Antecedents of wrist-based fitness tracker usage amongst members of the South African Generation Y cohort

A Hattingh


orcid.org/0000-00016971-1976

Dissertation accepted in partial fulfilment of the requirements for the degree *Master of Commercii in Marketing Management* at the North-West University

Supervisor: Dr C Muller

Co-supervisor: Prof N de Klerk

Graduation: May 2020

Student number: 26109263

DECLARATION

I, Amiskha Hattingh, declare that **Antecedents of wrist-based fitness tracker usage amongst members of the South African Generation Y cohort** is my own work and that all the sources used or quoted have been indicated and acknowledged by means of complete referencing.

Signature

Amiskha Hattingh

November 2019

Vanderbijlpark

LETTER FROM THE LANGUAGE EDITOR

Ms Linda Scott
English language editing
SATI membership number: 1002595
Tel: 083 654 4156
E-mail: lindascott1984@gmail.com

18 November 2019

To whom it may concern

This is to confirm that I, the undersigned, have language edited the thesis of

A. Hattingh

for the degree

Magister Commercii in Marketing Management

entitled:

Antecedents of wrist-based fitness tracker usage amongst members of the South African Generation Y cohort

The responsibility of implementing the recommended language changes rests with the author of the dissertation.

Yours truly,

Linda Scott

LETTER FROM THE STATISTICIAN

PO Box 263409

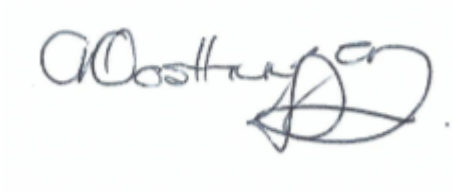
Three Rivers

20 October 2019

TO WHOM IT MAY CONCERN

I assisted with the statistical analysis of the data for research done by Amiskha Hattingh. The data as well as the analysis thereof were handled in the utmost confidentiality and was only be disclosed to the researcher. The interpretation thereof remains the responsibility of the researcher.

Kind regards



Aldine Oosthuyzen

M Sc

ACKNOWLEDGEMENTS

With the submission of this dissertation, I would like to express my sincere gratitude to everyone who assisted, encouraged and supported me throughout this study:

- First, a special thanks to Jesus Christ my Lord and Saviour. My research journey would not have started without Your guiding hand in my life. Thank You for Your daily grace that still carries me through trials and obstacles. Maker of heaven and earth there is none like You.
- To my dearest friend, Ricco Hammond. I am truly thankful for your constant words of encouragement and patience during the past year. Thank you very much for always believing in my abilities and for constantly reminding me to find my strength in the Lord. I am extremely grateful for your love, kindness and compassion.
- To my parents, Esme and Ampie Hattingh. Thank you for all your love, support and countless cups of coffee.
- To my brother, Woulan Hattingh. I am grateful for your sense of humour during stressful times, it helped me to see the light when I felt demotivated.
- To Betsie and Kallie Hammond for their continuous support and kindness throughout this year.
- To Martha Lekhoanyana, for always listening to me when I needed someone to talk to. Thank you for your patience and much-appreciated advice.
- To my supervisor, Dr. Chantel Muller, for her dedication, patience, guidance, support and encouragement. I am thankful for the countless hours you have invested in my work. Thank you for laying my research foundation, from which I will only continue to build upon.
- To my co-supervisor, Prof Natasha De Klerk, for her guidance, assistance and advice in completing this study, it is truly appreciated.
- To Prof Ayesha Bevan-Dye and Mrs Aldine Oosthuyzen for their expert assistance regarding the statistical procedures followed within this study.
- A special thanks to Ashley and Ricco for helping me distribute the questionnaires each Saturday at different parkrun events. Thank you for never leaving my side.
- To Ashley, Marcelle and Lewis who shared this experience with me. Thank you for all your motivation, advice, kindness and support throughout the year.
- To Brandon-Lee who encouraged me with words of wisdom. Thank you so much for your positivity and kind words during the past year.

