CHAPTER III

RESEARCH METHODOLOGY

3.1: Introduction

This chapter shows the steps taken to collect the data for this research study. Also, it shows the reasons for choosing the quantitative method adopted and its suitability for this research study. This chapter mentions the sample size, the demography of the participants, and the reliability of this survey.

The population of the study was chosen to be Zawia University students, and the sample size was 300 students from two departments (science and literature departments) at the university. The structured questionnaire was clear and understandable to all students at Zawia University. The technique for choosing the sample in this research is a non-probability sample method. The questionnaire was distributed randomly to participants in order to give an equitable representation of the population of the study. Also, it reduces factors that could bias the test results. Figure 1 presents the steps taken by the researcher to conduct this research study.

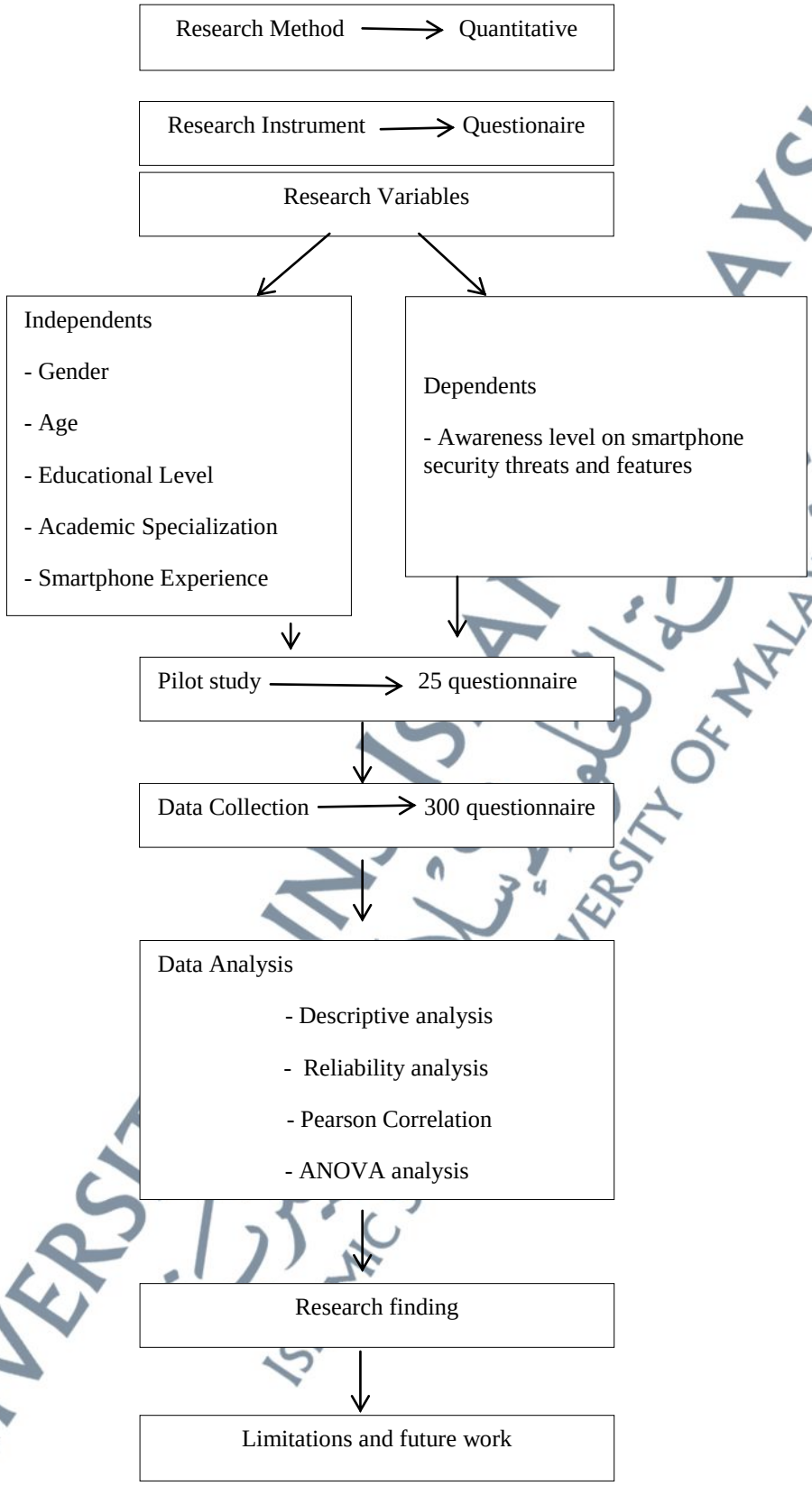

Figure 1: Methodology and variables of the study

3.2: Research Method

A cognitive activity is used to clarify some of the difficulties with understanding the challenges for smartphone users. There are several research methodology approaches, for example, qualitative approach, quantitative approach and mixed method approach. The qualitative approach is used to understanding basic reasons, motives, and views. It offers a comprehensive view to the problem and helps to innovate ideas and assumptions. Also, the qualitative research process is used to investigate and understand the meaning individuals or groups attribute to the social or human problem, and cultural and political contexts within which they occur (Creswell, 2013). The researcher used quantifiable data to show the facts and to detect patterns in the area of research. The methods used to collect quantitative data are more organized than the methods used to collect qualitative data. There are different types to collect quantitative data through different forms of surveys such as mobile surveys and online surveys. In this research there are some reasons for choosing a quantitative methodology, they are as follows:

1) The quantitative study provides an unbiased approach; this unbiased approach uses statistical operations and some standards for validity and reliability for numerical measured according to (Creswell, 2003).

2) The quantitative methodology offers the results using a large number of participants, also providing details of demographics with research questions (Creswell, 2008).

3) The quantitative methodology is a proper measure of quantitative research due to knowing the independent and dependent variables in the research study (Nardi, 2006).

