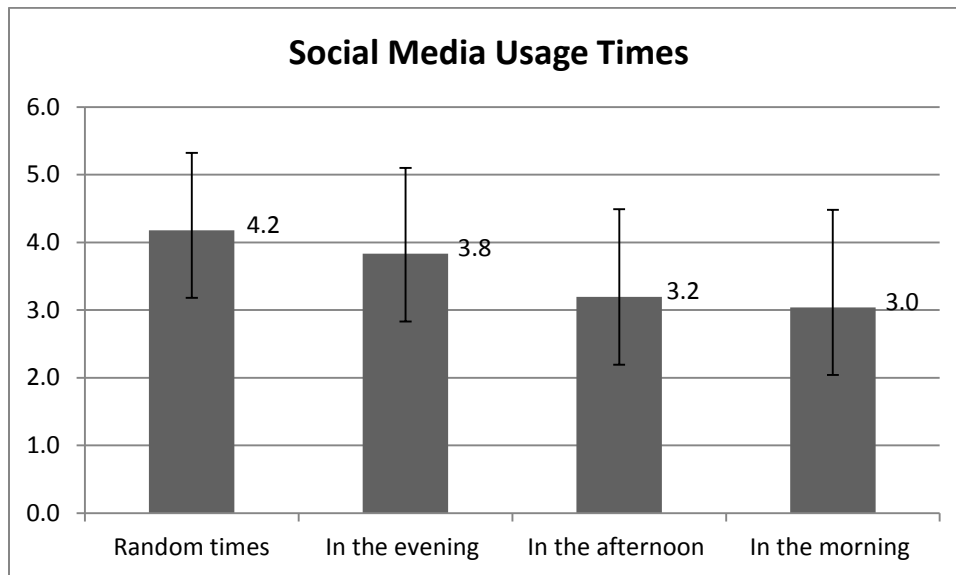
The participants were asked to select the social media that they used most frequently (Figure 4.6). In this case, Facebook scored the highest mean ( $\mu = 4.1$ ) and YouTube scored the second highest mean ( $\mu = 3.6$ ). Both Facebook and YouTube were rated as “positive” by the participant. Twitter scored a higher mean ( $\mu = 2.0$ ) than LinkedIn ( $\mu = 1.3$ ) and My Space ( $\mu = 1.0$ ). This confirms the study of Khang *et al.* (2012) reporting Facebook as the most popular social media site. The other three social media all had an overall mean in the negative range. It can be deduced that these social media are not used very frequently by the participants.





**Figure 4.6: The types of social media (n = 72)**

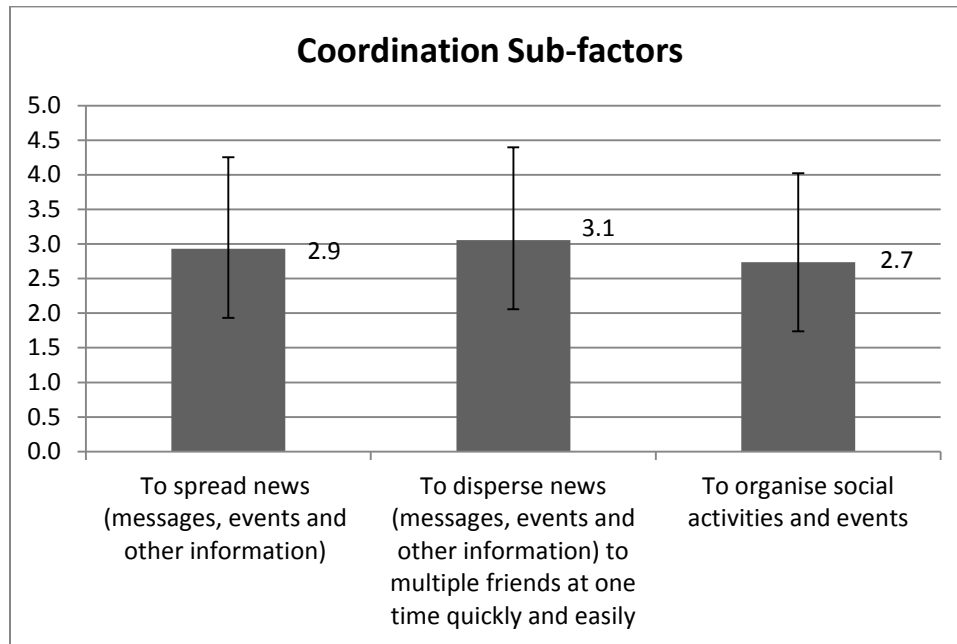
The results for social media usage times indicate that most participants use social media at random times ( $\mu = 4.2$ ) and in the evenings ( $\mu = 3.8$ ) (Figure 4.7). These social media usage times were ranked as “Positive” by the participants. However, most participants were “Neutral” about using social media in the morning ( $\mu = 3.0$ ) and in the afternoon ( $\mu = 3.2$ ).



**Figure 4.7: Social media usage times (n = 72)**

### 4.8.2.3 The Results for Factors Influencing Social Media Usage and Acceptance

The factors affecting social media usage and acceptance are based on the Uses & Gratifications (U&G) model which predicts social media usage and acceptance amongst users (Section 3.7). There are three sub-factors that determine social media usage for coordination (Figure 4.8). In this case the participants rated all three coordination sub-factors as “neutral”. The sub-factor that scored the highest mean score ( $\mu = 3.1$ ) is “to disperse news (messages, events and other information)” to “multiple friends at one time quickly and easily” and the sub-factor that scored the lowest mean score ( $\mu = 2.7$ ) is usage of social media “to organise social activities and events”.



**Figure 4.8: Coordination sub-factors (n = 72)**

Immediate access implies usage of social media to access individuals in different geographical areas. Immediate access includes five different sub-factors (Figure 4.9). The two sub-factors which scored the same highest mean score ( $\mu = 3.6$ ) are “to access others wherever they are” and “to access others anytime”. All the immediate access sub-factors were ranked in the “Positive” category by the participants except for “to keep contact with people I have no time to meet face-to-face” which scored the lowest mean ( $\mu = 3.3$ ) and was rated in the “Neutral” range.

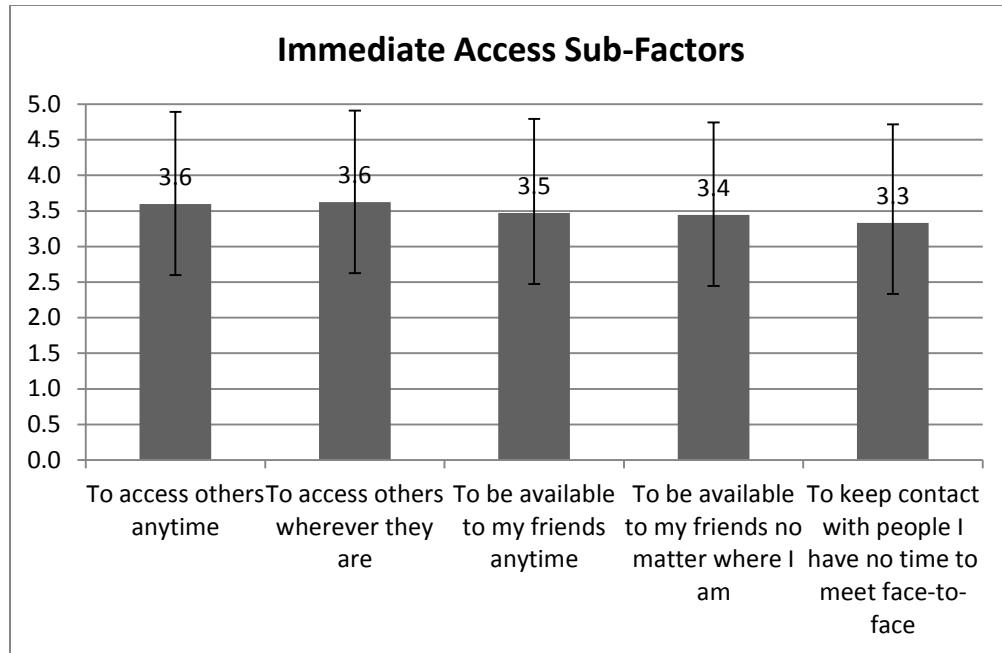


Figure 4.9: Immediate access sub-factors (n = 72)

Social presence includes three sub-factors and none of these sub-factors were rated in the “Positive” category (Figure 4.10). The sub-factor that scored the highest mean ( $\mu = 2.8$ ) is “to get a sense of sociability”. This sub-factor was rated as “Neutral” by the participants whereas the other two sub-factors were rated as “Negative” by the participants.

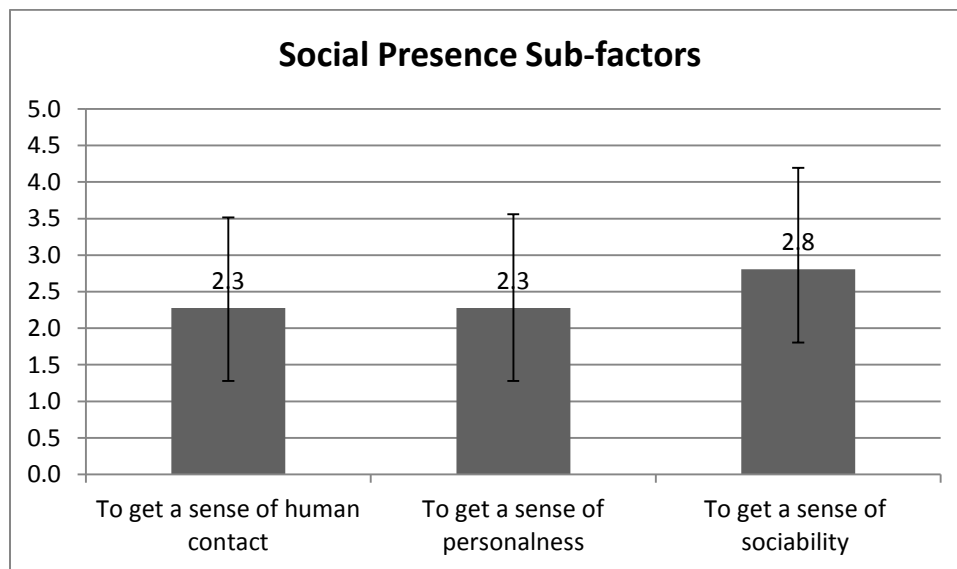


Figure 4.10: Social presence sub-factors (n = 72)

The Cronbach's alpha coefficients were calculated to determine the internal reliability of the sub-factors used to determine the gratification factors' mean scores (Table 4.4). The internal reliability of the sub-factors is significant since the coefficients are within an acceptable range ( $0.6 \leq \alpha \leq 0.9$ ).

**Table 4.4: Cronbach's alpha for gratifications' sub-factors**

Gratifications	Cronbach's alpha
Coordination sub-factors	0.704
Immediate access sub-factors	0.897
Social presence sub-factors	0.902

An analysis of the overall, aggregated means for each of the three factors revealed that only one of the factors was ranked in the positive range (Table 4.5). The participants rated coordination ( $\mu = 2.9$ ) as "neutral", immediate access ( $\mu = 3.5$ ) as "positive" and social presence ( $\mu = 2.5$ ) as "negative". These findings suggest that the participants mostly use social media to connect with people in other geographical areas (immediate access), followed by the use of social media to organise activities, make arrangements and disperse information (coordination). Social presence scored a negative mean which implies that only a few participants in the sample use social media to get a sense of human contact.

**Table 4.5: Factors affecting social media usage**

Gratifications			
	Coordination	Immediate Access	Social Presence
<b>n</b>	72	72	72
<b>Mean</b>	2.9	3.5	2.5
<b>Min</b>	1	1	1
<b>Max</b>	5	5	5
<b>SD</b>	1.0	1.1	1.2

### 4.8.3 Social Media for the SMENA

Facebook, YouTube and then Twitter were found to be the most prevalent social media sites amongst the participants. This confirms the results of a study conducted by Mohamed (2011) at NMMU as similar results were achieved in this study. However, the social media which will be incorporated as part of the SMENA are Facebook and Twitter. The researcher omitted YouTube and selected Facebook and Twitter because they incorporate the basic functionality of YouTube, which is to view videos.

The SMENA will also incorporate an in-house social media application (SMENA website) which will be used together with Facebook and Twitter (Figure 4.11). The Facebook page created for the study will be named “*Green Awareness at NMMU*” and the Twitter page will be named “*Green Awareness (NMMU)*”. The SMENA website will be deployed by the researcher and will be named “*Green Awareness @ NMMU*” (Section 4.8.3.1). This website will be evaluated by usability experts in order to improve its usability before being used for the environmental awareness campaigns (Section 4.8.3.2).

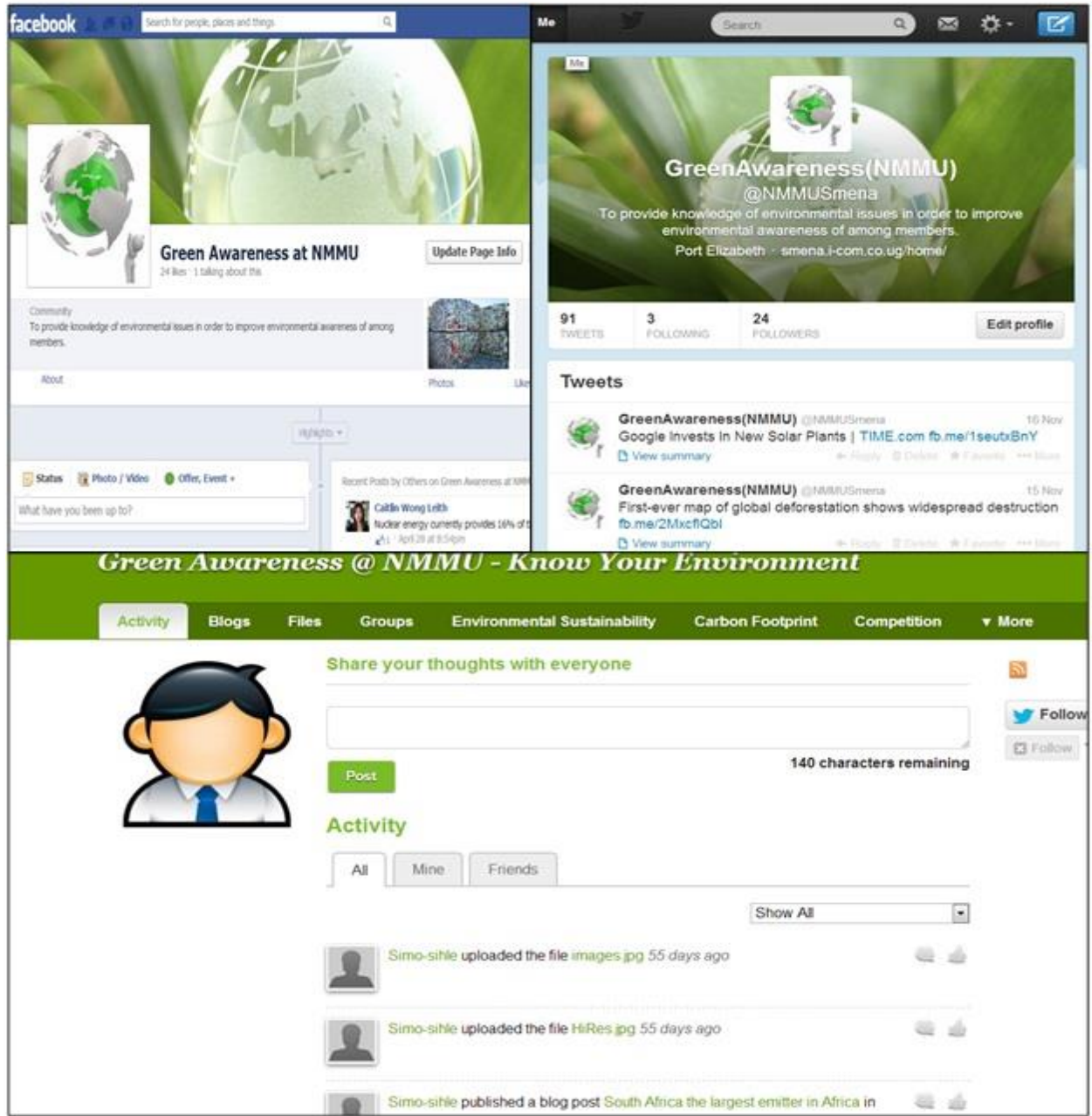


Figure 4.11: SMENA social media

The main aim of the SMENA social media is to disseminate environmental information to participants (students) in order to improve their environmental awareness (Figure 4.12). The researcher (Administrator) will distribute the environmental information using blogs, pictures and videos through the SMENA social media during the environmental awareness campaigns. The participants will perform activities on the social media by interacting with the information posted by the researcher.

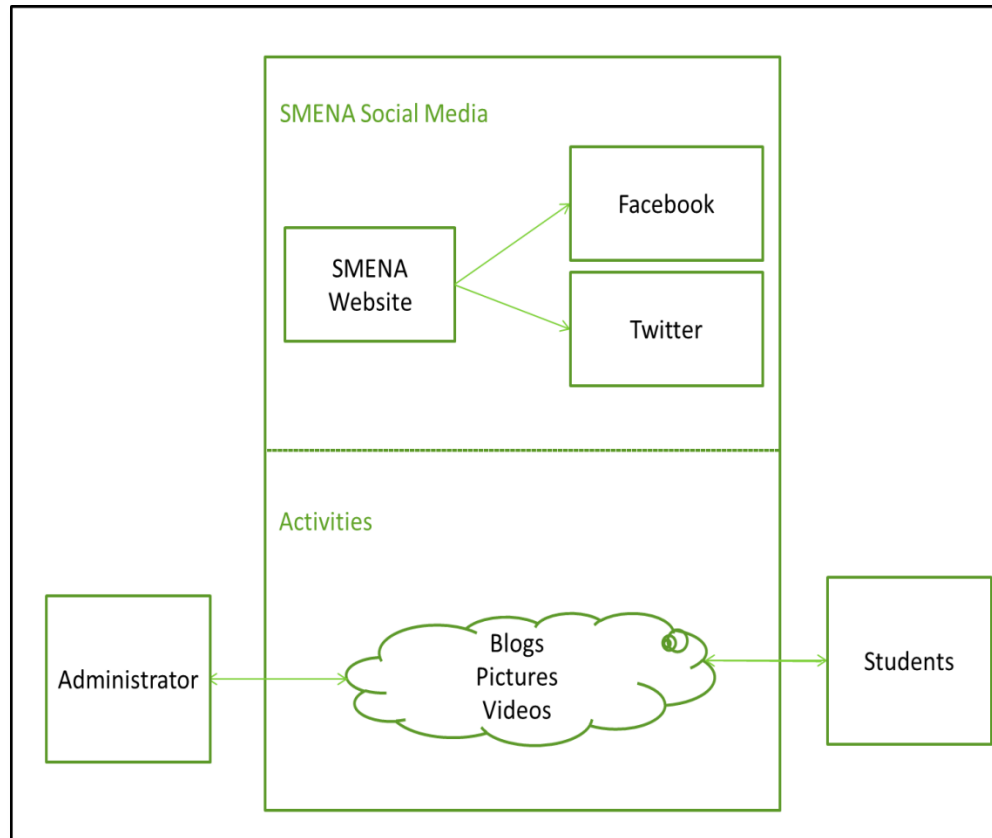


Figure 4.12: Functionality of SMENA social media

#### 4.8.3.1 SMENA Website

The SMENA website is a modification of open-source social networking software called *Elgg* (Figure 4.13). The built-in social networking features of the *Elgg* software includes: Avatar, Dashboard, Friends, Groups, Profile and Widgets. The software also includes optional modules which are Blogs, Bookmarks, File repository, Message board, Private messaging, Pages, Activity and Micro-blogging. All the modules were used besides the Bookmarks model which did not coincide with the objectives of the SMENA website. Another functionality of this software is the email notification system which delivers confirmation emails to users when they register on the website and when users (friends) interact on the website.

Some of the features of the default *Elgg* software were modified to conform to the requirements of the study. The default theme was changed and a green theme was added which conforms to the green colours used to portray the environment. The following modules were added to meet the objectives of this study:

- **Site page 1.8** which allows static pages to be added on the website;
- **Addthis-share 1.2** which provides buttons that allow users to share or post content on other social media platforms such as Facebook and Twitter;
- **Videos 1.4** which allows users to embed YouTube videos on the Website;
- **Videoplayer 0.1** which provide a video player that enables users to stream videos on the website;
- **Google Analytics 2.0**, which links the website to Google Analytics and enables the researcher to track website usage patterns; and
- **Live Notifications 1.8.0** which allows users to get notifications on the website when other users post or comment on the content they have posted previously.



Figure 4.13: SMENA website



#### **4.8.3.2 Website Expert Review**

In order to evaluate the usability of the SMENA website, a heuristic evaluation was conducted by several User Interface (UI) experts using Nielsen's heuristics (Nielsen 1995). The experts were given a Website Usability Evaluation Task sheet (Appendix F). They performed the required tasks using the SMENA website before they recorded their recommendations on the Usability heuristics sheet (Appendix E). The usability issues raised by the experts that were addressed are:

- Creating a balance on the website and making important menus more available;
- Including information on the home page that describes the website;
- Making the website more aesthetic by including pictures e.g. picture on the home page and by changing the colour of the website to a green colour; and
- Adding an "About" page that explains the objectives in which the website seeks to accomplish.

These usability issues were addressed because they were perceived as critical issues that can impair the usability of the website. Other usability issues that were raised by the experts such as including the "log out" button on the menu bar instead of the top bar and using the word "Profile Picture" instead of "Avatar" were neglected as they were found to be of less importance and because time was limited.

#### **4.9 Proposed Model (SMENA)**

The SMENA is divided into three phases, the strategy development phase, the planning phase and the implementation phase (Figure 4.14). The strategy development phase includes the strategies for creating environmental awareness by using environmental awareness campaigns (Section 4.9.1). The CSFs and guidelines for social media communication and marketing campaigns and for using social media in HEIs are included in the planning phase, to provide guidance on how to use social media for environmental awareness campaigns in a HEI (Section 4.9.2). The implementation phase (Section 4.9.3) depicts activities which should be conducted on the SMENA social media during the environmental awareness campaigns.