- To Brendan and Ricco for always assisting me with the technical aspects of this study.
- To Linda Scott for her professionalism in the language editing of this study.
- To all the lecturers that took part in the pre-testing of the questionnaire.
- To all the parkrunners who took part in the main questionnaire of the final study.

Psalm 115:1 – Not unto us O Lord, not unto us, but to Your name give glory, for the sake of Your steadfast love and Your faithfulness.

Amiskha Hattingh

Vanderbijlpark

2019

ABSTRACT

KEYWORDS: Wrist-based fitness trackers, technology acceptance model (TAM), attitude towards usage, Generation Y members, South Africa.

Wrist-based fitness trackers are known as the most popular wearable activity tracker compared to other wearable devices that have the ability to detect a variety of metrics, including steps taken, sport profiles, heart-rate data, sleep patterns and active minutes. These devices enable users to display the time and pace of their indoor and outdoor activities, such as walking, running, hiking, cycling and swimming, whilst receiving real-time feedback on their wrists as well as their smartphones. In South Africa, wearable devices had a market penetration rate of six percent in 2019, which is expected to grow to 6.2 percent in 2023. Furthermore, revenue generated by the sale of these devices in South Africa, is expected to grow by 5.3 percent, resulting in a market value of approximately R915 billion in 2023. The continuous innovation and improvement of wrist-based fitness devices, combined with the constant addition of new models, leads to the increased compatibility with consumers' personal needs and preferences. As such, higher adoption tendencies regarding such devices are imminent. Wrist-based fitness device users have an increased awareness of their physical and cognitive activities that lead to healthier lifestyles and improved methods of communicating with each other. However, literature pertaining to wrist-based fitness trackers amongst the South African Generation Y cohort is limited, where a search of the literature only revealed studies about wearable technologies, wearable fitness technologies, the accuracy of these devices, as well as adoption processes of future technology. Considering that a large number of South African consumers form part of the Generation Y cohort (35.12%), individuals tend to associate themselves with a higher social status and trends that ultimately results in an increased likelihood of adopting a wrist-based fitness tracker. It is essential to investigate Generation Y members' usage of wrist-based fitness trackers and the factors that influence their attitude towards the usage of such devices. As such, the technology acceptance model (TAM) was extended to include Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost to determine whether a statistically significant influence on their attitude towards wrist-based fitness tracker usage was found. In accordance with the TAM, if found significant, the outcomes will have an implied effect on members' intention to use wrist-based fitness trackers.

The primary objective of this study was to determine the antecedents that influence Generation Y members' attitude towards usage of wrist-based fitness trackers in the South African context.

The target population of this study was defined as all South African Generation Y individuals who participated in registered parkrun events during 2019, ranging between the ages of 18 and 33 years. The sampling frame comprised the 221 registered South African parkrun events, as of 2019. A single cross-sectional, non-probability convenience sample of three parkrun events was selected. The parkrun events were in the Free State and Gauteng provinces South Africa, of which two parkrun events were situated in the Free State province and one parkrun event in the Gauteng province. A convenience sample of 450 Generation Y parkrunners who participated at these three parkrun events, was drawn for this study.

To gather the data for this study, permission for parkrunners to complete the questionnaire was obtained from the main organisers of all the applicable parkrun events prior to distribution, where the outcome of these meetings was obtained by means of written proof of this agreement to distribute the questionnaires at the selected parkrun events. Thereafter, hand-delivered self-administered questionnaires were distributed to parkrunners at each event for completion, which were collected immediately thereafter.

The construct items of the questionnaire were measured on a six-point Likert scale based on the participants' agreement or disagreement with items designed to measure their attitude towards wrist-based fitness tracker usage, perceived usefulness, perceived ease of use, perceived social image and perceived cost. The data collected were analysed using exploratory factor analysis, reliability and validity analysis, descriptive statistical analysis, one sample t-test, correlation analysis and regression analysis.