This chapter discusses the research method and specifies the hypotheses, all hypotheses are about the awareness on smartphone security threats and features. The independent variables focus on the general background of the respondents such as gender, age, educational level, academic specialization, and smartphone experience. The dependent variable is related to the level of awareness on smartphone security threats and features.

3.3: Population and Sampling

The researcher used a random sample. The random sampling was selected because all the members of a population have an equal and independent chance of being selected. It increases the chance that the test results are successful; also it reduces factors that could bias the test results.

The population of the sample study is 2000 Zawia University students. The study sample is 300 students. Also, the researcher conducted a pilot-study randomly on 25 students to test the internal consistency of the questionnaire. The students are distributing between two departments, science and literature. The science department has three majors (Mathematics, Physics and Computer Science). The literature department has two majors (Arabic Language and English Language). The sample was chosen from Zawia University students who use smartphones; they were selected for four different reasons:

1) Study population consists of people with different ages from 18 to 33 years old, this age group has the highest percentage of smartphone users as shown in the Figure 2. Also the PEW Research in 2011 reported that college-aged students are among the largest group of smartphone users.

2) These ages are more receptive to new technologies. They also benefit more from Smartphones than older people who use smartphones mostly for phone calls.

3) The college campuses are open to the public that lead to high cybercrime and this is a good reason for choosing the students for awareness research.

4) This population comprises different cities, and not limited to a specific city. So that, it can be said the population, to a great extent, is representative of Libyan citizens.

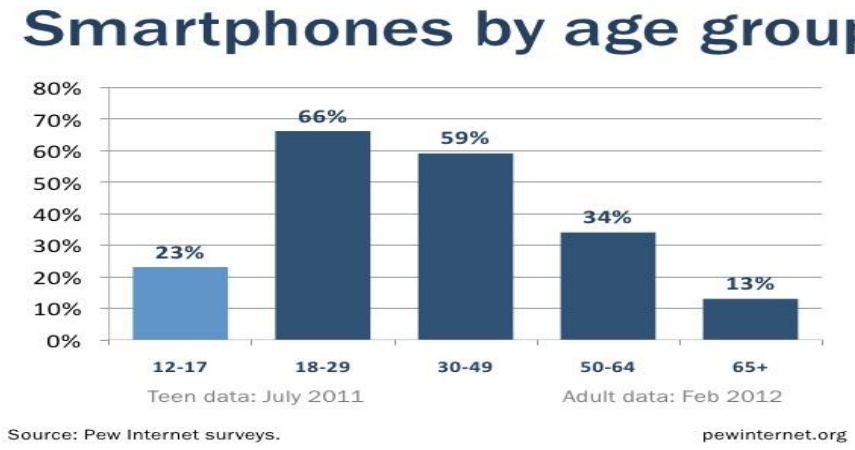

Figure 2: Smartphone users by age group (2012)

Source: Pew internet surveys (http://susannahfox.com)

3.4: Data Collection

The questionnaire was designed in line with the purpose of the study in order to achieve measuring the level of awareness smartphone security threats of the sample. Each question in the questionnaire was designed to answer the research questions. The questionnaire was adapted from survey instrument that was used by (Mylonas, Kastania and Gritzalis, 2013**).** The questionnaire was amended and some items were substituted in order to fit this research.