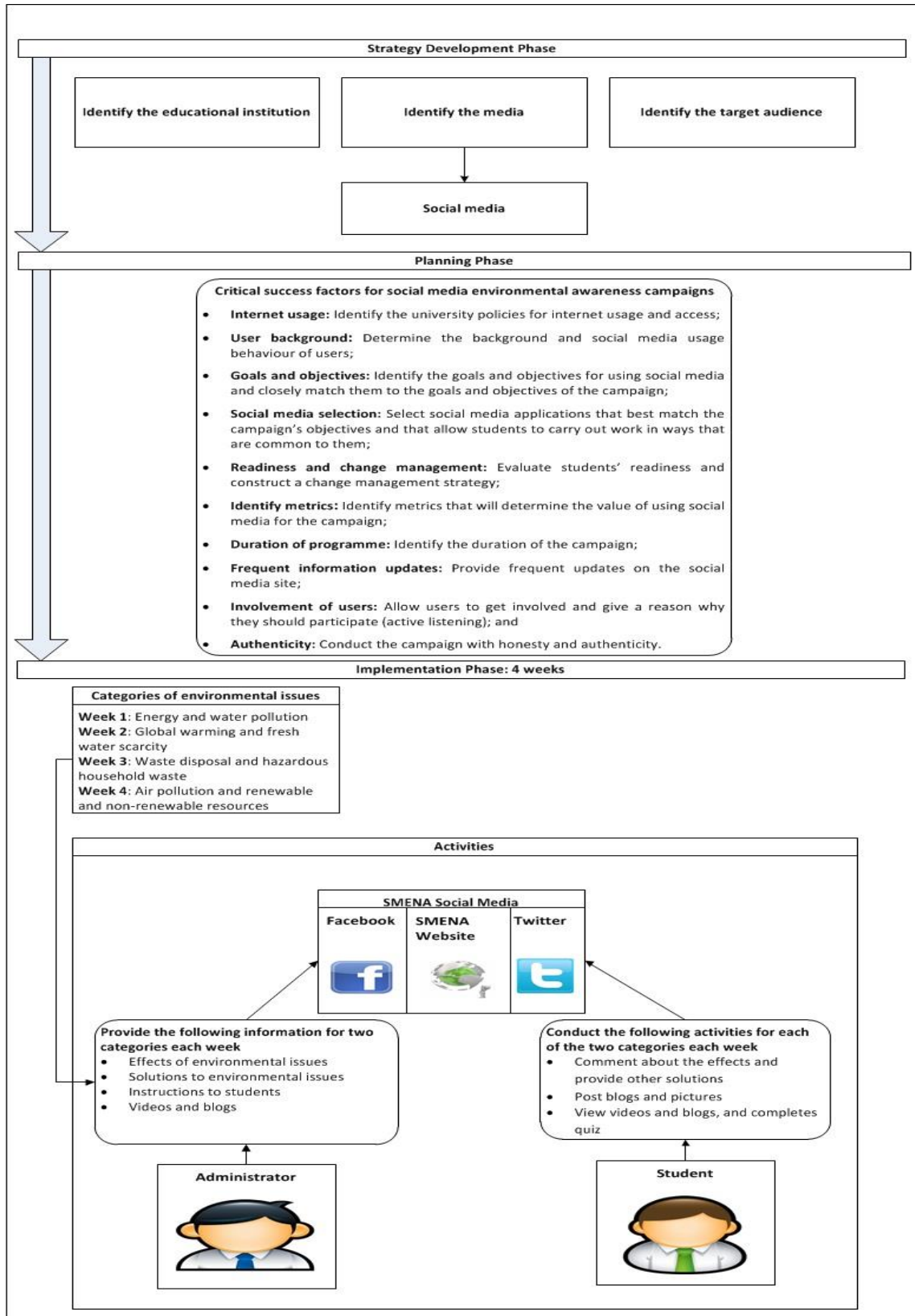


Figure 4.14: The Social media Model for ENvironmental Awareness (SMENA)

### 4.9.1 Strategy Development Phase

The strategy development phase includes the strategies for creating environmental awareness by using environmental awareness campaigns. These strategies provide focus to the campaign as they require the researcher to identify the target audience of the campaign, the media which will be used for the campaign, and the educational institution where the campaign will be implemented. In case of this study the environmental awareness campaign targets undergraduate students at the NMMU and social media will serve as the media that carries out the campaign. The social media plan will be formulated subsequently.

### 4.9.2 Planning Phase

The planning phase incorporates the consolidated list of CSFs and guidelines for social media usage in HEIs and for social media usage for communication and social media marketing. These CSFs and guidelines for using social media will provide guidance as to how social media can be used for environmental awareness campaigns in HEIs. Table 4.6 depicts the CSFs and guidelines and the manner in which they will be used for this study.

**Table 4.6: The CSFs for social media environmental awareness campaigns in HEIs**

The critical success factors for social media usage in HEIs	Application of critical success factors for social media usage in HEIs
1. <b>Internet usage:</b> Identify the university policies for Internet usage and access.	The Internet access policy of the NMMU stipulates that Facebook cannot be used in the respective university computer laboratories during office hours (8am – 5pm).
2. <b>User background:</b> Determine the background and social media usage behaviour of users.	The background of the participants and their usage and acceptance of social media was identified in the social media empirical study (Section 4.8.2).
3. <b>Goals and objectives:</b> Identify the goals and objectives for using social media and closely match them to the goals and objectives of the campaign.	Social media will be used because they allow easy information access to large numbers of audience quickly and at a very low cost. The main objective of the environmental awareness campaigns is to distribute environmental information in order to improve participants' environmental knowledge.

<p>4. <b>Social media selection:</b> Select social media applications that best match the campaign’s objectives and that allow students to carry out work in ways that are common to them.</p>	<p>The social media that have the ability to easily distribute information and which are the most prevalent amongst the participants were selected by the participants in the social media empirical study (Section 4.8.2).</p>
<p>5. <b>Readiness and change management:</b> Evaluate students’ readiness and construct a change management strategy.</p>	<p>In order to evaluate readiness and construct change management amongst the participants a motivational speaker will be deployed to motivate participants and incentives will also be awarded to the most active participants.</p>
<p>6. <b>Identify metrics:</b> that will determine the value of using social media for the campaign.</p>	<p>The SMENA social media will be evaluated using measures identified in literature. These measures will determine the extent to which the SMENA social media assisted in improving environmental knowledge. The U&amp;G gratification factors will also serve as measures which measure the usage of the SMENA social media.</p>
<p>7. <b>Duration of programme:</b> Identify the duration of the campaign.</p>	<p>The environmental awareness campaign will take place for a period of four weeks.</p>
<p>8. <b>Frequent information updates:</b> Provide frequent updates on the social media site.</p>	<p>The SMENA social media will be updated every day during the campaign with information about environmental issues.</p>
<p>9. <b>Involvement of users:</b> Allow users to get involved and give a reason why they should participate (active listening).</p>	<p>The participants will be encouraged to participate and get involved because it is important to acquire knowledge about environmental issues and ways to solve them.</p>
<p>10. <b>Authenticity:</b> Conduct the campaign with honesty and authenticity.</p>	<p>The participants will be provided with objectives of the study and a consent form as part of authenticity.</p>

### 4.9.3 Implementation Phase

The implementation phase depicts the activities which will be conducted on the SMENA social media during the environmental awareness campaign. The environmental awareness campaign will take place for a period of four weeks. The participants will use SMENA social media to complete tasks about environmental issues which are provided by the researcher on the SMENA social media. The participants will be encouraged to complete these tasks every week during the environmental awareness campaign.

These tasks are based on the eight categories of environmental issues, which include energy; water pollution; global warming; fresh water scarcity; waste disposal; hazardous household waste; air pollution and renewable and non-renewable resources. The researcher (Administrator) will focus on two environmental categories per week and will post information (blogs and videos) that is related to these categories on the SMENA social media throughout the week (Figure 4.15). The information posted by the researcher will include the effects of environmental issues related to each category, solutions that can be implemented to prevent these environmental issues, instructions requesting students to post blogs and pictures about these environmental issues in their surroundings, and videos and blogs about these environmental issues. This information will be posted on the SMENA social media at varying times during the campaign since the results of the social media empirical study show that most participants access social media at random times (Section 4.8.2.2).

The participants (students) will be requested to provide their opinions (post comments) regarding the effects of environmental issues and to provide other solutions that can be implemented to eradicate environmental issues. The participants will also be encouraged to post blogs and pictures and view the videos and blogs about environmental issues. In order to validate if the students viewed the videos and blogs they will be requested to complete a quiz that is directly based on these videos and blogs. This process will be repeated for two categories each week until the end of the environmental awareness campaign. The participants who conduct most activities on the SMENA social media will be awarded with incentives at the end of each week.

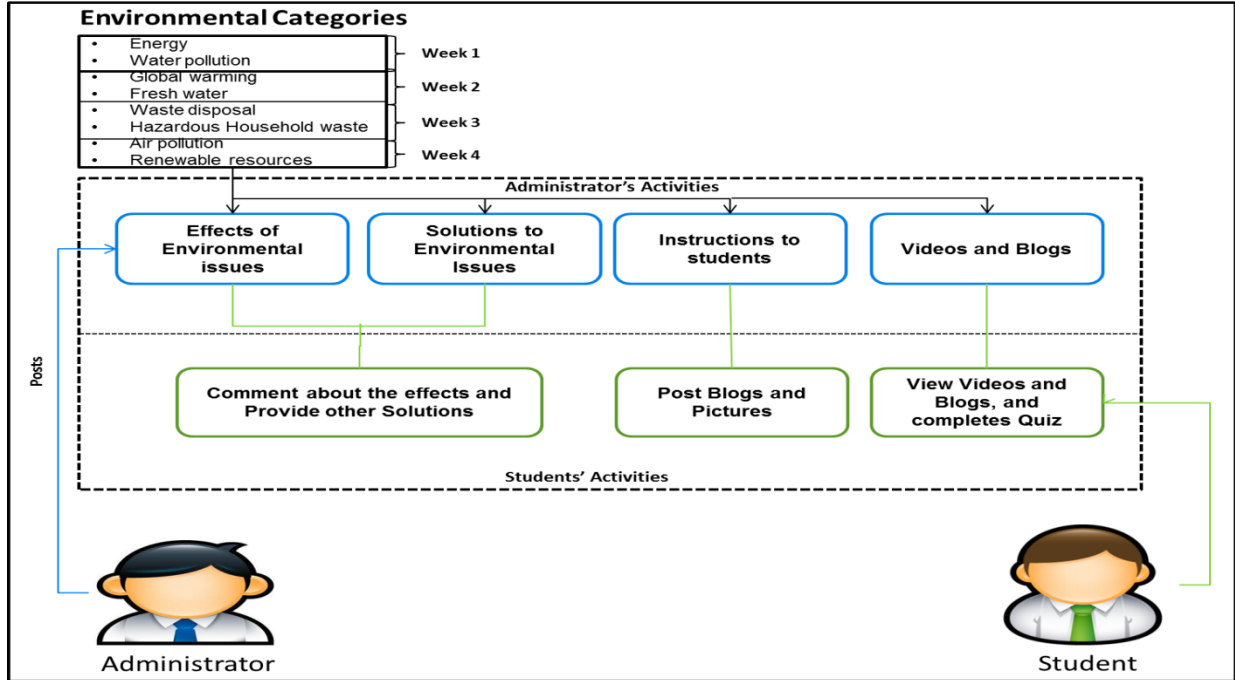


Figure 4.15: Environmental awareness campaign activities

#### 4.10 Conclusions

The chapter provides a detailed design of this research study and the design of the SMENA. The mixed research methods approach is used to acquire the benefits of both qualitative and quantitative research methods. The research strategies that are used to carry out processes of this research study are a case study, surveys, and field experiments. The data collection tools that are used are questionnaires to collect empirical data from the participants, the SMENA social media to collect data regarding activities conducted by participants on these applications, and interviews to provide clarification of participants' responses when necessary.

The prevalent social media amongst the participants (NMMU students) and the factors that influence the participants' usage of social media were validated by an empirical study in order to address RQ6. The results of this empirical study and the literatures identified in Chapter 2 and Chapter 3 are the components which were to design the SMENA to address RQ7. The results of the empirical study report that the most prevalent social media amongst the participants are Facebook, followed by YouTube and then Twitter. However, only Facebook and Twitter were used for the study since they both provide the basic functionality provided by YouTube which is to view videos.

The results also depicted factors that influence usage and acceptance of social media and it was identified that immediate access is the main factor that influences the participants' usage and acceptance of social media. This implies the ability of social media to connect users with people in different geographical areas is the main factor that influences individuals to use social media.

The theory components of the SMENA include strategies for creating environmental awareness campaigns, CSFs and guidelines for social media environmental awareness campaigns. The strategies are included in the strategic development phase of the SMENA to provide the campaign with focus they require the researcher to identify the target audience, the media to be used for the campaign, and the education institution that will be used for implementing the campaign. The CSFs and guidelines are included in the planning phase of the SMENA to provide guidance on how to use social media for the environmental awareness campaigns.

The implementation phase of the SMENA depicts the manner in which activities will be conducted on the SMENA social media during the environmental awareness campaigns. This proposed model (SMENA) will be used to facilitate the environmental awareness campaigns which will be conducted at the NMMU. The SMENA will be evaluated by the participants and the evaluation results of the SMENA will be presented in the next chapter (Chapter 5).

# Chapter 5: Evaluation of Model

## 5.1 Introduction

The previous chapter (Chapter 4) elaborated on the research design and the design of the SMENA. This chapter (Chapter 5) deals with the evaluation of the usage of SMENA to implement the environmental awareness campaigns at the NMMU. Two sequential field experiments (environmental awareness campaigns) were conducted with second year students (n = 72) and then with third year students (n = 15). Furthermore, the data acquired from third year students was used for qualitative analysis purposes and the data from the second year group was used for both qualitative and quantitative analysis because the sample size of the third year group was insufficient for quantitative statistical analysis. The aim of these campaigns was to expose the participants to environmental information in order to improve their environmental knowledge. The main aim of this chapter (Chapter 5) is to evaluate the SMENA and address the following research questions:

RQ8: “*What is the improvement in environmental knowledge for students using SMENA?*” and

RQ9: “*What is the usability of SMENA social media?*”

In order to address RQ8, the participants’ environmental knowledge was measured before and after the environmental awareness campaign to determine if there is an improvement in environmental knowledge of the participants (Section 5.2). The participants were requested to perform activities on the SMENA social media during the campaign in order to improve their environmental knowledge (Section 5.3).

The usage of SMENA social media was evaluated post-intervention in order to address RQ9 (Section 5.4). In this case, the usability of the SMENA website was evaluated, the usage and acceptance of the SMENA social media were determined, and the extent to which the SMENA assisted the participants to acquire environmental knowledge was investigated. Interviews were conducted with participants from the second year group in order to confirm the results of the SMENA social media evaluation (Section 5.5). Figure 5.1 depicts the structure of this chapter.



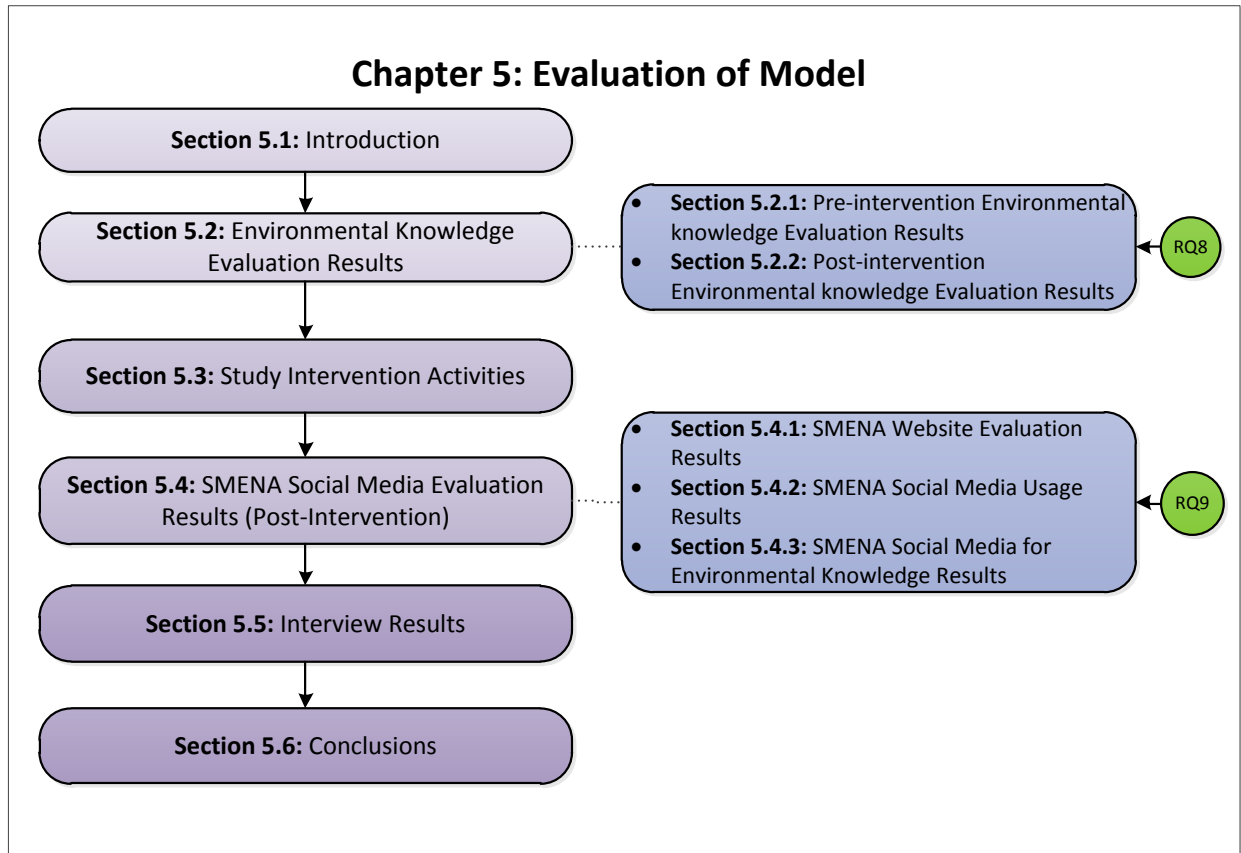


Figure 5.1: Chapter 5 structure

## 5.2 Environmental Knowledge Evaluation Results

The implementation of the environmental awareness campaigns is based on the implementation phase of the SMENA. The aim of the environmental awareness campaigns (study interventions) was to expose the participants to environmental information via the SMENA social media. The participants were requested to complete the pre-test environmental questionnaire (EQ) before the study intervention to determine their current environmental knowledge (Section 5.2.1). The same questionnaire (EQ) was used as a post-test to determine if the participants' environmental knowledge had improved after being exposed to environmental information during the study intervention (Section 5.2.2). Only the second year group participants completed these questionnaires since sample size of this was large enough for quantitative analysis of the improvement in environmental knowledge.

The environmental questionnaire (EQ) consisted of 16 Environmental Knowledge Questions (EKQ) which were used to measure the environmental knowledge of the participants (Coyle 2005). Two environmental knowledge questions in the questionnaire are grouped under one of eight environmental categories, which are; energy, water pollution, global warming, fresh water scarcity, waste disposal, hazardous household waste, air pollution, and renewable and non-renewable resources. For example, there are two questions which are related to energy in the questionnaire. Table 5.1 shows the categories of the environmental knowledge questions and the abbreviations and descriptions of these questions.

**Table 5.1: The categories of the environmental knowledge questions**

Category	Abbreviation	Description
Energy	EKQ1	How most of the electricity in South Africa is generated.
	EKQ2	The percentage of Hydropower electricity generated in South Africa.
Water pollution	EKQ3	The most common cause of pollution of streams, rivers, and oceans.
	EKQ4	One of the main benefits of wetlands.
Global warming	EKQ5	The main cause of global climate change.
	EKQ6	The effects of climate change.
Fresh water scarcity	EKQ7	The percentage of the world's water which is fresh and available for use.
	EKQ8	The percentage of fresh water which was used for agricultural purposes in the year 2000.
Waste disposal	EKQ9	The greatest threat posed by these waste disposal areas
	EKQ10	The greatest source of landfill material.
Air pollution	EKQ11	The biggest source of carbon monoxide.
	EKQ12	The natural source of air pollutants.
Renewable and non-renewable resources	EKQ13	Identification of renewable resources.
	EKQ14	The source of renewable energy.
Hazardous household waste	EKQ15	The household wastes considered hazardous waste.
	EKQ16	Disposal areas for household hazardous waste.

### 5.2.1 Pre-Intervention Environmental Knowledge Evaluation Results

The question that scored the highest mark (87%) in the pre-intervention environmental knowledge evaluation is EKQ14 followed by EKQ6 which scored a mark of 84.1% (Figure 5.2). The question that scored the lowest mark (0%) is EKQ3 where the participants were asked about the common cause of pollution of streams, rivers and oceans. The average percentage mark scored by participants on all the questions was 53.3%. In this case it is evident that most participants possessed prior knowledge about certain environmental issues. However, these results also show an opportunity to improve the environmental knowledge of the participants since they acquired an overall average percentage mark of 53.3% for the pre-intervention knowledge evaluation.