The findings of this study indicate that South African Generation Y members have a positive attitude towards wrist-based fitness tracker usage, perceiving such devices as being useful and easy to use. Furthermore, Generation Y members perceive wrist-based fitness trackers as having a positive social image, but as being costly. Moreover, Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost of wrist-based fitness trackers to have a statistically significant influence on their attitude towards wrist-based fitness tracker usage.

Insights gained from this study will assist wrist-based fitness tracker manufacturers and marketing practitioners to understand Generation Y members' attitude towards wrist-based fitness tracker usage in order to develop several marketing strategies to keep a strong competitive advantage in the wearable device industry in South Africa.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

The wearable technology industry consists of various types of devices, such as activity-tracking devices (Roberts & Skjong, 2019), heart-monitoring jewellery (Allison, 2018), epileptic episode trackers (Matchar, 2019), life-logging accessories (Hoyt, 2019) and interchangeable smartwatches (DeMarco, 2019). This industry is continuously flourishing with the constant addition of new products and updated features, thereby improving and expanding different ranges of these wearables. The wearable device industry is epitomised by the constant provision of both innovative and updated technology, where new and improved additions are constantly being introduced to the consumer market (Van Niekerk, 2017). Of all the types of wearable technology, 115.4 million activity-tracking devices were sold worldwide in 2017 (Framingham, 2018), this increased to 122.6 million in 2018 (Ubrani *et al*., 2018). It is evident that consumer interest in such devices has increased rapidly. To put this interest into perspective, the global wearable device sales revenue is estimated to reach approximately R498.9 million (South African rand) in 2019 (Statista, 2019a). Among the wide variety of wearable technology devices available, specifically wrist-based activity trackers, such as wrist-based fitness bands, have become mainstream, and it is expected that approximately 165 million units will be sold by the end of 2020 (CCS Insight, 2019). In addition, the wrist-based fitness tracker market comprises 47 percent of the overall wearable market, indicating a strong potential competitive advantage in the wearable technology industry (Statista, 2018). The wearable fitness tracker market can be categorised into wrist-wear, smart garments and body sensors, where wrist-based products comprise the largest share in the wearable fitness tracker market (Markets, 2018). The need for more features, diversity in devices and interactive screens will lead to higher potential purchases (Zaluzny, 2018).

A wrist-based fitness tracker, the most popular type of wearable activity tracker, is a device that can detect a combination of activity-related metrics, including steps taken (Vandrico, 2018), active minutes, which display the time and pace of indoor and outdoor activities, namely walking, running, cycling and swimming (Roberts, 2019). Furthermore, wrist-based fitness trackers enable users to exercise without uncomfortable smartphone attachments and bulky devices (Rear, 2019), which offer users real-time feedback on their wrists (Wired, 2019). The characteristics of wrist-based fitness trackers vary between models, from basic functionality to advanced features, some of which include different size displays and interchangeable bands, measuring heart rate,

sleep patterns and in certain cases, can detect an individual's swimming laps (Palladino, 2019). These types of trackers incorporate the calculation of daily calories burnt, GPS tracking, food logging, rotation and humidity sensors (YellowPages, 2018). Additionally, these fitness trackers are equipped with different algorithms and mobile applications that aid in health data collection (Henriksen *et al*., 2018:2), as well as displaying the recorded data visually. Traditional step counters utilise pedometers to recognise step counts. However, basic pedometers are less accurate than modern accelerometers, where the sensor quality is a vital component in fitness trackers (Corder *et al*., 2007). All modern fitness trackers have an accelerometer (Reid *et al*., 2017:579), which is more accurate, has more functionality and is user-friendly. Additionally, most accelerometer-based activity wearables can be used to evaluate the type of movement, determine energy expenditure and energy intensity (Yang & Hsu, 2010:7772). Given the attractiveness of the wearable industry, it is imperative to investigate the antecedents of consumers' attitude towards wrist-based activity-monitoring devices through evaluating consumers' decision-making processes to increase awareness and the adoption of such devices in South Africa.