The design of the questionnaire includes all of the primary concept in this research, such as the users' awareness on Smartphone security threats and features in order to collect the information related to the research study. The questionnaire was designed to be a clear and in a suitable format in a way that could be answered easily by all participants. Fisher (2007) recommended to design the questionnaire as short and as clear as possible, so participant can easily understand what the questionnaire is about. The questionnaire is divided into two major parts, namely:

The first part is a general background for participants (Gender, Age, Academic year, Academic specialization, Number of phones used by the participant, Duration of Smartphone usage).

The second part is a study area and a questionnaire consisting of 33 items distributed in two key areas.

- The first area: Awareness and knowledge about Smartphone security features. This area consists of nine questions.

- The second area: Awareness and knowledge about Smartphone threats and attacks. This area consists of ten questions.

The researcher has adopted a Likert scale to measure the responses of the participants as shown in Table 3.

Table 3: Grades on Likert scale

Response	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Grade	**1**	**2**	**3**	**4**	**5**

The design of the questionnaire is to translate the information needed into groups of specific questions. In this study, the information related to the security awareness on smartphone threats and features is also translated into simple questions to get the participants' perspectives on the research's themes as shown in the Table 4.

Table 4: Purpose of the questionnaire

Concept	Question	The purpose of the questions
Filter question	Do you have a Smartphone?	This question is used to know if the participant should go through the survey or not.
Distribution of participants	Literature Department Science Department	This question is used to ensure equal distribution of student in different specialization
	How many years have you been using Smartphone?	This question is used to determine the Smartphone experience.
	How many Smartphones do you have?	This question is used to determine if the number of Smartphones which the users have an effect on their awareness or not.
	What are your Smartphones network connection capabilities?	This question is used to determine which users are more vulnerable to attacks from their connection with the internet network.
	How do you constantly use your Smartphone?	This question is designed to ascertain how the participants are dealing with their Smartphone.
	What type of your Smartphone operating systems?	This question is used to know which kind of Smartphone operating system the participants are using.

Smartphone security features.	I know the feature of my Smartphones password.	These questions are used to determine how the participants know the Smartphone features which available in their Smartphones. Also to measure the participants' awareness level of these features.
	I know the availability of SIM PIN code on my Smartphone.	
	I know the existence of Smartphone security software (e.g. Antivirus, firewall).	
	I know the Smartphones speak password.	
	I know the screen lock on my Smartphone.	
Smartphone threats and attacks.	I know the existence of Smartphone malicious software (e.g. Virus).	These questions are used to determine how the participants know the Smartphone threats and attacks. Also to measure the participants' awareness level on Smartphone threats and attacks.
	I know what the term Smartphone phishing means.	
	I use anti-virus software on my Smartphone.	
	I consider applications in the official application repository to be secure for installation on my Smartphone.	
	I store the personal data on my Smartphone.	
	My Smartphone was attacked by malicious programs.	
	I know the privacy setting on my Smartphone.	
	I know the Smartphone protection mechanisms (e.g. File encryption, remote file deletion).	
	I know the IMEI number.	
	I am concerned about the privacy of my personal data.	

Willingness of users' on smartphone security features	I am willing to use Smartphone's password on my Smartphone.	These questions are used to determine if the participants willing to use the Smartphone security features.
	I am willing to use antivirus and firewall on my Smartphone.	
	I am willing to use the SIM PIN code on my Smartphone.	
	I am willing to use SIM card lock on my Smartphone.	
	I am willing to use the screen lock on my Smartphone.	
Users' willingness to attend awareness and training campaigns	I am considering the awareness campaigns are important for Smartphone users.	These questions are used to determine if the participants eager to improve their knowledge on Smartphone security. Also to measure their willingness to attend awareness and training campaigns.
	I am ready to attend an awareness campaign about security of my Smartphone.	
	I am ready to use the new security features available on my Smartphone.	
	I am eager to improve my knowledge about security and privacy and how to protect my Smartphone.	
	My willingness to acquire new Smartphone increases with new technological properties.	