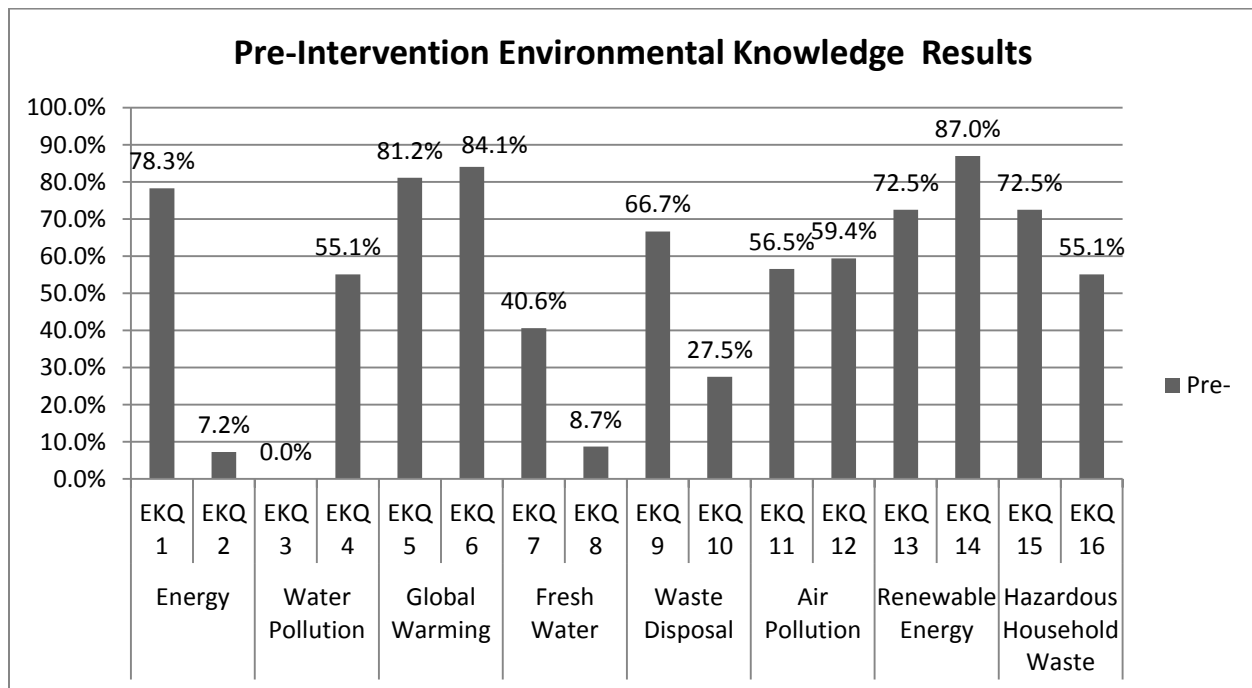


Figure 5.2: Pre-intervention environmental knowledge results (n = 69)

## 5.2.2 Post-Intervention Environmental Knowledge Evaluation Results

In the post-intervention environmental knowledge evaluation, the question that achieved the highest mark (94.2%) is EKQ14 followed by EKQ15 which achieved a mark of 92.8% (Figure 5.3). The question that received the lowest mark (8.7%) is EKQ8. It is evident from the results that the marks of all questions except for EKQ1 and EKQ8 have improved from pre- to post-intervention. These two questions scored a similar mark in both evaluations. EKQ14 scored the highest marks in both evaluations. This question scored 87.2% in the pre-intervention evaluation and 94.2% in the post-intervention evaluation. The overall average mark scored by participants for all the questions in the post-intervention evaluation is 63.9%. This mark is higher than 53.3% which was scored in the pre-intervention. This implies that the overall average environmental knowledge of all participants increased by 10.6%.

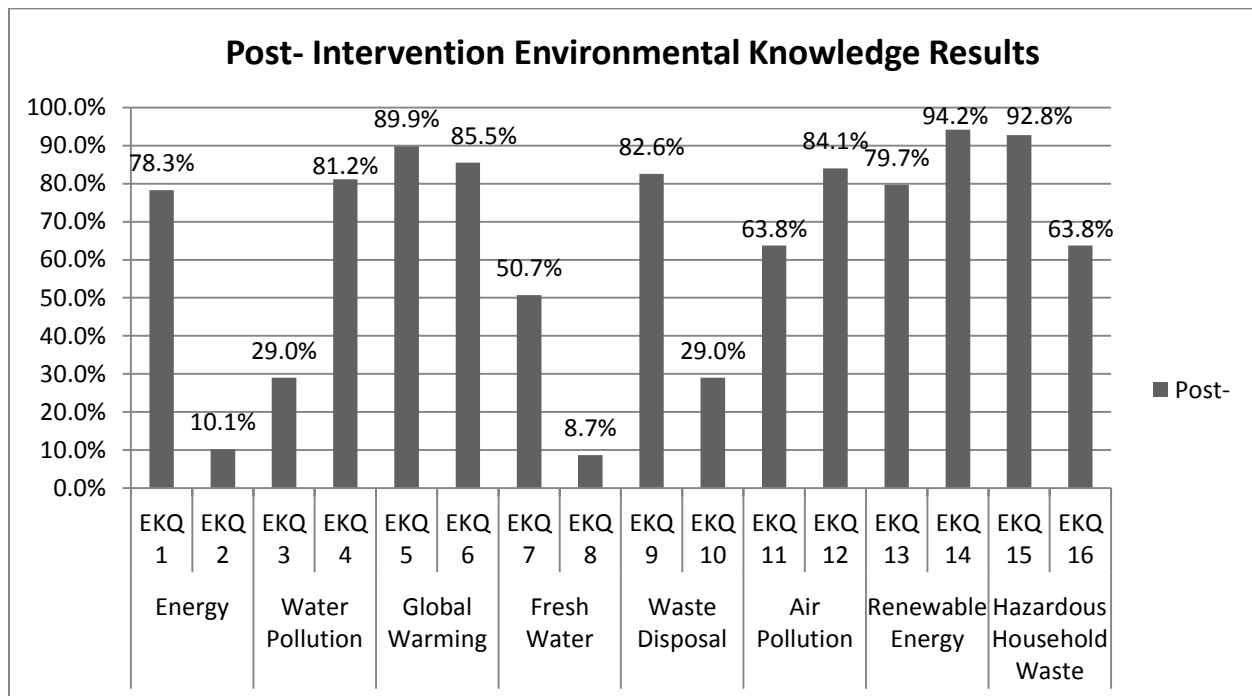


Figure 5.3: Post-intervention environmental knowledge results (n = 69)

### 5.3 Study Intervention Activities

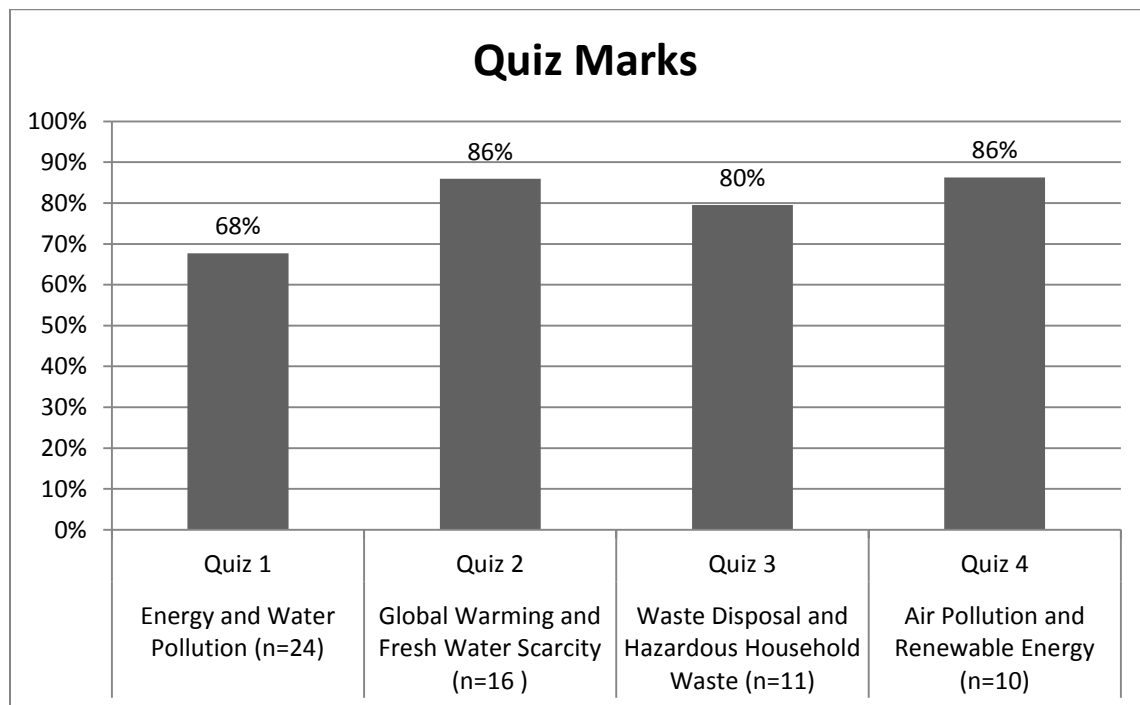
This study seeks to determine if the improvement of environmental knowledge of the participants depends on the activities conducted by the participants on the SMENA social media. The activities that were conducted by participants on the SMENA social media include commenting on posts, posting a blog or picture about environmental situations in their surroundings, and viewing videos and blog posts about environmental issues. Figure 5.4 illustrates an example of the effects and solutions activity which was conducted by participants on the SMENA website.



Figure 5.4: Example of an activity on the SMENA website

The participants were also asked to complete quizzes which are based on the videos and blog posts (Appendix G). The aim of the quiz was to encourage that the participants to watch the videos and read the blogs since the quiz questions were extracted from the videos and the blogs.

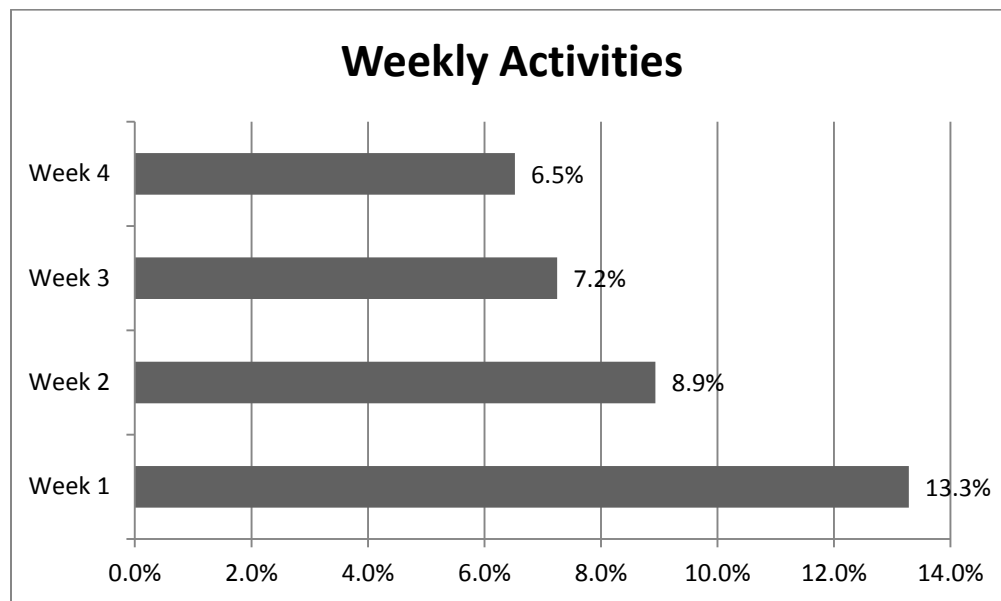
The questions included in each quiz were focused two environmental categories which are being discussed during a particular week (Figure 5.5). Each quiz included four questions which are related to one environmental category. Since two categories were discussed per week there were eight questions in included one quiz. The number of participants who completed each quiz varied each week. For example, twenty four participants completed the first quiz (Quiz 1) and sixteen participants completed Quiz 2. The quizzes which scored the highest average mark are Quiz 2 (86%) and Quiz 4 (86%). Quiz 1 had the highest number of participants and it scored the lowest average mark (68%).



**Figure 5.5: Quiz marks (n = 69)**

The activity rate was calculated by identifying if a certain participant conducted the required activities for each environmental category. The participant was then given a mark for each activity that he/she had completed. The researcher focused on two categories in one week and each participant was requested to complete three activities per category, therefore there was a total of six activities per week to be completed by each participant. The intervention took place for four weeks, which implies that the participants had to complete a total of twenty-four activities during the intervention.

The results shown in Figure 5.6 depict the percentage of activities conducted by participants per week. Week 1 scored the highest activity rate (13.3%) and it is followed by Week 2 which scored an activity rate of (8.9%). The lowest activity rate (6.5%) was in Week 4. According to these results, it is evident that the activity rate of the participants decreased gradually from the first to the last week.



**Figure 5.6: Activity rate per week (n = 69)**

The activity rate of the participants was divided into two different activity levels. The first activity level comprises a group of participants (Lower Activity Group) who achieved activity rates ranging from 0% to 8.3% (n = 53). The second activity level comprises a group of participants (Higher Activity Group) with a higher activity rate which ranges from 12.5% to 54.1% (n = 16). The Analysis of Variance (ANOVA) was calculated to determine if there was a difference between the post- and pre-difference (environmental knowledge) mean scores of these activity groups (Table 5.2). The post- and pre-difference mean scores are acquired when the scores from responses in the post-test environmental questionnaire are subtracted from the scores acquired in the pre-test environmental questionnaire. The results of the ANOVA test show that there is a significant difference at a 5% confidence level between the post- and pre-difference mean scores of the two activity groups ( $p < 0.05$ ). The result illustrates that there is a difference between the participants with both groups in terms of change in environmental knowledge.

**Table 5.2: ANOVA for post- pre-difference mean scores**

<b>Univariate Tests of Significance for Post- Pre-Difference</b>					
	<b>SS</b>	<b>Degree. of - Freedom</b>	<b>MS</b>	<b>F</b>	<b>p</b>
Intercept	8782.34	1	8782.3	39.144	0.000
Activity Levels	1225.73	1	1225.7	5.463	0.022
Error	15032.20	67	224.4		

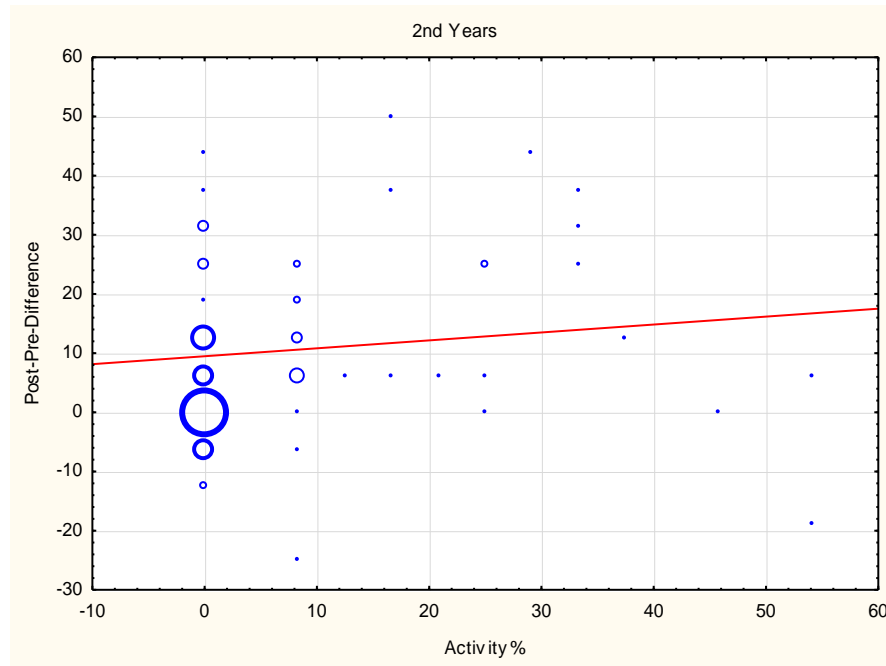
Since there was a difference between the two activity groups, Table 5.3 shows the descriptive statistics of the two groups separately. The overall post- and pre-difference mean score ( $\mu = 8.4$ ) of the lower activity group of participants was lower than the overall post- and pre-difference mean score of the higher activity group of participants ( $\mu = 18.4$ ). It can be deduced from these results that the environmental knowledge of the participants in the higher activity group is higher than the environmental knowledge of the students in the lower activity group.

**Table 5.3: Descriptive statistics for post-pre-difference**

<b>Descriptive Statistics for Post- Pre-Difference</b>					
	<b>Groups</b>	<b>n</b>	<b>Mean</b>	<b>SD</b>	<b>Std.Err</b>
Total		69	10.7	15.5	1.9
Activity Levels	Lower activity group	53	8.4	13.6	1.9
Activity Levels	Higher activity group	16	18.4	18.9	4.7

The post- and pre-difference (environmental knowledge) scores of the participants were compared to the activity rate of the participants (Figure 5.7). The results of the comparison illustrate a positive trend on the scatter plot which implies that environment knowledge increased as a result of activities which were conducted during the environmental awareness campaign. The largest circle on the graph illustrates that the environmental knowledge (Post- and pre-difference = 0%) of the participants who did not perform any activities (Activity rate = 0%) on the SMENA social media project, did not improve.





**Figure 5.7: Comparison of the post-pre-difference scores with the activity rate**

A regression analysis was performed to determine whether the activity rate had an influence on the improvement of environmental knowledge (Table 5.4). This analysis will help confirm if the activities conducted on the SMENA social media during the environmental awareness campaign improved the knowledge of the participants. The results of the regression analysis show a positive regression ( $p < 0.05$ ) between activity rate and post-test scores of the environmental questionnaire, which confirms that the activity rate is a significant factor which influenced improvement in environmental knowledge. Therefore, it can be deduced that activities conducted on the SMENA social media improved the environmental knowledge of the participants.

**Table 5.4: Regressions analysis summary for dependent and independent variable**

<b>Regression Summary for Dependent Variable: Post-test Score</b>		
	<b>t(66)</b>	<b>p-value</b>
Intercept	7.687	0.000
Pre-test Score	5.293	0.000
Activity%	2.110	0.039

## 5.4 SMENA Social Media Evaluation Results (Post-Intervention)

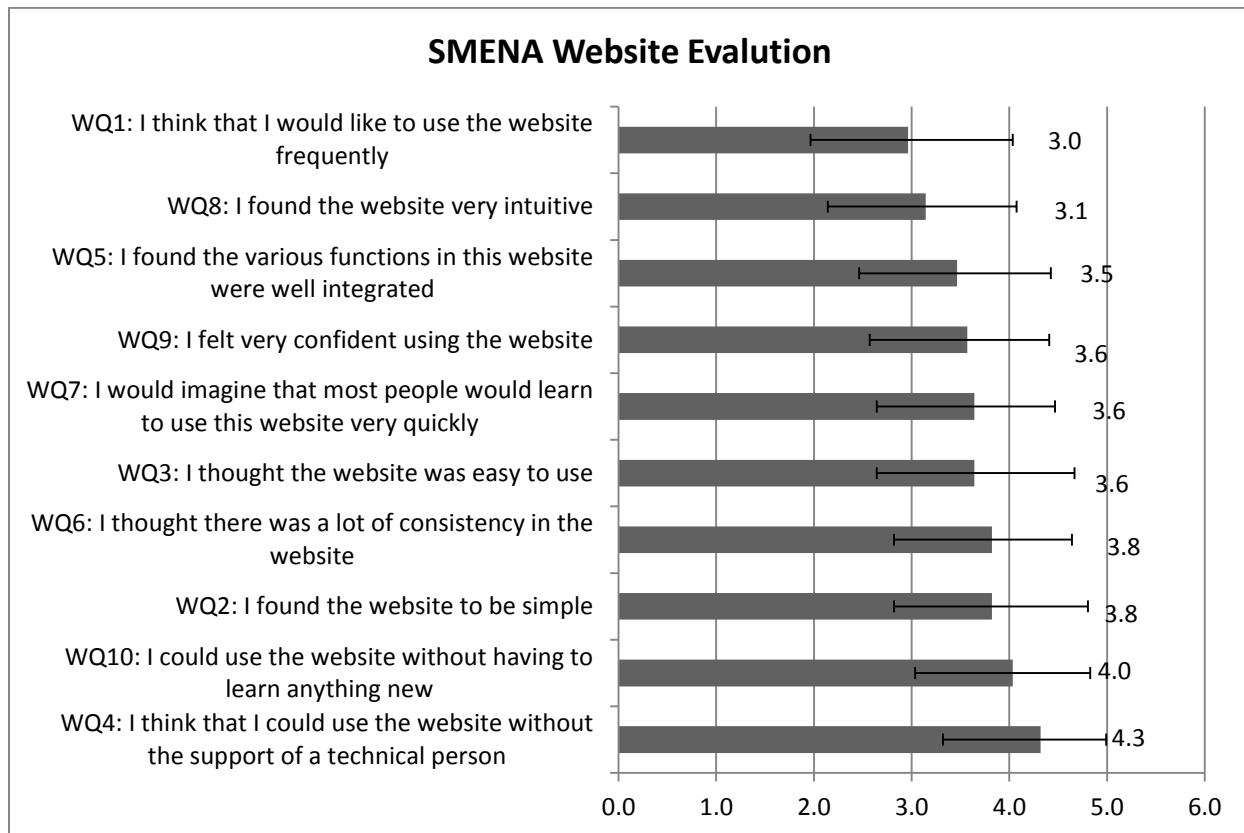
The evaluation of the SMENA social media was conducted post-intervention using the Usability Questionnaire (UQ). This questionnaire was used to acquire results about the usability of the SMENA website, usage and acceptance of the SMENA social media and the extent to which the SMENA social media assisted the participants to acquire environmental knowledge. This questionnaire included open-ended questions which produced qualitative data and 5-point Likert scale questions which produced quantitative data. The analysis and reporting of qualitative data was done for both groups of participants which are second and third year students. However, the quantitative analysis and reporting was only done for second year group since the sample size of this group was the only one large enough to conduct quantitative statistical analysis. The sample size of the second year group was 69 and 49 participants from this group had an activity rate of 0%. These participants were not included as part of the usability evaluation since they were regarded not to have used the SMENA social media. The sample size of the second year group of participants was therefore reduced ( $n = 28$ ).

### 5.4.1 SMENA Website Evaluation Results

The post-intervention usability evaluation of the SMENA website was based on the System Usability Scale (SUS) questionnaire (Tullis and Albert 2008). The questions were rated on a 5-point Likert scale where 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly agree. In the case of these questions, the following interval ranges apply: Negative = [1 - 2.6); Neutral = [2.6 - 3.4] and Positive = (3.4 - 5]. Open-ended questions were also included in order to acquire information about the positive and negative aspects of the SMENA website. Figure 5.8 depicts the results of the SUS questions.

The fourth question (WQ4: *“I think that I could use the website without the support of a technical person”*) scored the highest mean ( $\mu = 4.3$ ), which implies that most of the participants thought they could use the website without technical support. WQ10: *“I could use the website without having to learn anything new”* scored the second highest mean ( $\mu = 4.0$ ), followed by WQ2: *“I found the website to be simple”* and WQ6: *“I thought there was a lot of consistency in the website”* which both scored a mean of ( $\mu = 3.8$ ). The question that scored the lowest mean ( $\mu = 3.0$ ) is WQ1.