The market segment most likely to adopt these devices is the youth, where 38.9 percent of global activity tracker users are between the ages of 18 and 34 years (Statista, 2019b), a segment that forms part of the Generation Y cohort. Markert (2004:21) defines this cohort as individuals that are born between 1986 and 2005, which are shaped through the major force of being raised in the connectivity of the digital age. Furthermore, according to South Africa's senses data, individuals between 15 and 34 years consisted of approximately 35.12 percent of the total population of 20 640 722, in 2018 (Stats SA, 2018). Considering that the majority of global wearable device users form part of the Generation Y cohort, it is an important segment to investigate. Furthermore, members of this cohort tend to pursue tertiary qualifications, which are associated with higher social standing and trend-setting capacity (Bevan-Dye *et al*., 2009:172). Therefore, it is essential to investigate Generation Y members' attitude towards the usage of wrist-based fitness trackers.

Considering individuals' possible adoption of new technologies, Davis (1989) proposed a technology acceptance model (TAM), which is a robust and influential model for predicting consumers' tendency to accept an innovative technology (Solomon, 2018), such as activity trackers in general (Muller, 2019). Based on this theory, perceived usefulness (PU) (Reyes-Mercado, 2018), perceived ease of use (PEOU) (Dvorak, 2008) and a positive attitude (Choi & Kim, 2016) towards wrist-based fitness trackers will most likely lead to a positive intention to use. Furthermore, this study extended the TAM to include two additional factors to determine whether

perceived social image and perceived cost would influence users' attitude towards wrist-based fitness tracker usage. The inclusion of these two potential predictors was based on the findings of Jeong *et al*. (2017) and Kim and Shin (2015).

Consumers' acceptance of any given technology is theoretically strengthened by means of the TAM. That is, the TAM suggests that technology adoption is determined by behavioural intention, which is influenced by consumers' attitude towards technology, as influenced by their PU and PEOU of the particular technology (Davis, 1989). Attitude towards using technology can be described as a person's positive valuation of using a technological device (Choi & Kim, 2016:779) that can be strengthened as the benefits of using the technology increases. Based on previous research, fitness and exercise are highly influenced through a consumers' attitude towards physical behaviour, perceived behavioural control and motivation (Aarts *et al*., 1997:368; Hagger *et al*., 2002:24: Kerner & Grossman, 1998:1140). Researchers propose that a positive attitude will strengthen users' trust towards the technology, considering that adopting new technological methods will improve their job performance (Mahmood *et al*., 2000:764; Sanchez-Franco & Roldan, 2005:23). This favourable attitude will in turn result in a positive intention to use the technology. In addition to attitude, the TAM suggests two key factors of technology acceptance, namely Perceived usefulness and Perceived ease of use (Davis, 1989:320). Perceived usefulness describes the benefits that users believe they could experience when using a technological device, whereas perceived ease of use refers to the extent to which an individual believes that using the technological device would be effortless. When technological devices are studied from consumers' perspectives, PU is redefined as the degree to which a consumer believes that the usage of wrist-based fitness trackers would increase their personal efficiency, such as being physically more active and productive (Kulviwat *et al*., 2007:1063). Apart from users' adoption tendencies and attitude, users believe that technological devices are more useful and approved when they perceive the device as easy to operate (Davis, 1989:320). For instance, users' intention to use mobile devices increase when they have limitless access that is uncomplicated, fast and provides timely access to their preferred data (Haung *et al*., 2007:588; Kynaslathi, 2003). A recent study regarding wrist-based activity trackers has shown that (PU) and (PEOU) are both significant in determining users' attitude and intention to use such devices (Muller, 2019).