3.5: Data Analysis

The statistical analysis is a quantitative research to interpret the results of researchers' studies, also it is used for describing new trends according to Creswell (2008). The researcher created a coding system to facilitate data input and the analysis operations as suggested by Soter et al (2008). The researcher used numbers to facilitate the process of data entry into a statistical analysis program (SPSS). Also, these numbers refer to the responses of participants

The data analysis helps transform the data gathered during the research for useful information. The analysis is very important from the beginning because it is used for observations toward sources which is more useful for addressing the questions of the research, according to Corbin and Strauss (1990). Data analysis is very important stage in any scientific research. Also information obtained from the data analysis helps to support future decision processes. Levine (2007) defines data analysis as "a body of methods that help to describe facts, detect patterns, develop explanations and test hypotheses". A summary description of the analysis is shown below:

1) In this study the (Mean) was calculated to describe the level of Smartphone users' awareness on smartphone security threats and features.

2) Some operations were produced to come out with the frequencies and percent of the results.

3) The reliability analysis was used to validate the study based on coefficient alpha level of 0. 7 (Cronbach's, 1951).

4) The correlation was used to come out with the significant relationships between the variables.

5) The F test (One Way ANOVA) was used to validate the hypotheses in this study.

3.6: Pilot Test

This pilot test was tested using 25 samples among Libyan smartphone users and focused on updating the survey in order to suit real data collection of respondents' answers. The pilot study was used to improve the quality and efficiency of the questionnaire. Also, it detected the shortcoming in the design of the questionnaire which was treated before conducting the real study. The pilot study was conducted to ensure the reliability and validity of the measurement, and it helped to improve the choice of structures, also to select the suitable wording for the context.

Reliability was tested using Cronbach's alpha, it was greater than 0.8 for the instrument, also it provided an adequate level of reliability for the test and validated the hypotheses. Finally, all variables tested showed that the hypotheses were acceptable.

3.7: Consolidation

This section draws the process of conducting this study and the instruments used to obtain the outcome for each task in order to achieve the objectives of this study. The process of this study is as summarized in Table 5. First, One task was used in achieving the first objective. Mean was used to measure the average of the responses of the participants and come out with the students awareness level. Second task the Correlation Analysis and ANOVA were used to come out with the relationship

between the factors and security awareness level and validate the research hypotheses. Third task the correlation analysis was used to measure the relationship between the identified factors and security awareness level on smartphone threats and features. Also, it let us know which factor effect user awareness level.

Table 5: Tasks and Outcomes of study

Objectives	Task	Outcome
Assessing user awareness level of Smartphone security threats and security features.	Questionnaire Strategy Used 1- Reliability Statistics 2- Mean	▪ The reliability statistic for all used variables for the questionnaire. ▪ The level of user awareness on smartphone security threats. ▪ The level of user awareness on smartphone security features.

Explore the factors (gender, age, educational level, specialization and smartphone experience) which affect the user awareness level on smartphone security.	Questionnaire Strategy Used 1- Reliability Statistics 2- Correlation Analysis 3- ANOVA	▪ The reliability statistic for all used variables for the questionnaire. ▪ The Correlation Analysis to determine the relation between factors and awareness level. ▪ The ANOVA test to validate the hypotheses.
To measure the relationship between the factors and students' awareness level on smartphone security threats and smartphone security features.	Questionnaire Strategy Used 1- Reliability Statistics 2- Correlation Analysis	▪ The reliability statistic for all used variables for the questionnaire. ▪ The Correlation Analysis to determine the relationship between factors and awareness level on smartphone threats and features.

3.8: Summary

This chapter displays the methods which were used in this study. This research utilizes a quantitative approach which involves the use of survey questionnaire for data collection. The survey questionnaire was used to collect the data from smartphone users in Libya which were used to identify the users' awareness level on smartphone security threats and features. A pilot study was conducted using 25 samples among Zawia University students. The study population was 2000 students. A random sample of 300 respondents was chosen to answer questionnaire questions. This chapter also presents methods of data analysis used in this research.