All the questions were rated in the “Positive” range by the participants except for WQ8 and WQ1 which were rated as “Neutral” by the participants. This implies that the participants were “Neutral” when asked if the SMENA website was intuitive and they were also “Neutral” about using the SMENA website frequently. The overall usability of the SMENA website was satisfactory since the overall mean score ( $\mu = 3.6$ ) of all the SUS questions which was derived from the participants’ responses was “Positive”.



**Figure 5.8: SUS results (n = 28)**

The results regarding the positive and negative aspects of the SMENA website were acquired from open-ended questions. The information was acquired from the participants within both the second year and third year groups. The comments acquired from these participants were categorised into themes and the frequency (f) of each theme was recorded. The frequency is counted each time a comment relating to a specific theme is identified.

In the second year group a total of four frequent themes which represented responses about positive aspects of the SMENA website were identified (Table 5.5). The theme which appeared most frequently in the comments was “Easy to use” (f = 10). This result shows that participants thought the SMENA website was easy to use. These participants also favoured the way information is structured on the SMENA website since the “Good Information layout” (f = 8) theme also appeared frequently. The other themes which were identified are “attractive interface” (f = 6), “notification system” (f = 3) which implies the website functionality which provided participants with notifications on the website and on the email address which they used when registering on the website. In the third year group, “Easy to use” (f = 8) was also identified as a frequent theme. The second most frequent themes in this case were “Attractive interface” (f = 4) and “Informative content” (f = 4). “Good information layout” (f = 2) was also identified as a theme.

**Table 5.5: Positive aspects of the SMENA website**

<b>Themes (2<sup>nd</sup> year students) (n =28)</b>	<b>f</b>	<b>Examples of actual response</b>
Easy to use	10	<i>The website was user friendly</i>
Good information layout	8	<i>Easy to find updated information</i>
Attractive interface	6	<i>Good interface. I like the colours</i>
Notification system	3	<i>I liked that I could get messages through email</i>
<b>Themes (3<sup>rd</sup> year students) (n =14)</b>	<b>f</b>	<b>Examples of actual response</b>
Easy to use	8	<i>It is easy to use and understand. It is simple and easy to post videos and comments. There is good navigation throughout the site.</i>
Attractive interface	4	<i>I liked the colour scheme</i>
Informative content	4	<i>It's a learning environment, that makes people aware of everyday happenings which we take for granted or misuse</i>
Good information layout	2	<i>Layout was good</i>

The participants of both groups (second year and third year) also commented on the negative aspects of the SMENA website (Table 5.6). In the second year group, most participants (n = 13) stated that they had a problem with navigation and the information layout of the SMENA website since it was not always easy to find the information that they needed. Some of the participants (n = 6) reported that streaming and downloading of video was slow. Another theme identified in the second year group was “Too many groups” (f = 2) where some participants raised concern that the groups which were used as environmental categories were too cumbersome.

In the third year group, the main concern was that the website is not compatible with Microsoft Windows Internet Explorer browser (f = 5). This was due to the fact that Internet Explorer 9 browser which is used in the computer labs of the university does not natively support the rounded corner designs (Microsoft Developer Network 2009). The participants also provided negative comments relating to the following themes: “Confusing navigation” (f = 3), “Domain name difficult to remember” (f = 2), “Not easy to find information” (f = 2), and “Website took too long to load” (f = 2).

**Table 5.6: Negative aspects of the SMENA website**

<b>Themes (2<sup>nd</sup> year students) (n=25)</b>	<b>f</b>	<b>Examples of actual response</b>
Not easy to find information	13	<i>Difficult to find things, e.g. found it difficult to find the quizzes</i>
Slow video streaming and downloading	6	<i>Video would stop working half way through</i>
Too many groups	2	<i>A lot of different groups</i>
<b>Themes (3<sup>rd</sup> year students) (n=14)</b>	<b>f</b>	<b>Examples of actual response</b>
Website not compatible with Microsoft Internet Explorer	5	<i>When using internet explorer the layout would not display properly and it would be slow</i>
Confusing navigation	3	<i>Some concepts were confusing such as labels with computer jargon</i>
Domain name difficult to remember	2	<i>The domain name/URL is difficult to remember</i>
Not easy to find information	2	<i>It was hard to find other users and posts (mostly quizzes).</i>
Website took long to load	2	<i>It took forever to load</i>

### 5.4.2 SMENA Social Media Usage Results

The participants were encouraged to use all the SMENA social media during the study intervention. The SMENA social media include the SMENA website, the Facebook page (Green Awareness at NMMU) and the Twitter page (@NMMUSmena). The participants were requested to report which SMENA social media they used most frequently during the study. The participants were also requested to report if they used Facebook and Twitter for general purposes during the study intervention other than for this study, in order to identify whether the participants were active on these social media during the duration of the campaign.

According to the results depicted in Figure 5.9 most participants used Facebook ( $\mu = 4.1$ ) more than Twitter ( $\mu = 1.8$ ) for general purposes during the period of the study intervention. In the case of the SMENA social media, the participants used the SMENA website ( $\mu = 3.2$ ) more than they used the SMENA Facebook ( $\mu = 2.1$ ) and Twitter ( $\mu = 1.8$ ) pages. It can be deduced from these results that Facebook was used more for general purposes than for the purpose of this study, whilst Twitter was used equally for general purposes and for the purpose of this study.

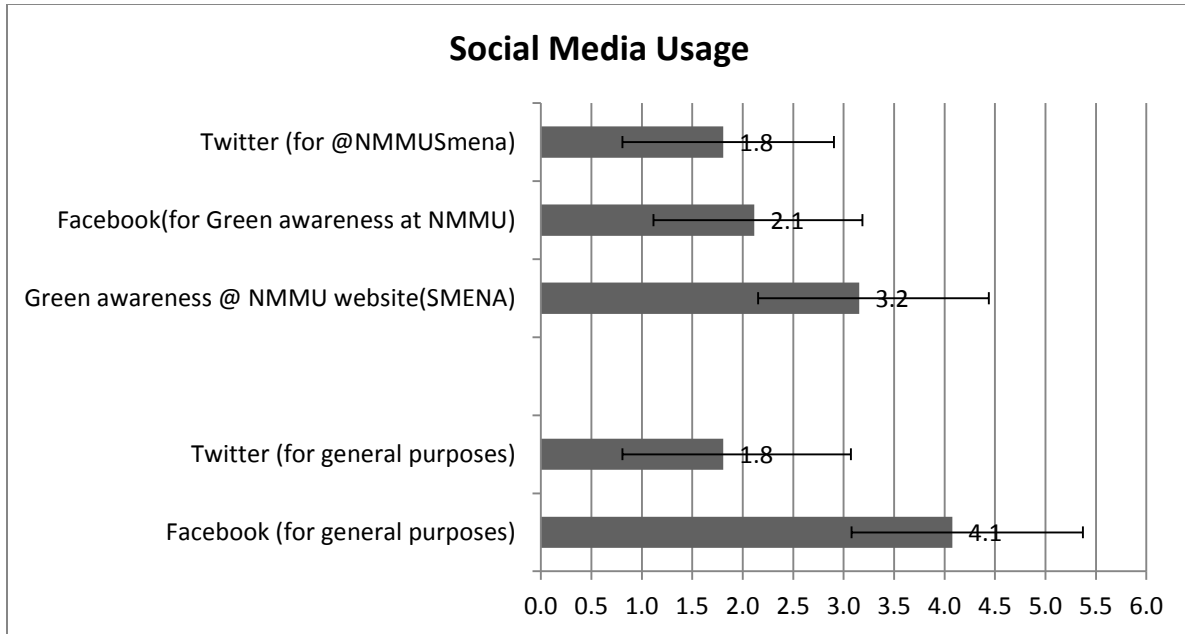


Figure 5.9: Social media used during the campaign (n = 26)

The U&G gratification factors were used to determine the participants' usage and acceptance of the SMENA social media. The same gratification factors which were used in the pre-intervention social media empirical study for general social media were also used for the SMENA social media. These gratification factors are: coordination, immediate access, and social presence (Table 5.7).

The main aim was to determine if the SMENA social media were able to provide the participants with coordination, immediate access and social presence. However, all these gratification factors scored a "Negative" mean score of ( $\mu = 2.1$ ). The negative mean score acquired on all the gratification factors suggests that the SMENA social media were limited in terms of enabling users to connect with users in other geographical areas (immediate access), to organise activities, make arrangements and disperse information (coordination), and to provide users with a sense of human contact (Social Presence). The reason for the negative mean scores could be the fact that the SMENA social media were used for educational purposes instead of social purposes. Therefore, it can be deduced that the U&G gratification factors do not apply for education environments.

**Table 5.7: Results of factors influencing SMENA social media usage and acceptance**

	<b>Coordination</b>	<b>Immediate Access</b>	<b>Social Presence</b>
<b>n</b>	26	26	26
<b>Mean</b>	2.1	2.1	2.1
<b>Min</b>	1.0	1.0	1.0
<b>Max</b>	4.3	3.6	4.0
<b>SD</b>	0.9	0.9	0.9

Open-ended questions were used to identify other factors that influence the participants' usage of social media in general and the SMENA social media. The open-ended questions requested the participants to provide their main reasons for using and not using these social media. The most frequent theme for using Facebook which was acquired from second year students' responses was "To stay in contact with people" ( $f = 23$ ) (Table 5.8). The second most frequent theme was "To get updated on current affairs" ( $f = 3$ ). These results show that most participants in the second year group used social media to stay in contact with their peers and to access information about current affairs.

In the third year group “To stay in contact with people” (f = 11) was the also most frequent theme followed by “To be updated on upcoming events” (f = 2). Most participants in the third year group also use social media to keep in touch with people. These participants also utilise Facebook to be in the loop with regard to upcoming events.

**Table 5.8: Reason for using Facebook**

<b>Themes (2<sup>nd</sup> year students) (n=26)</b>	<b>f</b>	<b>Examples of actual response</b>
To stay in contact with people	23	<i>To see what all my friends have been doing, and chatting to friends that are far away.</i>
To get updated on current affairs	3	<i>Keep in the loop of latest news.</i>
<b>Themes (3<sup>rd</sup> year students) (n=15)</b>	<b>f</b>	<b>Examples of actual response</b>
To stay in contact with people	11	<i>To keep in touch with old friends and current events.</i>
To be updated on upcoming events	2	<i>I use it to see any events that are taking place or any interesting things to do over the weekend or free time.</i>

The most frequent theme for not using Facebook amongst the second year group was “I do not like the content” (f = 2) (Table 5.9). In this case, the comments acquired from the participants show that the participants dislike Facebook content such as apps and games. The third year group also provided responses about reasons for not using Facebook. The two main themes acquired from these responses were “It is time consuming” (f = 3) and “It is an invasion of privacy (f = 3).

**Table 5.9: Reasons for not using Facebook**

<b>Themes (2<sup>nd</sup> year students) (n=17)</b>	<b>f</b>	<b>Examples of actual response</b>
I do not like the content	2	<i>Lots of irrelevant things, apps or games</i>
<b>Themes (3<sup>rd</sup> year students) (n=15)</b>	<b>f</b>	<b>Examples of actual response</b>
It is time consuming	3	<i>Time constraints. So many thing to get done and Facebook seems like a waste of time.</i>
It is an invasion of privacy	3	<i>It's an invasion of privacy and I don't want to share too much about my personal details.</i>



The groups of participants were also requested to provide the main reasons why they used the SMENA Facebook page (Table 5.10). The theme that appeared most frequently from the responses acquired from the participants within the second year group for using the SMENA Facebook page was “To learn about the environment” (f = 7). The second most frequent theme in this case was “To get easy access to environmental information” (f = 3). It can be assumed from the results that most participants use the SMENA Facebook page to get informed about the environment. In the third year group the themes for using the SMENA Facebook page were “To get access to environmental information” (f = 2) and “To view environmental information” (f = 2). It is evident that the third year group participants also used the SMENA Facebook page to get easy access to the environmental information which was posted on this page.

**Table 5.10: Reasons for using SMENA Facebook**

<b>Themes (2<sup>nd</sup> year students) (n=21)</b>	<b>f</b>	<b>Examples of actual response</b>
To learn about the environment	7	<i>To become enlightened and to hear other people’s point of view.</i>
To get easy access to environmental information	3	<i>Easy to see information while looking at newsfeed of friends or pages.</i>
<b>Themes (3<sup>rd</sup> year students) (n=15)</b>	<b>f</b>	<b>Examples of actual response</b>
To get easy access to environmental information	2	<i>Ease of access as while I am on Facebook browsing I can view SMENA updates.</i>
To view environmental information	2	<i>To see relevant environmental news and up-to-date information.</i>

In the reasons for not using the SMENA Facebook page the theme that appeared the most amongst the responses of the second year group of participants (f = 5) was “Do not use Facebook frequently” (f = 5) (Table 5.11). This theme was also appeared most frequently in the third year group (f = 3) together with “It is time consuming” (f = 3). These themes were followed by the theme “Information not interesting” (f = 2). The second most frequent themes in the second year group were “Information not interesting” (f = 2) and “It is time consuming” (f = 2). The results show that the participants from both groups were not frequently using Facebook hence they did not use the SMENA Facebook page. These participants also stated that the content on the SMENA Facebook page was not interesting and that using the SMENA Facebook was a waste of time.

**Table 5.11: Reasons for not using SMENA Facebook**

<b>Themes (2<sup>nd</sup> year students) (n=19)</b>	<b>f</b>	<b>Examples of actual response</b>
Do not use Facebook frequently	5	<i>I hardly use Facebook.</i>
Information not interesting	2	<i>The articles posted could be more interesting.</i>
It is time consuming	2	<i>Time constraints.</i>
<b>Themes (3<sup>rd</sup> year students) (n= 15)</b>	<b>f</b>	<b>Examples of actual response</b>
Do not use Facebook frequently	3	<i>I am not very active on Facebook.</i>
It is time consuming	3	<i>Time consuming.</i>
Information not interesting	2	<i>Sustainability is a topic I'm not too familiar with.</i>

The two groups of participants were requested to provide comments about the main reasons for using Twitter (Table 5.12). In the second year group, the theme which represented most comments relating the main reasons for using Twitter was “To get updated on current affairs” (f = 6). The theme “To get updated on current affairs” (f = 6) was also frequent in the responses of the participants in the third year group. The second most frequent theme acquired from the third year group participants was “To stay in contact with people” (f = 5).

**Table 5.12: Reasons for using Twitter**

<b>Themes (2<sup>nd</sup> year students) (n=20)</b>	<b>f</b>	<b>Examples of actual response</b>
To get updated on current affairs	6	<i>To be kept updated on what's happening around the world.</i>
<b>Themes (3<sup>rd</sup> year students) (n=15)</b>	<b>f</b>	<b>Examples of actual response</b>
To get updated on current affairs	6	<i>To see what is going on in my interests (sport and music.)</i>
To stay in contact with people	5	<i>Interact with peers.</i>

The themes that correlated with most comments regarding the main reasons for not using Twitter were “I do not like Twitter” (f = 2) and “I prefer Facebook” (f = 2) (Table 5.13). These two themes were acquired from the second year group. In the third year group the theme that appeared the most frequently from the participants’ responses was “Not interest” (f = 2), which implies that the participants were not interested in possessing a Twitter account.

Table 5.13: Reasons for not using Twitter

Themes (2 <sup>nd</sup> year students) (n =16)	f	
I do not like Twitter	2	<i>I am not a fan of twitter.</i>
I prefer Facebook	2	<i>Facebook provides all the services I find on Twitter useful for.</i>
Themes (3 <sup>rd</sup> year students) (n =15)	f	
Not interested	2	<i>I have never been interested in creating a twitter account.</i>

The most frequent theme which was acquired from comments of second year participants regarding the reasons for using the SMENA Twitter was “To learn about the environment” (f = 5) (Table 5.14). This theme was followed by “To get easy access to environmental information” (f = 2) which was the second most frequent theme. The most frequent theme acquired from the third year group’s responses was “To view environmental information” (f = 4). The two other themes acquired from these responses were “To learn about the environment” (f = 2) and “To share environmental information” (f = 2).

Table 5.14: Reasons for using SMENA Twitter

Themes (2 <sup>nd</sup> year students) (n= 20)	f	
To learn about the environment	5	<i>To be kept in the loop of what’s happening to our environment.</i>
To get easy access to environmental information	2	<i>Easy to view information while following celebrities/friends.</i>
Themes (3 <sup>rd</sup> year students) (n=15 )	f	
To view environmental information	4	<i>To see relevant environmental news and up- to- date information on my more favoured social media site.</i>
To learn about the environment	2	<i>To get informed and inform others while I’m on the social site.</i>
To share environmental information	2	<i>To give users short tips on being environmentally friendly and on ways to prevent pollution.</i>

In the second year group of participants, the theme with the highest frequency in terms of reasons for not using the SMENA Twitter page was “I do not use Twitter”(f = 8) which was followed by “I do not like Twitter” (f = 2) (Table 5.15). The theme “I do not use Twitter” (f = 2) was also frequent in the third year group. In this case, the participants are implying that they could not use the SMENA Twitter page since they do not like or use Twitter.

**Table 5.15: Reasons for not using SMENA Twitter**

<b>Themes (2<sup>nd</sup> year students) (n =15)</b>	<b>f</b>	
I do not use Twitter	8	<i>No Twitter account, not interested in twitter.</i>
I do not like Twitter	2	<i>Don't like or use twitter.</i>
<b>Themes (3<sup>rd</sup> year students) (n =15)</b>	<b>f</b>	
I do not use Twitter	2	<i>I do not have a twitter account.</i>

The two groups of participants were also required to provide responses about their main reasons for using the SMENA Website (Table 5.16). The most frequent theme based on the responses provided by the second year group participants was “To learn about the environment” (f = 10). The second most frequent theme was “To complete activities” (f = 6) and it was followed by the theme “To assist with research” (f = 4).

The theme “To learn about the environment” (f = 8) was also identified as the most frequent theme from responses of the third year group. The other frequent themes identified in this group were “To complete activities” (f = 4) and then “Course requirements” (f = 3). These results suggest that these participants used the SMENA website because they were required to use it as part of the course. These results also state that the participants used the website to complete activities and to learn about the environment.

Table 5.16: Reasons for using the SMENA website

Themes (2 <sup>nd</sup> year students) (n=24)	f	Examples of actual response
To learn about the environment	10	<i>To make myself a little more informed about the subject.</i>
To complete activities	6	<i>To work on the quizzes.</i>
To assist with the research	4	<i>To participate and help.</i>
Themes (3 <sup>rd</sup> year students) (n =15)	f	Examples of actual response
To learn about the environment	8	<i>Main reason was to educate myself on environmental factors and increase my knowledge about green awareness. Also to learn more ways on how I can prevent pollution and recycle material.</i>
To complete activities	4	<i>Watch uploaded videos and participate in various group activities.</i>
Course requirements	3	<i>Because it was a requirement for my ERP module.</i>

Time constraints were identified as the main reason most participants in the second year group did not use the SMENA website (Table 5.17). The theme “It is time consuming” (f = 7) was identified as the most frequent theme in this regard. The other themes which were acquired from the comments of the second year group were “Not interested” (f = 2) and “Videos took long to stream and download” (f = 2).

The comments relating to these themes suggested that the participants were not interested in using the website and that slow video streaming and downloading discouraged the participants from using the website. In case of the third year group two themes were acquired from their responses. The most frequent theme in this case was “It is time consuming” (f = 7) and it was followed by the theme “Information not interesting” (f = 2), which implies that the students did not like the contents of the website.

**Table 5.17: Reasons for not using the SMENA website**

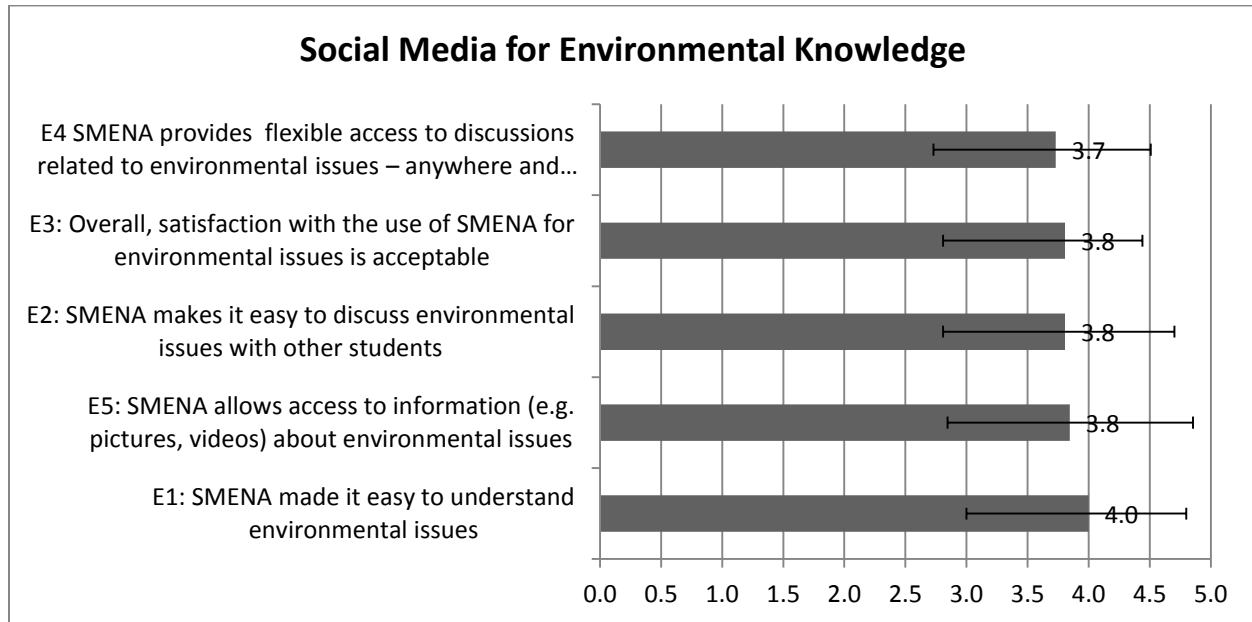
<b>Themes (2<sup>nd</sup> year students) (n =15)</b>	<b>f</b>	
It is time consuming	7	<i>I got caught up in other subjects and assignments.</i>
Not interested	2	<i>I'm not interested to waste my little time bit of free time on the website.</i>
Videos took long to stream and download	2	<i>One of the times I tried to view a video it did not work so I left it.</i>
<b>Themes (3<sup>rd</sup> year students) (n =15)</b>	<b>f</b>	
It is time consuming	7	<i>Sometimes it would slip my mind or I unfortunately did not have time to visit the website on a regular basis.</i>
Information not interesting	2	<i>Lack of interesting posts on the topic of environmental issues.</i>

### 5.4.3 SMENA Social Media for Environmental Knowledge Results

The main purpose of the study intervention was to improve the participants' environmental knowledge. The main aim of this evaluation is to determine the extent to which the SMENA social media assisted the participants to improve their environmental knowledge. This improvement in environmental knowledge was measured using the environmental questionnaire (EQ) (Section 5.2). The questions used for this evaluation are derived from a study by Uzunboylu *et al.* (2009) (Figure 5.10). A 5-point Likert scale was used to measure the responses to these questions and the following ranges were used rate the responses: Negative = [1 - 2.6); Neutral = [2.6 - 3.4] and Positive = (3.4 – 5].