Consumers' intention to use technological devices is directly determined by social influences, along with performance expectancy, effort expectancy and facilitating conditions (Venkatesh *et al*., 2003:446-447). Social image, a strong social influencer in consumer behaviour, strengthens the value of wearable fitness trackers. This influence applies for future and current users through

emphasising social influencing factors, such as visible methods of communication, as well as social interaction systems that serve as a figurative medium when users wear wearable devices (Hsu & Lu, 2004:857). Lin and Bhattacherjee (2010:167) describe social image as the degree to which users can obtain respect from individuals in their social communities through the usage of technological devices.

Consumers' purchasing behaviour and intentions are predominantly influenced by their attitude and perceived cost of these devices (Kim & Shin, 2015:531.) Perceived cost refers to the expected effort required to complete a specific task, as well as what consumers are willing to sacrifice for participating in a specific task, such as time and effort (Schoon & Eccles, 2014:247). Cost is described as the extent to which a person believes that using a specific technology will cost money, where consumers evaluate the price paid for the device compared to their disposable income (Moore & Benbhasat 1991:194), thereby determining whether it is worth the expense. As a result, consumers' purchasing intention is in part determined by their understanding and evaluation of perceived device cost, where high perceived cost typically leads to negative behavioural intentions to use technological devices (Wu & Wang, 2005:726). It is evident that perceived social image and perceived cost, in addition to the TAM, play an important role in determining consumers' behavioural intention to adopt various types of technologies by having a direct influence on their attitude towards the use of these technologies. As such, the probable adoption of wrist-based fitness trackers among Generation Y consumers is strengthened by these findings.

Wrist-based fitness trackers are considered a vital aspect in users' lifestyles, given that they have the capability to improve users' productivity, which results in positive behavioural changes of users with a sedentary lifestyle (Sullivan & Lachman, 2017:289). The benefits of using such devices, combined with the economical contribution of the wearable activity tracker market for a country, have initiated an increased interest amongst researchers to understand consumer behaviour. It is, therefore, critical to evaluate the relationships between the aforementioned factors that influence Generation Y members' acceptance of wrist-based fitness trackers by examining their attitude toward the usage of such devices.

1.2 PROBLEM STATEMENT

According to The World Health Organisation, obesity has nearly tripled since 1975, where 39 percent of adults are categorised as overweight (Henriksen *et al*., 2008:416; World Health Organization, 2018). Health-related behaviours, such as following a balanced diet or a healthy eating regimen, in addition to regular exercising, can cause significant development in an

individual's health (Chaput *et al*., 2010:7). Professional athletes and players across different sport types and sport teams are using wearable activity-tracking devices, including a wearable module worn on their backs, where some use a wrist-based device, to improve both their personal and team performance, while reducing injuries (Ohio University, 2019). Therefore, using wrist-based fitness trackers can increase users' physical performance, such as running or walking more often, while users become less sedentary (Livingstone, 2019) and stay up to date regarding daily food consumption (Seale, 2016). In order for wrist-based fitness trackers to create enduring habits, research concerning both users' attitude towards using such devices, as well as their internal and external motivations for using wrist-based fitness trackers is essential (Lunney *et al*., 2016:114).

Harwood *et al*. (2000:236) state that individuals base their training goals on their personal assumption of what achievement means to them when completing a specific task. This emphasises the fact that wrist-based fitness tracker users could improve their physical performance through collecting personal data pertaining to their practise sessions. Another major contributor that could strengthen technology acceptance is to place an emphasis on individuals who are technologically efficacious (Moore, 1991:22 Sunder & Marathe, 2010). These individuals have greater expertise and interest when considering adopting new technologies, given that these individuals engage in multitasking and exploring the potential of these new technologies. However, some consumers still believe they need certain skills to use a wrist-based fitness tracker, resulting in a lower perceived ease of use of these technologies. Thus, the need to investigate the adoption tendencies of different groups of users towards wearable technology must be considered (Kim & Shin, 2015:536).