In this evaluation, E1: “*SMENA made it easy to understand environmental issues*” scored the highest mean score ( $\mu = 4.0$ ). E5: *SMENA allows access to information (e.g. pictures, videos) about environmental issues*, E2: “*SMENA makes it easy to discuss environmental issues with other students*”, and E3: “*Overall, satisfaction with the use of SMENA for environmental issues is acceptable*” scored a similar mean score ( $\mu = 3.8$ ). E4: “*SMENA provides flexible access to discussions related to environmental issues – anywhere and anytime*” scored the lowest mean score ( $\mu = 3.7$ ).

However, the mean scores for all these questions fall within a “Positive” range. The overall mean score of these questions was also within a “Positive” range ( $\mu = 3.8$ ) which confirms that most participants were satisfied with the use of the SMENA social media to assist participants to acquire environmental knowledge.



**Figure 5.10: SMENA social media for environmental knowledge results (n = 26)**

## 5.5 Interview Results

Interviews were conducted with the second year group to confirm the perceptions of the participants regarding the environmental awareness campaign (study intervention). Four participants were randomly selected by the researcher to participate in the interviews in order to validate the survey results and the qualitative results. The interview questions which were used in this regard are:

IQ1: Describe your attitude towards the environmental awareness campaign at the beginning.

IQ2: Describe your attitude towards the environmental awareness campaign at the end.

IQ3: What are the positive aspects about the environmental awareness campaign?

IQ4: What are the negative aspects about the environmental awareness campaign?

IQ5: What are your general feelings about the environmental awareness campaign?

The main aim of IQ1 was to determine the attitudes of the participants when they were introduced to the environmental awareness campaign. IQ2 on the other hand aimed to determine the participants' attitudes at the end of the campaign. These questions assisted the researcher to determine the participants' attitudes towards the campaign and to determine if their attitudes fluctuated from the beginning to the end of the campaign.

P1 stated that in the beginning he thought the campaign was a waste of time and that there cannot be a link between computers and the environment (Table 5.18). P2 argued that she was a bit doubtful about the campaign in the beginning. P3 perceived the campaign as troublesome in the beginning and he was not motivated to signing up on the SMENA social media. P3 stated that he thought social media which focus on environmental issues are not as interesting as platforms like Facebook which are used for social purposes therefore his attitude was negative in the beginning. This result confirms the theme "Information not interesting" which was identified in the qualitative results of the SMENA social media evaluation (Section 5.4.2). P4 on the other hand reported that she thought it was great that the campaign was embarking on environmental issues. From these results, it can be assumed that the attitudes of all the participants except P4 were negative at the beginning of the campaign.

**Table 5.18: Attitudes of participants at the beginning of the campaign (IQ1)**

Participants	Themes	Actual response
P1	Negative	<i>At first I thought it was a waste of time, I didn't even think it would turn out good like that and I would end up enjoying it. At first thought there is no link between computers and the environment.</i>
P2		<i>I was a little sceptical about it at the beginning.</i>
P3		<i>It was a bit troublesome. Like you know people will obviously go join Facebook or something because they want to interact with their friends or whatever, but the environment wasn't as important... That's how I also felt. In general when you start with it, it was quite negative... that's how I felt.</i>
P4	Positive	<i>I thought it was great that you were embarking on environmental issues.</i>



In the case of attitudes of participants at the end of the campaign, P1 reported that he felt that the campaign could continue for the entire year and that he was a bit sad that it ended (Table 5.19). P2 stated that her attitude towards the campaign had improved and it was much better than at the beginning. P3 argued that he felt it was a relief that the campaign had ended. P4 stated that at the end she thought it was great that the campaign was creating environmental awareness because most people are aware of the environment but they do not know the impact of environmental issues. It can be deduced from these results that P4 was still positive towards the campaign at the end and P1 and P2's initial negative perceptions towards the campaign were changed and they were more positive at the end. P3 on the other hand felt relieved at the end of the campaign which implies that the campaign was burdening this participant and this participant could have had negative feelings towards the campaign.

**Table 5.19: Attitudes of participants at the end of the campaign (IQ2)**

Participants	Themes	Actual response
P1	Positive	<i>At the end, I wanted it to continue. I thought it was something that will run for the whole year. I was a bit sad. It was like you introduced us to this thing... now we getting more interested and getting the feel of it and now suddenly it goes away.</i>
P2		<i>It was much better [attitude], I realised it was quite useful and it did teach us things about the environment.</i>
P3	Negative	<i>It was a relief that it was over.</i>
P4	Positive	<i>It was great that you are trying to promote environmental awareness, because people are aware of it but they don't always think about how it impacts them.</i>

IQ3 and IQ4 are related to the positive and negative aspects of the environmental awareness campaign. IQ5 is related to the general perceptions of the participants towards the campaign. Regarding the positive aspects of the campaign, the first participant (P1) reported that the campaign improved his consciousness and he became conscious about issues such as littering and disposal of household chemical wastes (Table 5.20). The campaign also changed his perception since he thought that computers cannot play a role in environmental initiatives.

P2 stated that she learned new things and she likes the fact that the campaign encouraged them to post things, conduct research about environmental issues and allowed them to learn in a different way. P3 stated that the videos posted on the website helped him to learn much more about the environment. P4 reported that the positive aspects of the campaign were the fact that the campaign was able to reach out to large numbers of people in short time frame since most people are always on social media. This confirms studies by (Namrouga 2012; Willson 2010) which report that one of the benefits of using social media to create environmental awareness is their ability to reach a large audience in a short space of time (Section 2.7). P4 also stated the frequent updates on the social media created environmental awareness since people could see the updates. Although people did not comment on the updates, they actually saw them and this created awareness.

**Table 5.20: Positive aspects of the campaign (IQ3)**

Participants	Themes	Actual response
P1	Learned about the environment	<i>It really triggered a sense of consciousness about the environment because I started to be conscious about a few environmental issues, such as littering, disposal of chemical waste like batteries that we have at the household. It changed my view about the fact that, there is no link between the environment and computing.</i>
P2	Learned about the environment	<i>We learned new things and we were encouraged to post things and find research out ourselves which was nice. Like I said the videos were nice... finding out information in a different way... And the quizzes... it was nice...</i>
P3	Learned about the environment	<i>I did learn more about the environment though because we had to watch those videos as well. I learned much more about the environment.</i>
P4	Reach a large audience	<i>The positive aspects are you are able to reach a large number of people in a very short space of time because everyone is always on social media, like they always using it every single day. And very few people don't use social media so the positive aspect is that you were able to always reach out to them and you posted quite often on social media sites so then people were always able to see it. Even if they didn't respond they saw it, so it is still like creating awareness.</i>

P1 stated that there were not many negative aspects associated with the campaign except for the fact that the duration of the campaign was too short (Table 5.21). P2 stated that conducting activities on the SMENA social media was sometimes a bit time consuming since the videos were not working properly. P3 stated that there was nothing negative about the campaign, but negative attitudes could discourage people from participating. P4 stated that the campaign was time consuming since the videos took long to download but the issue was addressed and the downloading became a bit faster.

**Table 5.21: Negative aspects of the campaign (IQ4)**

Participants	Themes	Actual response
P1	Short period	<i>I didn't see much except that it took place for a short period of time.</i>
P2	Time consuming	<i>I think some of the tasks we had to... I don't know it wasn't that bad... but sometimes it was a bit time consuming. The bad thing was the video sometimes didn't load properly and then you would kind of have to sit ages waiting for them to answer the questions [Quiz questions]. The rest was fine though.</i>
P3	Attitude	<i>I wouldn't say there was any negative about it. It wasn't really negative it was just... I suppose it's all about the attitude.</i>
P4	Time consuming	<i>There wasn't. I just suppose time consuming. And especially when needed to download the videos, it took long download but then you put them in the drop-box eventually which was a bit faster.</i>

Concerning the general feeling of the participants about the campaign P1 stated that the campaign was good initiative for the NMMU Department of Computing Sciences, it was a very good experience and the whole process was informative since he learned something new every week (Table 5.22). P2 stated that she thought the campaign made a difference and if it had been conducted for longer period it would have made a bigger difference. P3 stated that if more people were encouraged to conduct research and post more materials on the SMENA social media people would actually learn more. In this case it would have assisted if there were more active people on the social media.

P4 felt the campaign was somehow successful since other people who were not selected as participants were able to view the environmental information which was posted on the SMENA social media therefore the campaign also created awareness for other people. The theme acquired from the responses of P2 and P4 is “Time consuming”. This confirms the qualitative results relating to reasons for not using SMENA social media where the same theme was acquired (Section 5.4.2).

**Table 5.22: General feelings towards the campaign (IQ5)**

Participants	Themes	Actual response
P1	Good initiative, Good experience and informative	<i>It's a nice thing to start in our department. And also it was a very interesting experience. It was informative because the whole process was informative, each and every task we completed I learned something new that was even much better for myself. I think I gained a lot of information.</i>
P2	Improved environmental knowledge	<i>I think it made a difference. If it had been on for longer... which I guess it couldn't really had been... but if it was, it could have made an even bigger difference. On a bigger scale I think it would have worked.</i>
P3	More interaction on the SMENA social media	<i>If people were encouraged to go do research or put more stuff there [website] for people to see. People will definitely learn a lot more. So it would be helpful if you had a larger amount of interaction on the site.</i>
P4	Reached a larger audience	<i>It was successful in a way because it wasn't only our year that was able to view that the pages and that... because my friends were able to see what we were doing and also created awareness for like, not only us but everyone else. Because I know one of my friends also... she is in third year... she liked the page.</i>

## 5.6 Conclusions

The results of the environmental knowledge questionnaire (EQ) address RQ8: “*What is the improvement in environmental knowledge for students using SMENA?*” The results of this questionnaire show that the environmental knowledge of the participants improved from pre- to post intervention. The results of the regression analysis show that the environmental knowledge of the participants improved as a result of the activities the participants conducted on the SMENA social media.

The SMENA social media which was used most frequently during the campaign is the SMENA website. Most participants stated that they used the SMENA website to get informed about the environment, to complete activities and because they were assisting with the research study. Some participants in the third year group stated that they used the SMENA website because they had to use it as part of their course.

Furthermore, the participants used the SMENA Facebook page more frequently than the SMENA Twitter page. This could be due to the fact that most participants use Facebook frequently for social purposes. The participants stated that they use Facebook to stay in contact with people and to get access to current affairs. Most participants stated that they do not use Twitter because they prefer Facebook. These participants also stated that Twitter is not interesting to them and they do not like it.

The activity rate of the participants on the SMENA social media declined gradually from the first to the last week. It can be suggested that time constraints and a slow Internet connection discouraged the participants from carrying out further activities on the SMENA social media. Some participants stated that they were not interested in the information which was posted on the SMENA social media. Therefore, the attitudes of the participants towards the campaign could be another factor which is responsible for the gradual reduction of activities on the SMENA social media. Four participants were interviewed to verify these results. The participants confirmed that the campaign was time consuming and they also reported that the campaign was generally successful to an extent.

In order to address RQ9: “*What is the usability of SMENA social media?*” it was identified that the usability of the SMENA website was satisfactory and the SMENA social media were able to assist the participants to acquire environmental knowledge. However, the usage of the SMENA social media was found to be limited in terms of providing users with coordination, immediate access and social presence. This could be due to the fact that most participants stated that they use social media for social purposes rather than educational purposes. The next chapter (Chapter 6) provide more detailed discussions about the evaluation results and recommendations are also provided about how the SMENA can be improved based on these results.

# Chapter 6: Observations and Generalisation of Model

## 6.1 Introduction

The previous chapter (Chapter 5) presented the results which were acquired from the evaluation of the SMENA which was used to implement environmental awareness campaigns within the NMMU. The objective of this chapter is to provide detailed discussions about the evaluation results and to provide recommendations about how the SMENA can be improved. Figure 6.1 depicts the structure of this chapter:

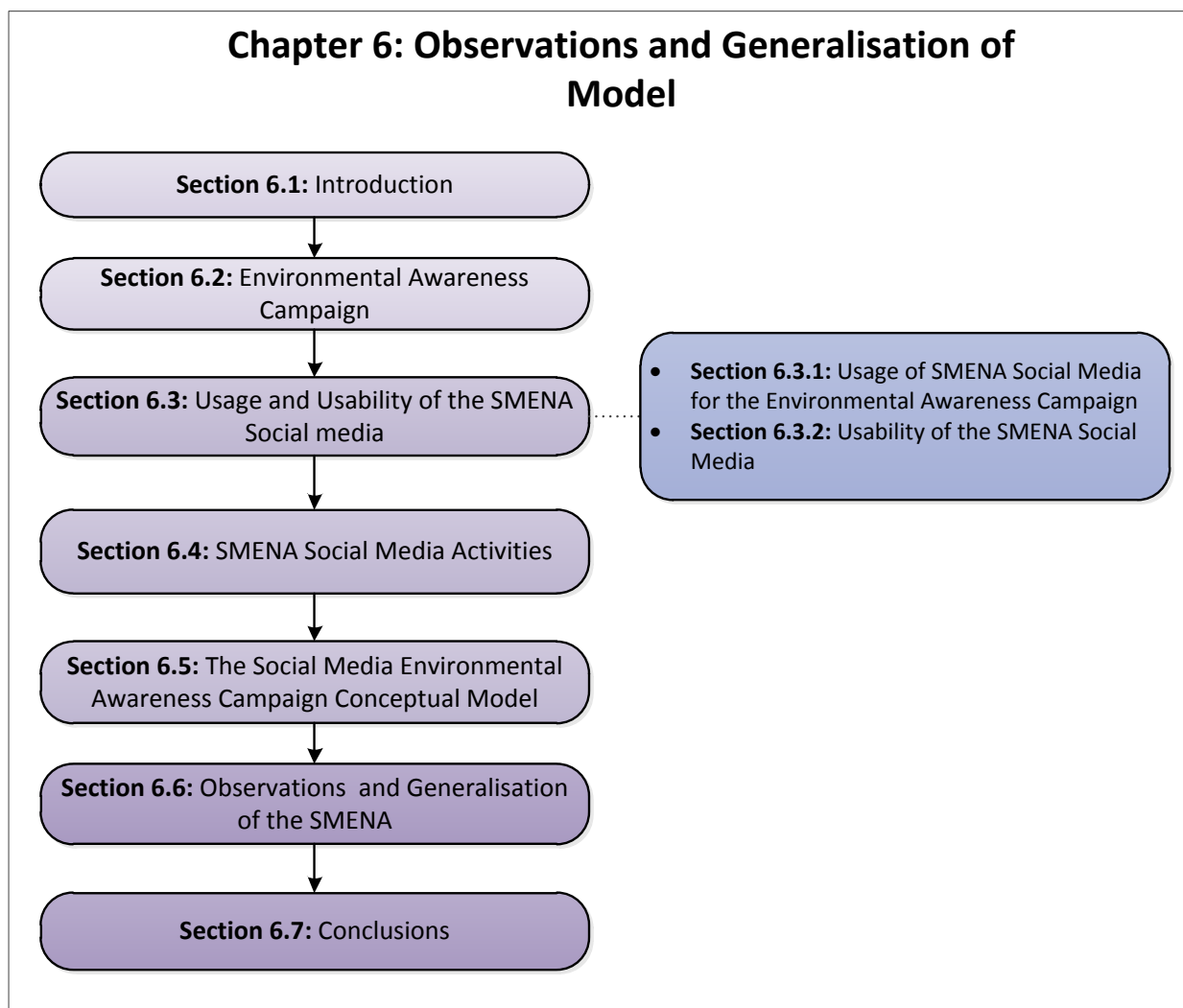


Figure 6.1: Chapter 6 structure

## 6.2 Environmental Awareness Campaign

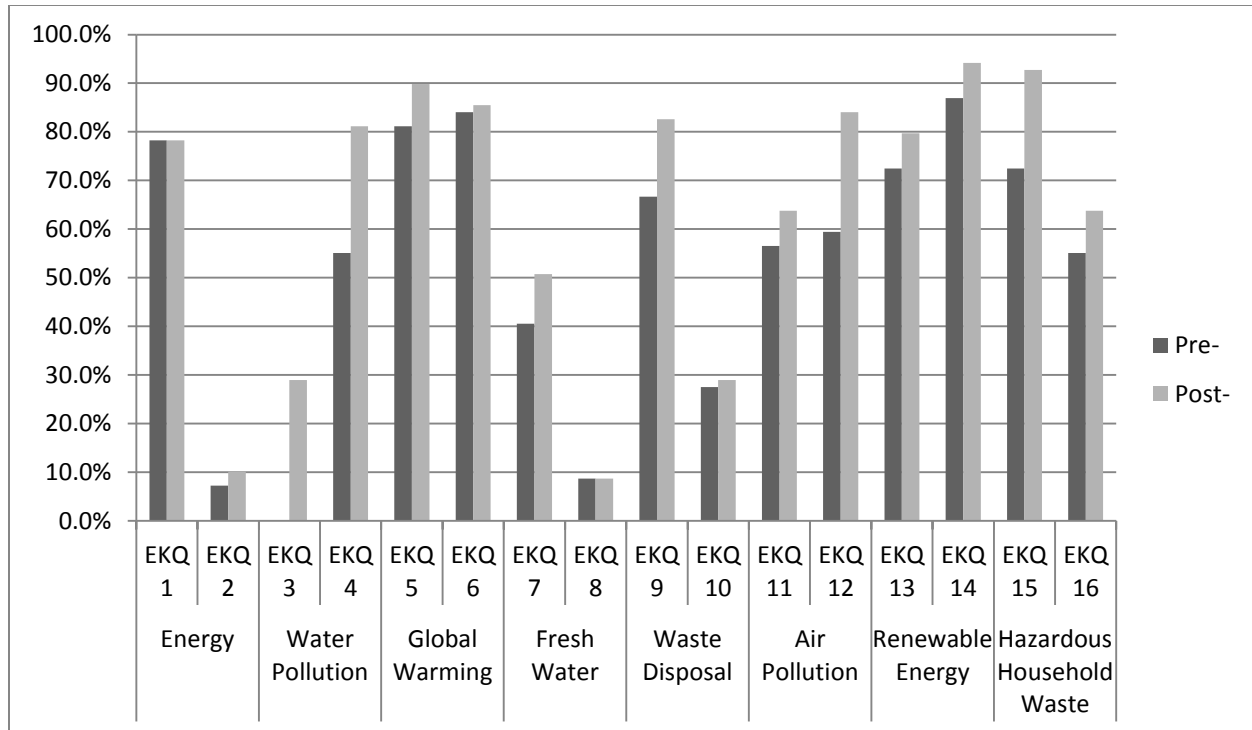
The environmental awareness campaign is the implementation phase of the SMENA. Two consecutive implementations of the campaign were conducted with two groups of participants (second year and third year students) within the Nelson Mandela Metropolitan University (NMMU). The data acquired from the second year students was used quantitatively to perform statistical tests since the sample size ( $n = 72$ ) of this group was sufficient to perform statistical analysis. However, the second group (third year students) was only used for qualitative reporting purposes since the sample size ( $n = 15$ ) was not enough to perform accurate statistical analysis therefore only the qualitative sections of the usability questionnaire (UQ) were reported for this third year group.

The main objective of the environmental awareness campaign is to improve the environmental knowledge of the participants. The results of the pre- and post-intervention questionnaire show that the environmental knowledge of the participants improved after being exposed to the environmental information during the environmental awareness campaign (Figure 6.2). All the Environmental Knowledge Questions (EKQ)<sup>2</sup> improved from pre- to post-evaluation except for EKQ1 and EKQ8. In this case, it can be assumed that the participants might have overlooked information relating to these questions during the campaign. The overall average percentage scored by participants in the post-intervention environmental knowledge evaluation is 63.9% which is higher than 53.3% which is the score in the pre-intervention questionnaire. This shows that the environmental knowledge of all participants increased by 10.6%.

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<sup>2</sup> Refer to Table 5.1 for detailed descriptions of the environmental knowledge questions





**Figure 6.2: Pre-and post-intervention results (n = 69)**

In order to verify the extent to which the campaign was successful, interviews were conducted with four participants from the second year group. The main objective of the interviews was to determine the perception of the participants towards the environmental awareness campaign. In the interviews the participants were asked about the positive and negative aspects of the campaign and also their general feeling towards the campaign. According to these participants the positive aspects of the campaign are:

- The campaign evoked a sense of consciousness towards the environment;
- The campaign changed perceptions about the notion that technologies cannot be used for environmental awareness purposes;
- The fact that the participants were encouraged to conduct research about environmental information during the campaign;
- The campaign enabled participants to learn in a different manner;
- The use of videos and the quizzes during the campaign was appealing;
- The campaign improved the participants knowledge about the environment;
- The campaign could reach a large number of audiences in a short duration;

- The campaign was able to reach out to everyday users of social media; and
- Information was posted frequently on the SMENA social media during the campaign.

Regarding the negative aspects of the campaign, the participants stated that they could not identify many negative aspects of the campaign. However, two negative aspects were extracted from the interview data, which are:

- The duration of the campaign was too short; and
- The campaign was time consuming.

The participants were also required to provide general feelings about the campaign. The participants stated that:

- The campaign was a good initiative to be conducted in the NMMU Department of Computing Sciences;
- The campaign was a good informative experience;
- The campaign made a difference in terms of improving their environmental knowledge;
- People could learn more if interactions on the SMENA social media could be improved; and
- The campaign was somehow a success since other people in addition to the participants of the study could view the environmental information updates on the SMENA social media.

These interview results show that these participants were mostly positive about the environmental awareness campaign. It can also be deduced from the interview results that the campaign achieved its objective of informing participants about environmental issues and improving their environmental knowledge. This result confirms the results of the environmental knowledge evaluation and studies by (Talero 2004; Barr 2003) which report that information intensive environmental awareness campaigns can improve environmental knowledge and awareness of individuals.

## **6.3 Usage and Usability of the SMENA Social Media**

The SMENA social media were selected based on the results of the participants in the pre-intervention social media empirical study (Section 4.7.2). The social media used for the environmental awareness campaign were Facebook and Twitter. The SMENA website was also added as part of the SMENA social media. These social media were used to distribute environmental information during the environmental awareness campaign (Section 6.3.1). The usability evaluation of the SMENA website and the evaluation of the SMENA social media to determine the extent to which they were able to assist the participants to acquire environment knowledge is discussed (Section 6.3.2).

### **6.3.1 Usage of SMENA Social Media for the Environmental Awareness Campaign**

According to the results of social media used during the campaign, it is evident that most participants were active on Facebook when using it for general purposes ( $\mu = 4.1$ ) during the period of the campaign. However, far fewer participants were using Twitter ( $\mu = 1.8$ ) for general purposes during the period. The participants claimed that they did not use Twitter because they do not like Twitter, because they prefer to use Facebook instead of Twitter and because they are not interested in using Twitter.

The participants used Twitter for SMENA ( $\mu = 1.8$ ) at the same rate as they used Twitter for general purposes during the campaign. Furthermore, the participants did not use the SMENA Facebook to the same extent to which they used Facebook for general purposes. When asked reasons for not using the SMENA social media, most participants stated that they are not frequent users of Facebook so they could not use the SMENA social media; the information on the SMENA social media was not interesting; and time constraints deterred them from using the SMENA social media. The results also show that the participants used the SMENA website ( $\mu = 3.2$ ) more frequently than they used the SMENA Facebook and Twitter pages. This could be due to the fact that most participants stated that they use Facebook and Twitter for social reasons such as staying in touch with people and getting updated on current affairs. The findings from a study conducted by Smith (2011) also confirm that most social media users use social media to stay in contact with friends and family.

### 6.3.2 Usability of the SMENA Social Media

The overall usability of the SMENA website was satisfactory since the overall mean score ( $\mu = 3.6$ ) of the questions was positive. It can be deduced from this result that the usability of the website was not a major concern for the participants. This implies that the usability of the SMENA website did not have a negative impact on the participants and did not deter them from performing activities on the website. The most positive aspects of the SMENA website according to the participants' responses were that the website was easy to use, the information layout was good and the user interface was attractive.

There were also negative aspects associated with the SMEA website. The most negative aspects of the SMENA website according to the participants were that information was hard to find on the website, downloading and streaming videos was difficult and the website was not compatible with Microsoft Internet Explorer browser hence it was not appealing when loaded on this browser.

The evaluation results regarding the SMENA social media's ability to provide participants with environmental knowledge (Section 5.4.3) were positive. The overall mean score ( $\mu = 3.8$ ) of the questions relating to this evaluation was positive. The participants confirmed that the SMENA social media made it easy for them to understand environmental issues, enabled them to acquire information about environmental issues, enabled them to easily discuss environmental issues with their peers, and enabled them access discussion related to environmental issues anywhere and anytime. The participants also stated that they were satisfied with using the SMENA social media for environmental issues. The results of the of the environmental knowledge evaluation confirm that the SMENA social media assisted the participants to acquire environmental knowledge since the environmental knowledge of participants increased by 10.6% (Section 5.2). These results also confirm a study conducted by Stamm *et al.* (2000) which argues that mass media and personal communication are the prime factors that can assist to enhance people's understanding of issues related to the environment.

## **6.4 SMENA Social Media Activities**

The participants were encouraged to perform activities on the SMENA social media during the four week duration of the environmental awareness campaign in order to improve their environmental knowledge. The information which was posted on the social media by the researcher was based on eight environmental topics, which are energy, water pollution, global warming, fresh water scarcity, waste disposal, hazardous household waste, air pollution and renewable and non-renewable resources. The campaign focused on two environmental topics per week.

The activities which were completed by the participants on the SMENA social media include posting about the effects of environmental issues and the solutions to environmental issues, posting blogs and pictures about environmental issues in their surroundings and viewing videos and blogs posts. The participants were also asked to complete quizzes which are based on these videos and blogs. The purpose of the quiz was to encourage and provide incentive to participants to watch the provided videos and read the blogs posted on the SMENA social media. The quiz questions were related to the two environmental topics which were discussed each week during the four week period of the campaign. All the quizzes achieved an aggregate mark of 80% or higher except for the first quiz (energy and water pollution). This could be due to the fact that the participants' attitudes towards the study were negative in the beginning.

However, the weekly activity results show that the participants' activity rate on the SMENA social media was higher in the first week when compared to the other three weeks. The declining activity rate throughout the four weeks of the campaign could be explained by the fact that some participants were negative towards the study since they stated that the content was of no interest to them, while others were concerned about courses and time constraints. Moreover, this could also be explained by the fact that some participants refrained from participating in the campaign. One of the participants sent an email to the researcher requesting to be excluded from the study (Appendix I).

## **6.5 The Social Media Environmental Awareness Campaign Conceptual Model**

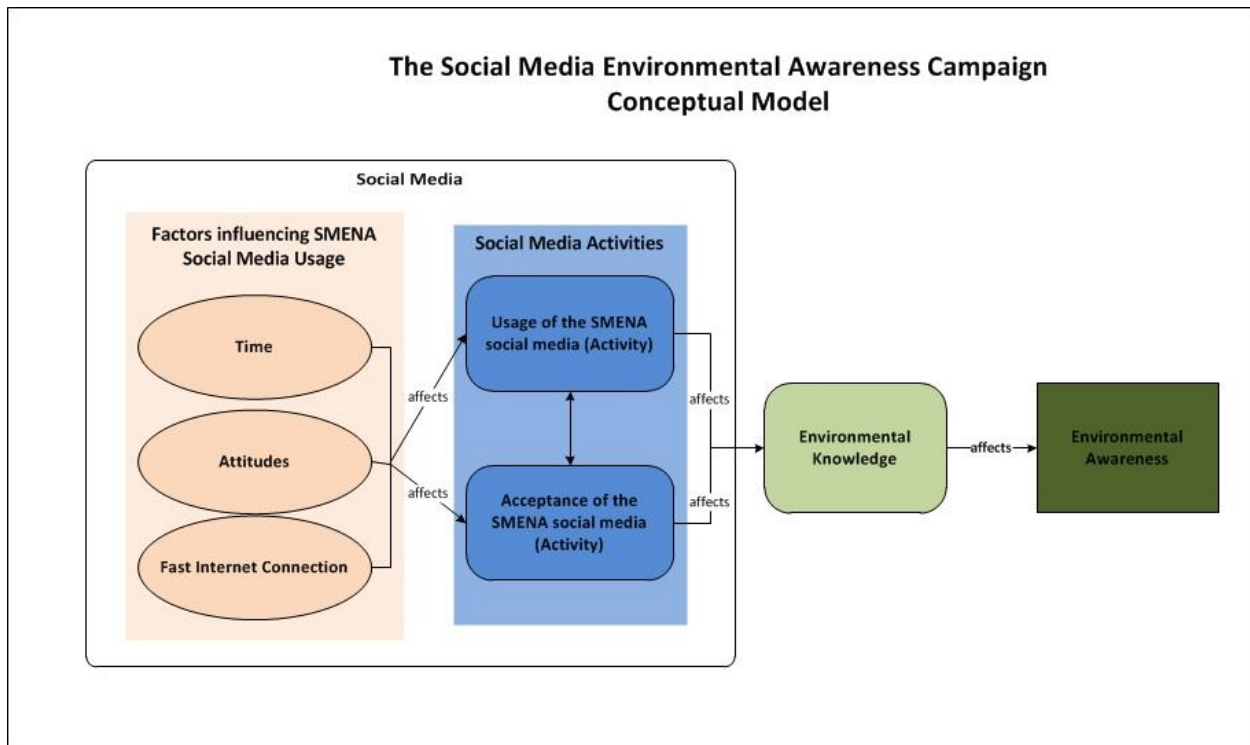
The social media environmental awareness campaign conceptual model (Section 4.7.4) depicts that activity on the SMENA social media will improve if the participants use these social media for coordination, immediate access and social presence. This model further predicts that high activity rate of the SMENA social media will improve the participants' environmental knowledge which will in turn improve their environmental awareness.

The initial prediction of this conceptual model which implies that the usage of the SMENA social media for coordination, immediate access and social presence will improve activity on the SMENA social media was inaccurate according to the SMENA social media usage and acceptance results (Section 5.4.2). These results show that the gratification factors were ranked negatively by the participants since all three acquired a negative mean score ( $\mu = 2.1$ ). This negative mean score implies that the SMENA social media were limited in supporting any of the three gratifications. It can be deduced from the results that the participants did not find the SMENA social media useful for coordination, immediate access and social presence. This could be due to the fact that students in HEIs rarely use social media for education purposes.

This confirms the study of Hussain (2012) which reports that university students mainly use social media for social purposes and to access academic information. In this study the environmental information posted on the SMENA social media was not part of the course outcomes, therefore the information was not considered as academic outcomes.

Furthermore, the main themes which were acquired from the participants' responses regarding the main reasons why they did not use the SMENA social media were: time consuming, information not interesting and the videos took too long to stream and download. The participants stated that they did not have sufficient time to participate on the website since they also had to focus on their academic work. The participants also stated that the information which was posted on the social media was not interesting to them and the videos took too long to download.

These themes represent some of the factors which hindered the participants from using the SMENA social media. Therefore, it can be suggested that they should be included as part of the factors influencing SMENA social media usage. If these factors are improved or catered for beforehand they could have a positive impact on the activity rate on the SMENA social media. In this case, the social media environmental awareness campaign conceptual model was modified to include these factors (Figure 6.3). The modified model implies that individuals require sufficient time, positive attitudes towards environmental information, and fast Internet connection in order to improve their usage of the SMENA social media. This confirms a study by Falahah and Rosmala (2012) which reports that social media usage in HEIs depends on the attitudes of users. The responses acquired from the participants also show that time constraints and slow video downloading and streaming deterred them from being active on the SMENA social media.



**Figure 6.3: Social media environmental awareness campaign conceptual Model (Version 2)**

The predictions of the conceptual model with regard to the notion that higher activity on the SMENA social media will improve environmental knowledge were accurate. A comparison of the marks acquired by participants in the pre- and post-test environmental questionnaire show that the participants' environmental knowledge improved by 10.6%.

Furthermore, it was identified that some participants ( $n = 53$ ) did not conduct sufficient activities on the SMENA social media. The activity rate of these participants ranged from 0% to 8.3%. The participants ( $n = 16$ ) with a higher activity rate had an activity rate ranging from 12% to 54.1%. These participants were therefore treated as two distinct activity groups and an ANOVA test was conducted to determine if there was a difference in these two activity groups in terms of environmental knowledge which they acquired during the campaign. The results of the ANOVA test showed that there was a significant difference between these two activity groups. The descriptive statistics which were calculated for both groups confirmed a statistical difference in environmental knowledge between these two activity groups since the environmental knowledge mean scores of the lower activity group ( $\mu = 8.4$ ) was lower than the mean score of the higher activity group ( $\mu = 18.4$ ).

In order to determine whether activity on the SMENA social media was responsible for the improvement of environmental knowledge amongst the participants, a regression analysis was conducted. The results of this analysis were positive ( $p < 0.05$ ) at a 5% confidence level. It can be deduced from these results that the usage of SMENA social media improved the environmental knowledge of the participants. This confirms the purpose of the environmental awareness campaign conceptual model. Furthermore, since environmental knowledge is the key factor that influences environmental awareness (Pe'er *et al.* 2007; Zsóka *et al.* 2013) it can be assumed that the environmental awareness of the participants also improved.

## **6.6 Observations and Generalisation of the SMENA**

The SMENA was developed using literature components identified in Chapters 3 and 4. The prevalent social media identified in the pre-intervention social media empirical study were also included as part of the SMENA. The main aim of the SMENA is to provide guidance to implementations of environmental campaigns that make use of social media. The model incorporates three phases, the first phase (strategic development) implies that in the initial stage of developing an environmental awareness campaign the conductor should identify the target audiences, the media to be used carry out the campaign and the environment in which the campaign will be implemented.



The second phase of the SMENA is the planning phase, where the CSFs and guidelines for social media environmental awareness campaigns (Section 3.4.4) can be used by the campaign conductor to plan how to successfully deploy social media in HEIs, how successfully communicate with the participants using social media and how to conduct the campaign in a manner that will interest the participants and increase the chances of success.

The implementation phase of SMENA provides the campaign processes which should be followed during the actual implementation of the social media environmental awareness campaign. This phase includes processes on how the conductor will interact with participants, the type of information to be posted on the social media by the conductor, the activities which will be conducted on the social media by participants and the environmental topics which should be promoted each week.

The main objective of environmental awareness campaigns, supported by the SMENA, is to improve the environmental knowledge of the participants which will in turn improve their environmental awareness. The environmental awareness campaign conducted as part of this study achieved this objective of improving environmental knowledge of participants. However there were some negative issues which were identified with regards to the campaign. The main issue was that some participants were negative towards the campaign which implies that critical success factor and guideline which involves the evaluation of participants' readiness and the formulation of change management strategy was not effectively complied with.

In this research, the change management strategy was carried out by rewarding the participants with incentives and inviting a motivational speaker to motivate the participants about the importance of acquiring environment knowledge. The findings of a study conducted by Lillah and Viviers (2010) show that NMMU students would participant in environmental awareness initiatives if they are offered some form of incentive. However, it is evident that this strategy was not entirely effective since most participants were still negative towards the environmental awareness campaign. More effective strategies need to be formulated which can used to assist with changing the participants' attitudes. Other factors which negatively influenced the campaign are slow Internet connection and time constraints on behalf of the participants. These factors were beyond the control of the researcher but they should be considered in a future implementation of the environmental awareness campaigns using the SMENA.

## **6.7 Conclusions**

The SMENA was used to provide guidance for the implementation of the environmental awareness campaign. The participants stated the positive and negative aspects of the campaign and provided their general feeling towards the campaign. According to the participants the positive aspects of the campaign outweigh the negative aspects. Furthermore the campaign achieved its main objective which is to improve the environmental knowledge of the participants.

The SMENA social media which was used most frequently by the participants during the environmental awareness campaign is the SMENA website. The participants' main reasons for not frequently using the SMENA social media are time constraints, lack of interest in the information posted on the SMENA social media and videos which were slow to stream and download.

The environmental awareness campaign conceptual model was amended to include these issues as contextual factors that can improve usage of the SMENA social media if adhered to. Furthermore, the results of the regression analysis show that the activities conducted on the SMENA social media improved the environmental knowledge of the participants.

The attitudes of some participants were negative during the campaign. In this case, it was identified that the factor which deals with the evaluation of the participants' readiness and change management strategy formation in planning phase of the SMENA was not implemented effectively. However, in general terms, it can be concluded that the SMENA was successful in providing guidance to the environmental awareness campaign since the campaign achieved its main objective of improving the participants environmental knowledge.

The final chapter (Chapter 7) revisits the objectives of the study and provides discussion about the manner in which these objectives were addressed. This chapter also provides problems encountered during the study and recommendations for future research in the field of environmental education and social media usage and acceptance.

# Chapter 7: Conclusions and Recommendations

## 7.1 Introduction

The main aim of this research was to propose a model which can be used to support environmental awareness using social media in Higher Education Institutions (HEIs). To satisfy this objective the Social media Model for ENvironmental Awareness (SMENA) was designed, implemented and evaluated in a HEI which is the NMMU.

The SMENA was designed using components identified from literature and confirmed in an empirical study. The model consists of three phases of a social media environmental awareness campaign which are the strategic phase, the planning phase and implementation phase. The implementation phase includes the processes involved in the actual implementation of the campaign. The SMENA was adopted in environmental awareness campaigns which were conducted within the NMMU as a case study with second year and third year students as participants. These participants participated in the environmental awareness campaigns by conducting activities on the social media (SMENA social media) which were identified as suitable for the campaign in the planning phase.

The participants also assisted with the evaluation of the SMENA after the implementation process of the environmental awareness campaign. The evaluation consisted of feedback about the campaign and the SMENA social media which were used during the campaign. The main aim of the environmental awareness campaigns was to improve the environmental knowledge of the participants which will in turn improve their environmental awareness.

The SMENA social media were used to distribute environmental information to the participants during the campaign. The participants were encouraged to interact and perform activities on these social media in order to improve their environmental knowledge. The intention of the SMENA evaluation was to measure three aspects of the model, which are:

1. The usability of the SMENA website;
2. The usage and acceptance of the SMENA social media; and
3. The extent to which the SMENA social media assisted the participants to acquire environmental knowledge.

The participants were satisfied with the usability of the SMENA website and they also insisted that the SMENA social media assisted them to acquire and improve their environmental knowledge. The post-intervention environmental knowledge evaluation results confirmed that the environmental knowledge of the participants improved. With regard to the usage and acceptance of the SMENA social media, it was identified that most participants did not use SMENA social media for coordination, immediate access and social presence.

The structure of this chapter is illustrated in Figure 7.1. This chapter provides a discussion about the manner in which the study objectives were achieved (Section 7.2). The problems encountered and limitations which were identified during the study are highlighted (Section 7.3). The theoretical and practical contributions (Section 7.4) are discussed and recommendations are provided for future work which intends to improve some the aspects of this study (Section 7.5).

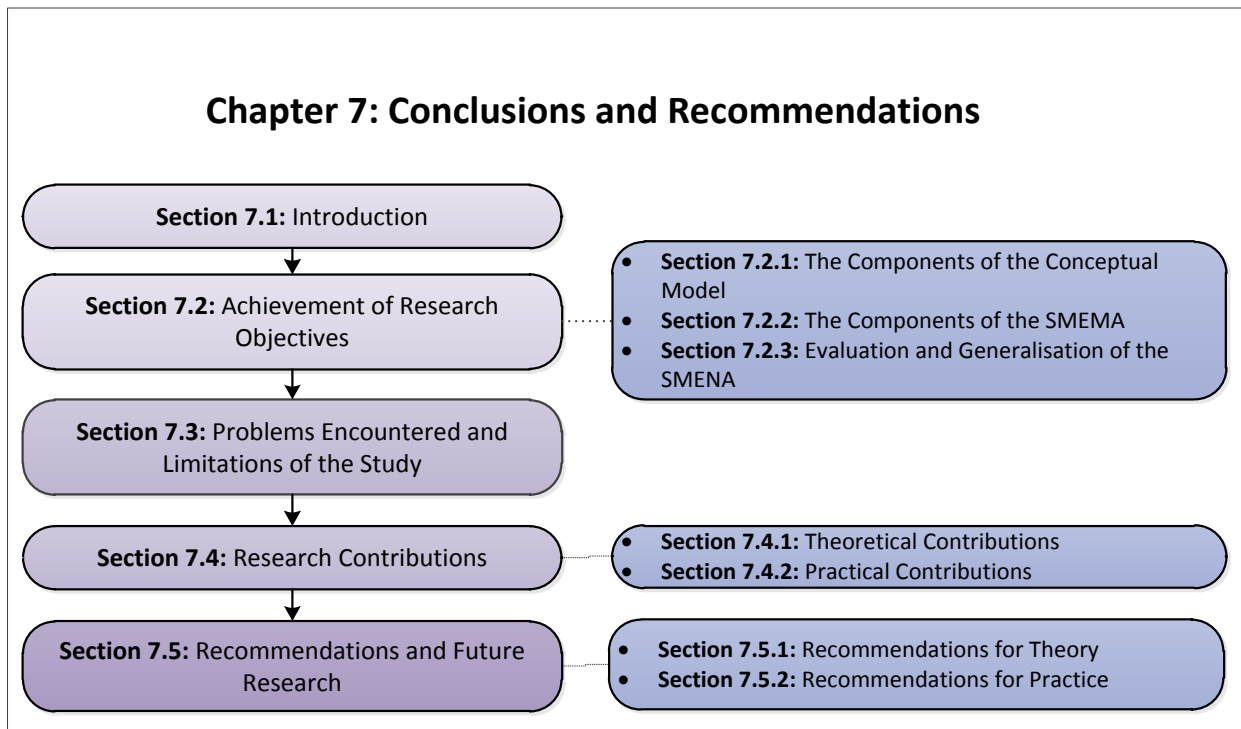


Figure 7.1: Chapter 7 Structure

## 7.2 Achievement of Research Objectives

The research problem identified in this study is that there is a lack of comprehensive models which use social media to support environmental awareness in higher education environments. The main objective of the research (MRO) was to propose a comprehensive model which can be used to support environmental awareness in HEIs. The secondary research objectives which were used to address the main research objectives were:

RO1: To identify factors that influence environmental awareness.

RO2: To identify the strategies that can be used to carry out a successful environmental awareness campaign.

RO3: To investigate the most prevalent social media applications.

RO4: To identify the critical success factors for social media communication, marketing campaigns and for using social media in Higher Education Institutions.

RO5: To investigate factors that influence usage and acceptance of social media.

RO6: To investigate the usage and acceptance of social media by students in a Higher Education Institution.

RO7: To identify the components of the Social media Model for ENvironmental Awareness (SMENA) in a Higher Education Institution.

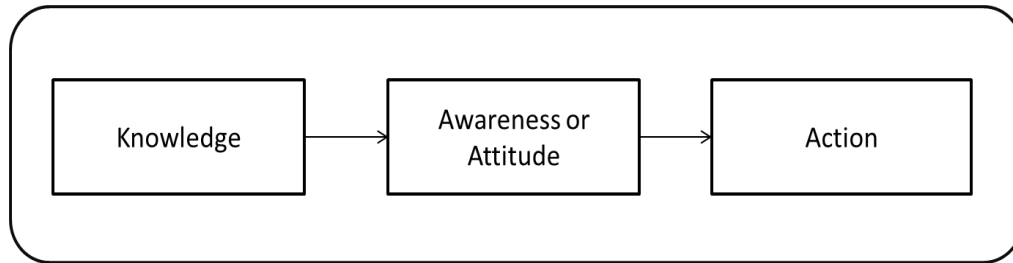
RO8: To determine the extent to which the levels of environmental knowledge amongst students have improved as a result of the implementation of SMENA.

RO9: To determine the usability of SMENA social media.