Owing to research relating to wrist-based fitness tracker adoption being limited, the antecedents that influence the target population's attitude towards such devices, as well as the sample size of this research study were based on previous research of a similar nature, including research related to the adoption of new technology and wearable devices. A search of the literature revealed studies regarding wearable technologies (Chau *et al*., 2016:278), wearable activity trackers (Evenson *et al*., 2015:159), as well as the adoption of activity-tracking devices amongst Generation Y students in South Africa (Muller, 2019). Therefore, the fundamental purpose of this study was to determine the factors that influence Generation Y members' attitude towards the usage of wrist-based fitness trackers within the South African context.

Given that 20.8 percent of the South African total population comprised members of the Generation Y cohort as of 2019 (World Population Review, 2019), it is paramount to investigate South African Generation Y members' attitude towards wrist-based fitness tracker usage in order

to make the necessary recommendations to appeal to this lucrative market segment and increase the adoption rate of these devices in the country.

1.3 OBJECTIVES OF THE STUDY

The succeeding objectives were developed for this study:

1.3.1 Primary objective

The primary objective of this study was to determine the antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage in the South African context.

1.3.2 Theoretical objectives

To achieve the primary objective, the succeeding objectives were developed for this study:

- Review the literature regarding wearable device technology.
- Conduct a literature review regarding wearable fitness trackers.
- Review the literature pertaining to technology adoption theories.
- Conduct a literature review of the Generation Y cohort pertaining to factors that influence members in this generation's attitudes and intentions to buy wearable fitness trackers.
- Review the literature that incorporates possible factors influencing consumers' attitude towards wrist-based fitness tracker usage.

1.3.3 Empirical objectives

In line with this study's primary objective, the succeeding empirical objectives were developed:

- Determine South African Generation Y members' attitude towards wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived usefulness of wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived ease of use regarding wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived social image regarding wrist-based fitness tracker usage.

- Determine South African Generation Y members' perceived cost of wrist-based fitness tracker usage.
- Determine the relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and South African Generation Y members' attitude towards wrist-based fitness tracker usage.
- Determine the influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on South African Generation Y members' attitude towards wrist-based fitness tracker usage.

1.4 HYPOTHESES

The following hypotheses were developed to achieve the empirical objectives of this study:

H_o1: Generation Y members do not have a positive attitude towards wrist-based fitness tracker usage, perceiving such devices as being useful, easy to use, having a positive social image, but as being costly.

H_a1: Generation Y members do have a positive attitude towards wrist-based fitness tracker usage, perceiving such devices as being useful, easy to use, having a positive social image, but as being costly.

H_o2: There is no statistically significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness tracker usage.

H_a2: There is a statistically significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness tracker usage.

H_o3: Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost do not influence their attitude towards wrist-based fitness tracker usage.

H_a3: Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost do influence their attitude towards wrist-based fitness tracker usage.

1.5 RESEARCH DESIGN AND METHODOLOGY

This study comprised a literature review and an empirical study. Quantitative research, using the survey method, was used for the empirical portion of the study. A descriptive research design with a single cross-sectional sample was followed.

1.5.1 Literature review

Supporting the empirical study, South African and International literature were reviewed through conducting a secondary data analysis comprising sources that included journal articles, textbooks, newspaper articles, the Internet, as well as online databases.

1.5.2 Empirical study

The empirical portion of this study comprised the succeeding methodology dimensions:

1.5.2.1 Target population

The target population comprised all South African Generation Y members aged between 18 and 33 years. The target population was described as follows:

- Element: Members of the Generation Y cohort aged between 18-33 years.
- Sampling unit: Three registered parkrun events.
- Extent: Free State Province and Gauteng Province, South Africa.
- Time Period: 2019.