The extent to which the research objectives were achieved is highlighted in the subsequent sections. The conceptual model of the environmental awareness campaign was derived from an existing theoretical model and modified by using literature (Section 7.2.1). The components of the SMENA were extracted from literature and an empirical study (Section 7.2.2). This research discovered that environmental awareness campaigns that utilise social media can be implemented successfully using the SMENA (Section 7.2.3).

### 7.2.1 The Components of the Conceptual Model

The conceptual model of the environmental awareness campaign depicts how certain factors influence each other in order to achieve the goal of the campaign, which is to improve environmental knowledge and awareness of participants (Section 4.2). This model is derived from the behavioural change system introduced in environmental education literature (Figure 7.2). The conceptual model was also confirmed by literature investigations which were conducted in order to achieve the first research objective (RO1). The literature results confirmed that environmental knowledge is a key factor that influences environmental awareness. The behavioural change system also illustrates the notion that an improvement in environmental knowledge increases environmental awareness which in turn improves environmental behaviour.



**Figure 7.2: Behavioural change system (Hungerford and Volk 1990)**

The behavioural change system was confirmed by the results of this study. This system was expanded in this study to form the social media environmental awareness campaign conceptual model by including the impact of usage of social media for activities related to environmental information as well as factors for usage and acceptance of social media (Figure 4.2).

The factors that influence usage and acceptance of social media were adopted from the Uses and Gratification (U&G) theory from the communication field of study (Xu *et al.* 2012) in order to achieve RO5. These theories were used instead of the Technology Acceptance Model (TAM) since the TAM lacks the ability to evaluate usefulness of a system. The U&G theory assumes that users play a role in identifying the media which satisfies their needs and that the selected media possesses the ability to gratify these needs better than other media. The U&G theory includes several gratifications which can be used to determine acceptance and usage of social media. The gratifications which were used for this study are coordination, immediate access and social presence.

However the factors for social media usage and acceptance were not confirmed by the results of this study and are therefore not included in the updated system (Figure 7.3). The components of the proposed amended system are therefore the prominent factor that influences environmental awareness which are environmental knowledge (Section 2.4), the activity and usage of the SMENA social media and the factors that influence usage of the SMENA social media which were identified from the SMENA social media evaluation results (Section 5.4). The amended model illustrates that sufficient time, positive attitudes and an adequate Internet connection will increase activity rate on the SMENA social media. Higher activity rates on SMENA social media will improve environmental knowledge which will in turn improve environmental awareness.

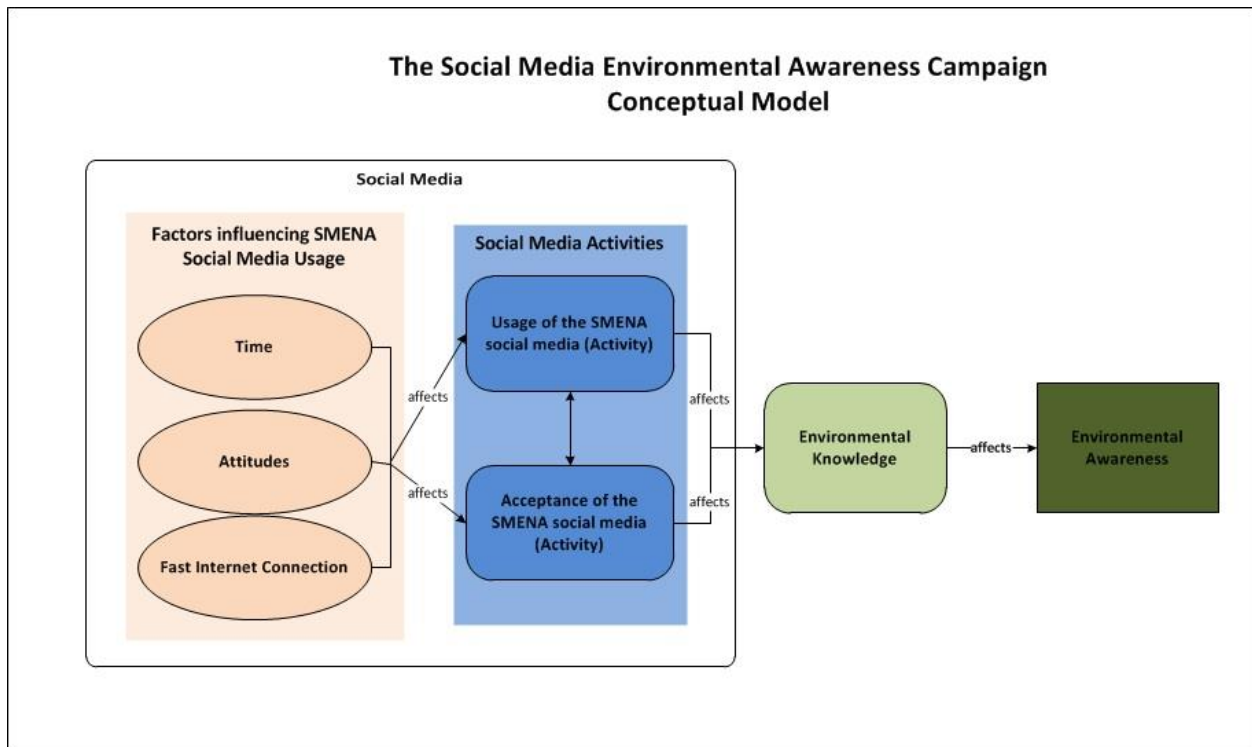


Figure 7.3: Social media environmental awareness campaign conceptual model (Version 2)

### 7.2.2 The Components of the SMENA

The SMENA was used to facilitate the social media environmental awareness campaign which was implemented in the Department of Computing Sciences at the NMMU. The components which were used to design the SMENA were identified in literature and from the social media usage empirical study in order satisfy RO7.

The proposed SMENA includes three phases, which are the strategic development phase, the planning phase and the implementation phase. In order to achieve RO2, the strategic development phase includes the strategies for creating environmental awareness campaigns which were identified in Chapter 2 (Section 2.6). These strategies were used in the initial stages to provide focus to the environmental awareness campaign in terms of:

- Finding a target audience for the campaign;
- Finding the media which will be used to distribute environmental information during the campaign; and
- Finding the environment at which the campaign will be implemented.

The second phase of the SMENA is the planning phase. This phase includes the CSFs and guidelines for social media communication and marketing and for using social media in HEIs which were identified in Chapter 3 (Section 3.4) in order to satisfy RO4. These factors are used in this phase to provide guidelines for successful usage of social media during the campaign. The intention of these CSFs and guidelines was to assist the researcher to successfully deploy social media in a HEI, to improve social media communication between the participants and the researcher and to assist the researcher to effectively carry out the environmental awareness campaign using social media. These CSFs and guidelines include:

1. **Internet usage:** Identify the university policies for Internet usage and access;
2. **User background:** Determine the background and social media usage behaviour of users;
3. **Goals and objectives:** Identify the goals and objectives for using social media and closely match them to the goals and objectives of the campaign;
4. **Social media selection:** Select social media applications that best match the campaign's objectives and that allow students to carry out work in ways that are common to them;
5. **Readiness and change management:** Evaluate students' readiness and construct a change management strategy;
6. **Identify metrics:** that will determine the value of using social media for the campaign;
7. **Duration of programme:** Identify the duration of the campaign;
8. **Frequent information updates:** Provide frequent updates on the social media site;



9. **Involvement of users:** Allow users to get involved and give a reason why they should participate (active listening); and
10. **Authenticity:** Conduct the campaign with honesty and authenticity.

The third phase of the SMENA is the implementation phase, which shows the processes of the campaign and the activities conducted on social media during the campaign. In order to achieve RO3, A list of the most widely used social media globally was identified in Chapter 3 (Section 3.3). This list of social media was included in a survey questionnaire, which was used during the pre-intervention social media empirical study to confirm participants' usage and acceptance of social media and to determine the prevalent social media amongst the participants (Section 4.7.2). This empirical study was conducted to achieve the sixth research objective (RO6). Furthermore, Facebook and Twitter were identified as the most prevalent social media amongst the participants. These social media together with the SMENA website were included in this implementation phase of the SMENA and were used to distribute environmental information during environmental awareness campaigns.

### **7.2.3 Evaluation and Generalisation of the SMENA**

The SMENA social media which were used to carry out the environmental awareness campaign were evaluated by the participants in this study in order to satisfy RO9. The participants were satisfied with the usability of the SMENA website and they also confirmed that the SMENA social media assisted them to acquire environmental knowledge (Section 5.4). The SMENA social media were used by participants to conducted activities which are related to the environment. There were some participants who completed minimal activities on the SMENA social media and the activity rate of some students was satisfactory. The environmental knowledge of the participants who were active on the SMENA social media was higher than the environmental knowledge of the non-active participants (Section 5.2).

The environmental knowledge evaluation was conducted to satisfy RO8. The results of this evaluation confirm that the environmental knowledge of the participants improved from pre- to post-intervention and the improvement of environmental knowledge is a result of the activities in which the participants conducted on SMENA social media during the campaign.

This implies that there is a positive correlation between usage of SMENA social media and the environmental knowledge of the participants. These results confirm the following thesis statement which was proposed for this research:

*A comprehensive model for supporting environmental awareness in a higher education environment can be designed to disseminate environmental information through social media in order to improve students' environmental knowledge which will in turn improve their environmental awareness.*

These results also confirm the notions illustrated by the social media environmental awareness campaign conceptual model. However, it also discovered that most participants did not use the SMENA social media for coordination, immediate access and social presence. In this case, additional factors which influenced the participants' usage of the SMENA social media were identified, which are time, attitude and fast Internet connection.

Interviews were conducted with some participants to determine their perceptions about the campaign. These participants were positive about the campaign since the positive aspects outweighed the negative. Furthermore, it can be concluded that the environmental awareness campaign which was implemented using the SMENA achieved its main objective of improving the participants' environmental knowledge and awareness.

### **7.3 Problems Encountered and Limitations of the Study**

The main problem which was encountered in the study was the cooperation and continuous participation of the participants. It was difficult to get some of the participants to actively participate in the study since they were initially negative towards the study. The researcher embarked on several attempts to get the participants to cooperate, however the researcher's efforts to get the cooperation of the participants was a constant challenge since the activity rate of the participants on the SMENA social media reduced gradually each week.

The slow Internet connection at the university also caused a problem for the study. Due to this problem it was sometimes difficult for the participants to conduct certain activities on the SMENA social media such as streaming and downloading videos. This issue also had a negative effect on the attitudes of the participants.

Another issue related to Internet connection is the fact that university policies stipulate that usage of Facebook is prohibited in the computer labs during working hours (8am -5pm). This issue was limiting to the study since this study was dependent on social media usage and most participants are frequent users of Facebook.

Time constraints were another problem that had an impact on this study. The study was conducted during a time when participants were attending lectures and conducting academic work. This was limiting in that participants had to alternate between activities of this study and academic workload. As a result, the cooperation of the participants was very low during test weeks.

The data collection instrument which was used to determine environmental knowledge of the participants before and after the study intervention included 16 multiple choice questions. These multiple choice questions were limiting since it is possible that the participants could guess the correct answers. In this case, the environmental knowledge of participants who did not undergo the study intervention could become positive due to the questions which were coincidentally answered correctly by these participants.

## **7.4 Research Contributions**

This section is discussed in terms of theoretical and practical contributions of the study. The theoretical contributions provided material for the literature of environmental education and social media usage and acceptance (Section 7.4.1). The practical contributions provided material for institutions which may need to use the SMENA to implement an environmental awareness campaign (Section 7.4.2).

### **7.4.1 Theoretical Contributions**

The theories which contributed to the development and design of the SMENA were acquired from literature studies about environmental education. The conceptual model that was used as a foundation for the social media environmental awareness campaign was also derived from these literature studies. The design of the SMENA was proposed since a number of studies showed limited evidence of a comprehensive model which can be used to support environmental awareness in HEIs. The SMENA serves to bridge this gap as a comprehensive model that supports environmental awareness in HEIs.

The results of this study show that the SMENA can successfully facilitate environmental awareness campaigns and enable them to achieve their main objective which is to improve environmental knowledge and awareness of individuals. The SMENA will therefore serve as a valuable contribution to the field of environmental education as a model which facilitates environmental awareness campaigns that utilise social media to create environmental awareness.

It was identified in this study that the U&G theory gratification factors are limited in influencing usage and acceptance of social media which are used for educational purposes. This study will contribute to the U&G theory by providing factors that influence usage and acceptance of social media used for educational purposes, which are: Time, Attitude and Internet Connection.

#### **7.4.2 Practical Contributions**

Higher Education Institutions (HEIs) are embarking on a mission to their change strategies and processes to be more environmentally friendly. Furthermore, studies argue that it is the responsibility of HEIs to include sustainable practices in their operations since they provide education to prospective future leaders who can potentially influence societies to become more environmentally friendly.

The SMENA can therefore be adopted by HEIs that seek to improve environmental awareness of individuals within the university environment. These institutions can optimise the implementation of environmental awareness campaigns by utilising the SMENA. However, the limitations of this study should be considered and optimised in order to achieve seamless implementations of environmental awareness campaigns. Apart from HEIs, other organisations can use SMENA to implement environmental awareness campaigns in order to improve environmental awareness of employees.

#### **7.5 Recommendations and Future Research**

The recommendations for this study and for future work in the environmental education field of study are discussed in terms of theory and practice. Theoretical recommendations will provide bases for similar theoretical studies (Section 7.5.1) and the practical recommendations have been provided for situations where organisations seek to implement environmental awareness campaigns using the SMENA (Section 7.5.2).

### **7.5.1 Recommendations for Theory**

The SMENA is a comprehensive model which supports environmental awareness in HEIs by using social media. The environmental awareness campaign conducted in this study met its objective of improving the environmental knowledge of participants. The SMENA website and commercial social media were used to carry out this campaign. However, the participants had limited access to the SMENA website due to a lack of resources to access the Internet and a lack of Internet infrastructure, which is a problem in developing countries such as South Africa. Future researchers can look into developing mobile applications that simulate the SMENA website. The mobile applications can be easily accessible to the participants on their mobile phones since mobile phones are resources which are predominantly used for Internet access in South Africa.

The gratification factors which were used for this study are goal-oriented gratifications which focused on measuring usage and acceptance of social media for social purposes. These factors were found to be limited in this study since the social media used for this study were used for educational purposes. It can be suggested that future research studies should conduct further investigations about other factors for usage and acceptance of social media which are focused on providing education to users. Future researchers can also conduct a similar study in other HEIs in order to test the theories which were used for this study.

The SMENA was focused on facilitating a social media environmental awareness campaign which intended to improve environmental knowledge and awareness of students in a HEI. It can be suggested that future researchers should extend the focus of this study and use the SMENA to facilitate a social media environmental awareness campaign that focuses on both students and employees in HEIs. Future researchers could also carry out investigations within other organisations apart from HEIs and determine if the usage of the SMENA to facilitate environmental awareness campaigns can assist with improving environmental knowledge and awareness of employees in these organisations.

### 7.5.2 Recommendations for Practice

The SMENA can be used in HEIs to facilitate environmental awareness campaigns in order to improve the environmental awareness of individuals. The three phases of the SMENA should be considered and all the guidelines within each phase should be implemented intensively. For example, the guideline which requests change management strategies to be formulated should not be overlooked. In this case, proper change management strategies which intensively motivate participants and improve their attitudes towards the campaign and the environment in general should be formulated. Educators and environmental activist can also consider these guidelines when implementing initiatives that seek to educate individuals about environmental issues using social media.

o----- End -----o

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# Appendix A: Social Media Questionnaire

Please put (X) in the appropriate box

## SECTION A: BIOGRAPHICAL DETAILS

<b>Student Number</b>										
<b>First Name:</b>										
<b>Surname:</b>										
<b>Gender</b>	Male		Female							
<b>Race:</b>	Black		Asian		Coloured		White		Other (Specify)	
Other (Specify)										
<b>Home Language (pick one)</b>	English		Afrikaans		Xhosa		Other (Specify)			
<b>Age:</b>	18-25			26-40			41-50			51+
<b>Degree registered for</b>	BSc		BCom		BA		Other(Specify)			
<b>Year of studies</b>	1 <sup>st</sup> Year		2 <sup>nd</sup> Year		3 <sup>rd</sup> Year		4 <sup>th</sup> Year		Other(specify)	

## SECTION B: SOCIAL MEDIA USAGE

<b>What type of mobile phone do you have? (pick one or more from the list below)</b>										
Apple		Blackberry		Motorola						
Nokia		Samsung		Sony-Ericsson						
Other(Specify):										
<b>Which resources do you use to access these social media sites? (pick one or more)</b>	Mobile phone		Personal Computer		Tablets		University Computers			
Other(Specify):										
<b>How long have you been using these social media sites?</b>	Less than one year			Between 1 & 2 years			More than 2 years			
<b>How often do you use these social media sites</b>	Daily		Weekly		Monthly		Yearly			

Please indicate your response to the following statements by placing an "X" in the appropriate block, where 1 = Strongly Disagree, 2 = Disagree, 3 = Unsure, 4 = Agree and 5 = Strongly Agree

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Unsure
- 4 – Agree
- 5 – Strongly Agree

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
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### 1. I use the following social media sites frequently

1.1. Facebook	1	2	3	4	5
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1.2. Twitter	1	2	3	4	5
1.3. YouTube	1	2	3	4	5
1.4. My Space	1	2	3	4	5
1.5. LinkedIn	1	2	3	4	5

## 2. I frequently use social media sites

2.1. In the morning	1	2	3	4	5
2.2. In the afternoon	1	2	3	4	5
2.3. In the evening	1	2	3	4	5
2.4. Random times	1	2	3	4	5

## 3. The following barriers hinder my usage of social media sites

3.1. Time (to learn and explore)	1	2	3	4	5
3.2. Slow internet connection	1	2	3	4	5
3.3. Lack of connection resources (e.g. mobile phone)	1	2	3	4	5
3.4. Lack of funds (airtime)	1	2	3	4	5

## SECTION C: FACTORS AFFECTING SOCIAL MEDIA USAGE

- 1 – *Strongly Disagree*  
 2 – *Disagree*  
 3 – *Unsure*  
 4 – *Agree*  
 5 – *Strongly Agree*

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
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### 1. I use social media for the following reasons:

<b>1.1. Coordination</b>					
To spread news (messages, events and other information)	1	2	3	4	5
To disperse news (messages, events and other information) to multiple friends at one time quickly and easy	1	2	3	4	5
To make arrangements to get together	1	2	3	4	5
To organise social events	1	2	3	4	5
<b>1.2. Immediate access</b>					
To access others anytime	1	2	3	4	5
To access others where ever they are	1	2	3	4	5
To be available to my friends anytime	1	2	3	4	5
To be available to my friends no matter where I am	1	2	3	4	5
To keep contact with people I have no time to meet face-to-face	1	2	3	4	5
Because it entertains me	1	2	3	4	5
<b>1.3 Social presence</b>					
To get a sense of human contact	1	2	3	4	5
To get a sense of personalness	1	2	3	4	5
To get a sense of sociability	1	2	3	4	5
To get a sense of human warmth	1	2	3	4	5
To get a sense of human sensitivity	1	2	3	4	5

Thank you for your participation.