1.5.2.2 Sampling frame

The sampling frame for this study consisted of 221 registered South African parkrun events, as indicated by Parkrun South Africa in 2019, where approximately 723633 parkrunners participate every Saturday morning across South Africa in a collection of five kilometre running events (Parkrun, 2019a). From the initial sampling frame, three parkrun events were selected, two in the Free State province and one in the Gauteng province of South Africa. As of 2019, the selected Free State province comprised 456 parkrun events, with a recorded average number of 514.7 parkrunners per parkrun per week (Parkrun, 2019b; Parkrun, 2019c). The selected Gauteng province comprised 33 parkrun events in 2019, with a recorded average number of 149.9 parkrunners per parkrun per week (Parkrun, 2019d). These three parkrun events were selected due to their close geographic proximity, which reduced cost and time spent when collecting data for this research study. The questionnaires were distributed between three parkrun events.

1.5.2.3 Sample method

For this study, a single cross-sectional, non-probability convenience sample of runners, who participate in a parkrun event, referred to as parkrunners, that form part of the Generation Y was chosen. The decision was taken to only include those Generation Y members with adult status. Therefore, the sample was limited to individuals aged between 18 and 33 years.

1.5.2.4 Sample size

The sample size chosen for this study was 450 Generation Y parkrunners. Bearing in mind that the research relating to wrist-based fitness tracker usage is limited, the sample size was based on previous research studies that consisted of the adoption of new technology and activity related wearable devices, such as Dwivedi *et al*. (2016) (sample size of 525), Muller (2019) (sample size of 480) and Ooi and Tan (2016) (sample size of 459), deeming this sample size as sufficiently large. A sample size of 450 Generation Y parkrunners were distributed between the three intended parkrun events.

1.5.2.5 Measuring instrument and data collection method

A self-administered questionnaire was used to collect the necessary data for this research study. In order to determine the antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage, the measuring instrument comprised existing scales used in previously published research. The adapted scale of Kim and Shin (2015) as developed by Venkatesh *et al*. (2003) was used. The scales from Shin (2007), Park and Chen (2007), Kim and Shin (2015), Kuo and Yen (2009), Davis (1989), Yang *et al*. (2016) and Shin (2009a) were adapted and used for the empirical section of the research study.

Participants were required to complete a questionnaire comprising three sections. The first section (Section A) collected the participants' demographical information. The second section (Section B) gathered participants' background information regarding wrist-based fitness tracker usage to determine their interest in such devices. The third section (Section C) of the questionnaire, comprising a 23-item measuring scale, measured the extent to which PU (six items), PEOU (five items), perceived social image (four items) and perceived cost (four items) influence Generation Y members' attitude (four items) towards wrist-based fitness tracker usage. All scaled responses were measured on a six-point Likert scale, ranging from (1) strongly disagree to (6) strongly agree.

Permission to conduct the survey at the three parkrun events, that formed part of the sample frame, was obtained telephonically and in writing from the organisers of each of the events, as

well as from relevant gatekeepers, where an event was hosted in a private estate or premises. The event organisers were provided with an ethics clearance certificate acquired from the Economic and Management Sciences Research Ethics Committee (EMSREC) at the North-West University. The questionnaires were distributed to the parkrunners when permission was obtained with the aid of two trained fieldworkers. Due care was taken not to disrupt the events and to allow for enough time after the event for participants to complete the questionnaire. Participants were informed that participation in the study was strictly voluntary. The researcher and the two fieldworkers collected the questionnaires immediately upon completion.

The questionnaire comprised a cover letter that described the nature and purpose of this research study, aligned with the expectations of the participants. A pre-test was executed first using a sample of five individuals that did not form part of the sample frame of the main study. This was performed to ascertain the validity of the measuring instrument.