# Appendix B: Pre- and Post-Environmental Questionnaire

## SECTION A: BIOGRAPHICAL DETAILS

<b>Student Number</b>	
<b>First Name:</b>	
<b>Surname:</b>	

## SECTION B: ENVIRONMENTAL KNOWLEDGE QUESTIONS

Please select only one answer from each question below by placing an "X"

**1. How is most of the electricity in South Africa generated? Is it...**

- a) By burning oil, coal, and wood
- b) With nuclear power
- c) Through solar energy
- d) At hydroelectric power plants
- e) Don't know

**2. Hydropower is used to generate approximately what percentage of South Africa's electricity?**

- a) 100%
- b) 0.8%
- c) 78%
- d) 0.1%
- e) Don't know

**3. What is the most common cause of pollution of streams, rivers, and oceans? Is it...**

- a) Dumping of garbage by cities
- b) Surface water running off yards, city streets, paved lots, and farm fields
- c) Trash washed into the ocean from beaches

- d) Waste dumped by factories
- e) Don't know

**4. What is one of the main benefits of wetlands? Do they...**

- a) Help to control global climate change
- b) Help filter and store water before it enters lakes, streams, rivers or oceans
- c) Prevent the spread of undesirable plants and animals
- d) Provide good sites for landfills
- e) Don't know

**5. What do you think is the main cause of global climate change, that is, the warming of the planet Earth? Is it...**

- a) A recent increase in oxygen in the atmosphere
- b) Sunlight radiating more strongly through a hole in the upper ozone layer
- c) More carbon emissions from autos, homes and industry
- d) Increased activity from volcanoes worldwide
- e) Don't know

**6. What are the effects of climate change?**

- a) Global temperatures increasing by a few degrees on average
- b) Changes in seasonal rainfall patterns (droughts, floods)
- c) A significant rise in the sea level
- d) All of the above
- e) Don't know

**7. To the best of your knowledge, what percentage of the world's water is fresh and available for use? Is it...**

- a) 1%
- b) 5%

- c) 10%
- d) 33%
- e) Don't know

**8. In the year 2000, what percentage of fresh water was used for agricultural purposes?**

- a) Approximately 5%
- b) Approximately 10%
- c) Approximately 70%
- d) Approximately 85%
- e) Don't know

**9. There are thousands of waste disposal areas – dumps and landfills that hold toxic waste. The greatest threat posed by these waste disposal areas is...**

- a) Chemical air pollution
- b) Contact with farm animals and household pets
- c) Contamination of water supplies
- d) Human consumption through contaminated food
- e) Don't know

**10. Many communities are concerned about running out of space in their community trash dumps and land-fills. What is the greatest source of landfill material? Is it...**

- a) Disposable diapers
- b) Lawn and garden clippings, trimmings and leaves
- c) Paper products including newspapers, card board and packaging
- d) Glass and plastic bottles and aluminium and steel cans
- e) Don't know

**11. Carbon monoxide is a major contributor to air pollution. Which of the following is the biggest source of carbon monoxide? Is it...**

- a) Factories and businesses
- b) People breathing
- c) Motor vehicles
- d) Trees
- e) Don't know

**12. Which of the following is a natural source of air pollutants? Is it...**

- a) Motor vehicles
- b) Burning of fire wood
- c) Factories and businesses
- d) Smoke and dust from volcanic eruptions
- e) Don't know

**13. Which of the following is a renewable resource? Is it...**

- a) Oil
- b) Iron ore
- c) Trees
- d) Coal
- e) Don't know

**14. Which of the following is a renewable energy source? Is it...**

- a) Burning oil
- b) Wind power
- c) Natural gases
- d) Burning Coal
- e) Don't know

**15. Which of the following household wastes is considered hazardous waste? Is it...**

- a) Plastic packaging

- b) Glass
- c) Batteries
- d) Spoiled food
- e) Don't know

**16. Which of the following represents proper disposal of household hazardous waste? Is it...**

- a) Drop off sites
- b) Dump in the trash can
- c) Dump it in landfills
- d) Dump in the ocean
- e) Don't know

Thank you for your participation

# Appendix C: Usability Questionnaire

## SECTION A: BIOGRAPHICAL DETAILS

<b>Student Number</b>	
<b>First Name:</b>	
<b>Surname:</b>	

## SECTION B: WEBSITE EVALUATION

Please rate the Green Awareness @ NMMU website by placing an “X” in the appropriate block, where 1 = Strongly Disagree, 2 = Disagree, 3 = Unsure, 4= Agree and 5 = Strongly Agree

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Unsure
- 4 – Agree
- 5 – Strongly Agree

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
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1. I think that I would like to use the website frequently	1	2	3	4	5
2. I found the website to be simple	1	2	3	4	5
3. I thought the website was easy to use	1	2	3	4	5
4. I think that I could use the website without the support of a technical person	1	2	3	4	5
5. I found the various functions in this website were well integrated	1	2	3	4	5
6. I thought there was a lot of consistency in the website	1	2	3	4	5
7. I would imagine that most people would learn to use this website very quickly	1	2	3	4	5
8. I found the website very intuitive	1	2	3	4	5
9. I felt very confident using the website	1	2	3	4	5
10. I could use the website without having to learn anything new	1	2	3	4	5

### 1. Identify the most positive aspects of the website

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**2. Identify the most negative aspects of the website**

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**SECTION C: SOCIAL MEDIA USAGE EVALUATION**

Please indicate your response to the following statements by placing an “X” in the appropriate block

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
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**1. In the last month I have used the following social media pages/ sites daily**

1.1. Facebook (for general purposes)	1	2	3	4	5
1.2. Facebook(for Green awareness at NMMU)	1	2	3	4	5
1.3. Twitter (for general purposes)	1	2	3	4	5
1.4. Twitter (for @NMMUSmena)	1	2	3	4	5
1.5. Green awareness @ NMMU website(SMENA)	1	2	3	4	5

Please rate the Social Media for Environmental Awareness (SMENA) which includes our Twitter and Facebook pages and the Green Awareness @NMMU website by placing an “X” in the appropriate block

Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
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**2. I used SMENA for the following reasons:**

<b>2.1. Coordination</b>					
To spread news (messages, events and other information)	1	2	3	4	5
To be able to quickly and easily disperse news and information (messages, events and other information) to multiple friends at one time	1	2	3	4	5
To organise activities and events	1	2	3	4	5
<b>2.2. Immediate access</b>					
To access others anytime	1	2	3	4	5
To access others wherever they are	1	2	3	4	5
To be available to my peers anytime	1	2	3	4	5

To be available to my peers no matter where I am	1	2	3	4	5
To keep contact with peers I have no time to meet face-to-face	1	2	3	4	5
<b>2.3. Social presence</b>					
To get a sense of human contact	1	2	3	4	5
To get a sense of personalness	1	2	3	4	5
To get a sense of sociability	1	2	3	4	5

### 3. Facebook

**3.1 Please state the main reasons for using Facebook for general purposes (not SMENA)**

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**3.2 Please state the main reasons for not using Facebook for general purposes (not SMENA)**

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### 4. Our Facebook page (Green Awareness at NMMU)

**4.1 Please state the main reasons for using our Facebook page**

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**4.2 Please state the main reasons for not using our Facebook page**

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### 5. Twitter

**5.1 Please state the main reasons for using Twitter for general use (Not SMENA)**

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**5.2 Please state the main reasons for not using Twitter for general use (Not SMENA)**

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**6. Our Twitter page (@NMMUSmena)**

**6.1 Please state the main reasons for using our Twitter page**

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**6.2 Please state the main reasons for not using our Twitter page**

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**7. Green Awareness @ NMMU website**

**7.1 Please state the main reasons for using the Green Awareness @NMMU website**

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**7.2 Please state the main reasons for not using the Green Awareness @ NMMU website**

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**SECTION D: SOCIAL MEDIA FOR ENVIRONMENTAL AWARENESS**

Please indicate your support of the following statements regarding the Social Media for Environmental Awareness (SMENA) which was used during the environmental awareness campaign of this project. SMENA includes our Twitter and Facebook pages and the Green Awareness @NMMU website. Please do so by placing an “X” in the appropriate block

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. SMENA made it easy to understand environmental issues	1	2	3	4	5
2. SMENA makes it easy to discuss environmental issues with other students	1	2	3	4	5
3. Overall, satisfaction with the use of SMENA for environmental issues is acceptable	1	2	3	4	5
4. SMENA provides flexible access to discussions related to environmental issues – anywhere and any-time	1	2	3	4	5
5. SMENA allows access to information (e.g. pictures, videos) about environmental issues	1	2	3	4	5

Thank you for your participation.

# Appendix D: Consent Form

## NELSON MANDELA METROPOLITAN UNIVERSITY

### INFORMATION AND INFORMED CONSENT FORM

<b>EXPLANATION OF THE STUDY</b>	
<p>You will be asked to complete three types of questionnaires, which are the social media usage questionnaire, the environmental questionnaires (pre- &amp; post-test) and the usability questionnaire. The social media usage questionnaire aims to determine the usage of social media sites you use most frequently and when you use them. Your personal details (student number and name) will be requested on all questionnaires in order to assist the researcher to link all the questionnaires to the same participant. However, even though your student number and name is recorded your anonymity will be protected at all times and your identity will not be revealed in any discussion, description or scientific publications by the researcher. The pre-test environmental questionnaire will determine your knowledge and awareness regarding certain environmental issues. You will be requested to complete the social media usage and the pre-test environmental questionnaire before the intervention of the study, which will take place for 4 weeks approximately. During the intervention you will be exposed to certain material (videos, articles, pictures, text) about environmental issues via commercial social media sites and a social media website designed for the study. You are expected to interact (view, read and post material) on these social media platforms once a day for at least 15min-30min five days a week at any convenient time for you. Your activity on the website will be logged in terms of login and logout times, username and actions completed on the website (e.g. update, delete, create etc.). This data will be stored for data analysis purposes by the researcher. Lastly, you will be requested to complete a post-test environmental questionnaire and a usability questionnaire which will be distributed for completion after the intervention. The post-test environmental questionnaire will help determine if your awareness of environmental issues has improved. The usability questionnaire on other hand will determine your satisfaction with the social media websites (commercial and internal sites) and the usefulness of the model for creating environmental awareness.</p>	

<b>RESEARCHER'S DETAILS</b>	
<b>Title of the research project</b>	<b>A model for supporting environmental awareness using social media</b>
<b>Reference number</b>	
<b>Principal investigator</b>	<b>Thabo Tlebere</b>
<b>Contact telephone number (private numbers not advisable)</b>	<b>0784761808</b>

<b>A. DECLARATION BY OR ON BEHALF OF THE PARTICIPANT</b>		<b>Initial</b>
<b>I, the participant and the undersigned</b>	<b>(full names)</b>	

<b>A.1. HEREBY CONFIRM AS FOLLOW</b>		<b>Initial</b>
<b>I, the participant was invited to participate in the above-mentioned research project that is being undertaken by</b>		
<b>from</b>	<b>Thabo Tlebere</b>	
<b>Nelson Mandela Metropolitan University</b>	<b>Department of Computing Sciences</b>	

<b>A.2 THE FOLLOWING ASPECTS HAVE BEEN EXPLAINED TO ME, THE PARTICIPANT</b>		<b>Initial</b>
<b>Aim</b>	The researcher is investigating how social media can be used to support the distribution of environmental	

		information and to create environmental awareness. The information will be used for research purposes		
	<b>Procedures</b>	I understand that I am required to complete all the questions in the questionnaire and participate in the study to the best of my ability.		
	<b>Risks</b>	I understand that there are no risks involved in participating in this process		
	<b>Confidentiality</b>	My identity will not be revealed in any discussion, description or scientific publications by the researcher.		
	<b>Access to findings</b>	Any new information or benefit that develops during the course of the study will be shared, if requested:		
	<b>Voluntary participation / refusal / discontinuation</b>	My participation is voluntary	YES	NO
		My decision whether or not to participate will in no way affect my present or future career/employment/lifestyle	TRUE	FALSE
	No pressure was exerted on me to consent to participate and I understand that I may withdraw from the investigation at any time without any risk of reprisal			
	Participation in this study will not result in any additional cost to myself			

<b>I HEREBY VOLUNTARILY CONSENT TO PARTICIPATE IN THE ABOVE-MENTIONED PROJECT:</b>			
Signed/confirmed at		on	
		20	
Signature	Signature of the witness:		
	Full name of witness:		

# Appendix E: Usability Heuristics Sheet

## Nielsen's Ten Usability Heuristics

(Taken from Nielsen's website [www.useit.com](http://www.useit.com))

**1 Visibility of system status--** The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

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**2 Match between system and the real world--** The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

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**3 User control and freedom--** Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

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**4 Consistency and standards--** Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

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**5 Error prevention--** Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

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**6 Recognition rather than recall--** Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

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**7 Flexibility and efficiency of use--** Accelerators -- unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

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**8 Aesthetic and minimalist design--** Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

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**9 Help users recognize, diagnose, and recover from errors--** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

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**10 Help and documentation--** Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

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**Other comments**



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## Appendix F: Task Sheet

<b>Task 1: Register and Log in</b>
<p>1.1 Click on register on the front page</p> <p>1.2 Add your details and click on the register button (your password must be a minimum of six letters)</p> <p>1.3 You will receive email validation link in your email inbox or junkmail. (If in junkmail move the email to your inbox)</p> <p>1.4 Click on the email validation link (When you click on the link you will be automatically logged in to website)</p>
<b>Task 2: Edit profile</b>
<p>2.1 Click on the “<b>Profile</b>” button (Top left button) (Hover your mouse over the picture icon, you will see screen tip that reads “Profile”)</p> <p>2.2 Click on the “<b>Edit Avatar</b>” button and upload a profile picture from your computer</p> <p>2.3 Go back to the profile screen and edit your profile as you wish</p> <p>2.4 Go back to the profile screen and click on the “<b>Add widgets</b>” button</p> <p>2.5 Click on activity to add the “<b>Activity widget</b>”.</p> <p>2.6 Click the “<b>Add widgets</b>” again to close widgets.</p>
<b>Task 3: Add a file</b>
<p>3.1 Click on the “<b>More</b>” button and select file</p> <p>3.2 Click on the “<b>Upload a file</b>” button</p> <p>3.3 Click on the “<b>Choose File</b>” button to upload a file from your computer</p> <p>3.4 Insert the title, description and change access to “Friends”.</p> <p>3.5 Click on the “<b>Upload</b>” button</p>
<b>Task 4: Add a video</b>
<p>4.1 Click on the “<b>More</b>” button and select <b>videos</b></p> <p>4.2 Click on the “<b>Add video</b>” button</p> <p>4.3 Enter the title of video</p> <p>4.4 Enter the URL of the video (e.g. go to you YouTube and copy the desired video’s URL)</p> <p>4.5 Enter the description and change access to friends</p>
<b>Task 5: View and share file</b>
<p>5.1 Click on the “<b>More</b>” button and select Activity</p> <p>5.2 Click on the “<b>Green peace</b>” link added by admin</p> <p>5.3 Press play and view the video</p> <p>5.4 Share the video on Facebook, twitter, Google plus or any social media site using the <b>Facebook Like, Twitter</b> or <b>Google plus</b> button.</p>

# Appendix G: Quiz Questions

## Energy

1. List two problems that are caused by an explosions at a coal mines (Noise and Dust clouds)
2. What is produced when pollutants from coal burning react with water molecules in the atmosphere? (Acid rain)
3. What position is South Africa in the ranking of the worlds' list of biggest greenhouse gas emitters? (12<sup>th</sup>)
4. What percentage of electricity is produced by coal fired power plants in South Africa? (71.7% of electricity)

## Water pollution

1. Name two natural water sheds boundaries (Hills and ridges)
2. Name two reasons why water sheds should be kept clean? (they are source of drinking water, we use them for recreation purposes, wild life depends on them)
3. List three common non-point source pollutants... (oil, fertilizers, pesticides, pet waste and soil)
4. Name three ways of preventing non-point source pollution in your own yard (proper use of fertilizers, pesticides, clean driveways and hard surfaces, pick up pet waste and septic systems)

## Global Warming

1. Name three sources that are responsible for burning fossil fuels that emit greenhouse gases into the atmosphere? (Factories, power plants and cars)
2. Which two greenhouse gases have hit their highest levels in the last 420 000 years? (Carbon dioxide and methane)
3. What effect will the rising sea levels from global warming have on the environment? (Floods in coastal areas all over the world.)
4. Name two ways consumers can help reduce greenhouse gas emissions in order to reduce the impact of global warming. (Saving energy in households, switching to compact florescent light bulbs)

## Fresh water scarcity

1. Name four sources/bodies of fresh water (Rivers, lakes, streams and ground water)
2. Name the three main uses of fresh water (Agriculture, industry or domestic use)
3. What percentage of world's fresh water is destroyed by the cryosphere (snow, ice and frozen ground) (75%)
4. How many people die every day from water-borne diseases? (800 people)

### **Waste disposal**

1. What's the key factor that helps control landfills from polluting the environment? (The liner system)
2. Name the two types of liners that are used to control pollutants at the landfill (Synthetic liner and Clay liner)
3. What is the product of the landfill decomposition (methane)
4. What is the importance of maintaining and controlling leachate? (Prevents ground water contamination)

### **Hazardous Household wastes**

1. Name three types of household hazardous waste. (Batteries, electronic waste, oils)
2. What are the benefits of proper disposal of household hazardous waste? (Keeps unwanted chemicals out of the water, protects the marine life and protects drinking water)
3. Name three uses of chemical products in households. (*Home care, pest-control, automobiles*)
4. Household hazardous waste should not be disposed in the trash. Where should we dispose household hazardous waste products? (Drop off sites)

### **Air pollution**

1. Which high level pollutants are produced by vehicles? (Carbon monoxide, Carbon dioxide, nitrogen oxide and smoke)
2. Petroleum refineries are a major source of which gaseous pollutants? (Sulphur dioxide and nitrogen dioxide)
3. Sulphur dioxide is also produced by combustion of which fossil fuels used in power plants? (coal)
4. Name breathing difficult caused by smog (bronchitis and asthma)

### **Renewable and non-renewable resources**

1. Name two types of natural resources (renewable resources and non-renewable resources)
2. Name four non-living renewable resources (Air, water, soil and solar energy)
3. Name three renewable energy sources (Solar power, geothermal power, wind power)
4. Which three major fossil fuels are used as energy sources? (Coal, oil, Natural gases)

## Appendix H: Environmental Information

Week 1		
	Energy	Water Pollution
<b>The effects</b>	The intensive use of energy in our household is affecting the environment so we have to be cautious when we use energy intensive resources in our households because an extra million tonnes of carbons are released into the atmosphere through power wastage in households.	The main source of water pollution is Litter that is thrown on the ground which can end up in our storm drains, ditches, and streams. This can cause diseases such as cholera and affect the marine life
<b>The solution</b>	There are several ways to save energy in our households. For example, many of us use the remote to switch off the TV or stereo, leaving the appliance running on standby – using up to 85% of the energy they would use if fully switched on. Don't leave electrical appliances on standby. Switch off all electrical appliances and lights when not in room.	There are many ways to prevent water pollutants from contaminating our water sources. For example, one must: <ul style="list-style-type: none"> <li>• Throw all litter in appropriate trash cans.</li> <li>• Wash your car at a commercial car wash, on the grass, or a gravelled area</li> <li>• Recycle and reuse items whenever possible</li> </ul>
<b>Instructions</b>	Please share with us other ways energy can be saved in our households by posting blogs and pictures	Please share with us pictures and/ or blog about areas that have been affected by litter in your surroundings
<b>Blogs and Videos</b>	<a href="http://www.dw.de/global-3000-the-globalization-program-2012-09-03/e-16172088-9798">http://www.dw.de/global-3000-the-globalization-program-2012-09-03/e-16172088-9798</a>	<ul style="list-style-type: none"> <li>• <a href="http://www.in.gov/idem/nps/2369.htm">http://www.in.gov/idem/nps/2369.htm</a></li> <li>• <a href="http://www.spk.usace.army.mil/">http://www.spk.usace.army.mil/</a></li> </ul>
Week 2		
	Global Warming	Fresh Water Scarcity
<b>The effects</b>	Due to climate change, extremes of drought and flooding will become more common, causing displacements and conflicts among people. Less fresh water due to droughts will lead to less agriculture, food and income	Many of us take clean water for granted and we should not. Nearly 51 per cent (300 million people) in sub-Saharan countries lack access to a supply of safe water and 41 per cent lack adequate sanitation
<b>The solution</b>	The main cause of Global Warming is the greenhouse gases such as carbon dioxide that get emitted into the atmosphere. Therefore, using less energy and taking steps like switching to fluorescent bulbs for lighting, using public transport or installing a solar geyser can go a long way to reducing	Unlike energy we don't have alternative means to produce water. So we must manage with the resource that we have, therefore we must find solutions on how to save water. For example, turn the tap off when you clean your teeth - this can save around 17 litres of water a minute.

	our carbon footprint	
<b>Instructio ns</b>	Please share pictures and blogs of human activities that emit carbon dioxide in your surroundings	Please share with us pictures and blogs of ways in which we can save water in our surroundings
<b>Blogs and Videos</b>	<a href="http://video.nationalgeographic.com/video/?source=4001">http://video.nationalgeographic.com/video/?source=4001</a>	<a href="http://as.tufts.edu/environmentalstudies/default.aspx">http://as.tufts.edu/environmentalstudies/default.aspx</a>
<b>Week 3</b>		
	<b>Waste Disposal</b>	<b>Hazardous Household Waste</b>
<b>The effects</b>	A substance that contaminates our water sources is Leachate. Leachate is a liquid that is formed when water trickles through contaminated areas (Landfills and dumps). It forms a very harmful mixture of chemicals that may result in hazardous substances entering surface water, groundwater or soil	Hazardous Wastes are solid, liquid, or gas wastes that can cause death, illness, or injury to people or destruction of the environment if improperly treated, stored, transported, or discarded. Examples of Hazardous Household wastes are batteries, fertilizers, electronic wastes (e.g. old cell phones) etc.
<b>The solution</b>	There are numerous ways to reduce creating waste in our households. For example, get your own shopping bags instead of bringing home plastic bags each time you go grocery shopping	It is important to properly dispose these hazardous substances that negatively impact our health and the environment. Therefore, we need to recycle all the substances that need to be recycled such as waste motor oil, transmission fluid, antifreeze, automotive batteries, button batteries, etc
<b>Instructio ns</b>	Please share with us some pictures and blogs of ways in which we can recycle and reuse waste in your communities	Please share with us some pictures and blogs of places where we should not dispose hazardous household wastes.
<b>Blogs and Videos</b>	<ul style="list-style-type: none"> <li>• <a href="http://www.nj.com/">http://www.nj.com/</a></li> <li>• <a href="http://www.youtube.com/watch?v=fV-Te_EtHys&amp;feature=c4-overview-vl&amp;list=PLBD17D4DE400504C5">http://www.youtube.com/watch?v=fV-Te_EtHys&amp;feature=c4-overview-vl&amp;list=PLBD17D4DE400504C5</a></li> </ul>	<ul style="list-style-type: none"> <li>• <a href="http://www.co.ramsey.mn.us/ph/hw/index.htm">http://www.co.ramsey.mn.us/ph/hw/index.htm</a></li> <li>• <a href="http://www.recyclemore.com/content/household-hazardous-waste-residential">http://www.recyclemore.com/content/household-hazardous-waste-residential</a></li> </ul>
<b>Week 4</b>		
	<b>Air Pollution</b>	<b>Renewable and Non-Renewable and Non-Renewable Resources</b>
<b>The effects</b>	It is estimated that you breathe 20,000 litres of air each day. This means the more polluted the air is, the more we breathe into our lungs dangerous chemicals	The use of non-renewable energy resources can cause damage to the environment. For example, fossil fuels are the number one contributor to global warming as they emit harmful greenhouse gases in the atmosphere when they are burned to produce products such as electricity
<b>The solution</b>	Remember manufacturing industries create a lot of pollution, so if we can re-	There are many ways in which we can use renewable sources of energy and help

	use or recycle things like shopping plastic bags, clothing, paper and bottles, it can help reduce air pollution because the manufacturers will reduce production of these products	remediate our environment. For example, hang your washed clothes on a clothesline instead of throwing them into an energy guzzling dryer. You will be using free energy from the wind and sun to dry your clothes
<b>Instructio ns</b>	Please share with us some pictures and blogs of sources of air pollution in our communities	lease share with us some pictures and blogs of ways in which we use renewable sources of energy in our communities
<b>Blogs and Videos</b>	<a href="http://www.mexuseducation.com/">http://www.mexuseducation.com/</a>	<ul style="list-style-type: none"> <li>• <a href="http://www.tutorvista.com/content/biology/biology-iv/natural-resources/natural-resources-types.php">http://www.tutorvista.com/content/biology/biology-iv/natural-resources/natural-resources-types.php</a></li> <li>• <a href="http://www.youtube.com/watch?v=pBTnVoElb98">http://www.youtube.com/watch?v=pBTnVoElb98</a></li> </ul>

## **Appendix I: Email from Student Opting Out of Study**

**From:** Bentley, Douglas (Mr) (s212241583) [<mailto:s212241583@live.nmmu.ac.za>]

**Sent:** 16 April 2013 02:46 PM

**To:** Nel, Janine (Ms) (Summerstrand Campus South)

**Subject:** Opting out of the Environmental Awareness Campaign

Hi ma'am,

I would like to opt out of the Environmental Awareness Campaign by Thabo Tlebere.

I was informed that my marks will not be negatively affected by this decision and hope that that is the case.

Thanks,

Doug