1.5.3 Statistical analysis

The captured data was analysed using the IBM Statistical Package for Social Sciences (SPSS), version 25.0. The succeeding statistical methods were used on the empirical data sets:

- Exploratory factor analysis
- Reliability and validity analysis
- Descriptive statistical analysis
- One sample t-test
- Correlation analysis
- Regression analysis

1.6 ETHICAL CONSIDERATIONS

The research study is in line with the ethical standards of academic research. The necessary permission to conduct the study was obtained from the event organisers of the selected parkrun events, as well as from the gatekeepers of private estates and premises where applicable. Participation in the survey was on a voluntary basis and no individual was obligated to participate. This study did not involve any invasion of privacy, therefore protecting the confidentiality of the information provided by the participants. The questionnaire and the proposal were submitted to the Economic and Management Sciences Research Ethics Committee (EMSREC) at the North-

West University. The following ethical clearance number was received after approval: 00097-19-A4.

1.7 CONTRIBUTION OF THE STUDY

Research regarding wrist-based fitness tracker usage amongst the Generation Y cohort in South Africa is limited, it therefore forms part of pioneering research. The findings that were gathered in the study fills the gap that exists pertaining to the consumer behaviour of the general Generation Y consumer market. This study contributed towards previous studies of wrist-based fitness trackers as well as to the existing literature on the Generation Y cohort's attitude, PU, PEOU, perceived social image and perceived cost, which lacks research in South Africa. As such, the discovery of the research study encourages the literature regarding the establishment of perceived accuracy and trust that is associated with these devices, which aligns with the objectives of a larger research study at the applicable parkrun events. The outcomes of this study will allow wrist-based fitness tracker manufacturers to accurately produce devices according to consumers' perspectives regarding the device's improved productivity, level of easy operational usage, visibility and recognition factors, as well as improved capturing of data and organising capabilities. The results of this study have a major influence on professional athletes, healthcare professionals, marketing practitioners and health conscious individuals.

Therefore, this study can assist marketing practitioners in the promotion of wrist-based fitness tracker applications amongst Generation Y consumers that resonates accurately with the user, which could create more awareness regarding living a healthier lifestyle when using such a device. Thus, in order for wrist-based fitness trackers to encourage enduring habits within users, this study focused on determining users' attitude towards the usage of wrist-based fitness trackers.

1.8 CHAPTER CLASSIFICATION

This study comprised the following chapters:

Chapter 1: Introduction and background to the study

Chapter 1 incorporated an introduction and background of this research study. A layout of the problem statement, research objectives and the research design and methodology are also provided. The chapter concludes with the organisation and structure of the research study.

Chapter 2: Literature review

A comprehensive literature review is provided in Chapter 2, where a general perception regarding the wearable technology is discussed. Accordingly, consumers' perceptions of and attitude towards new technology, the development of the digital environment and the mobility of technological devices are provided. Furthermore, the chapter will outline the importance of wearable fitness trackers, where several technology adoption theories and models will be identified in order to indicate the acceptances of these specific devices. This chapter also provides a discussion pertaining to wrist-based fitness trackers, where wrist-based fitness tracker benefits, categories and types will be identified and discussed. Moreover, it will provide an overview of the Generation Y cohort, including a definition of the Generation Y cohort, followed by a discussion of the South African Generation Y members influence on technology adoption and how this segment is targeted through marketing practitioners. The following possible factors of wrist-based fitness tracker usage will be discussed and outlined in this chapter, namely attitude towards device usage, PU, PEOU, perceived social image and perceived cost. Lastly, this chapter will emphasise the proposed model of the antecedents of attitude towards wrist-based fitness tracker usage amongst members of the South African Generation Y cohort.

Chapter 3: Research design and methodology

In Chapter 3, the target population, sampling method, sample frame and sampling size will be identified. The measuring instrument and data collection method are also analysed, combined with the statistical methods that were used. This chapter will include a detailed explanation on the questionnaire design, the layout and pre-testing of the questionnaire, the preliminary data and statistical analysis and the administration of the questionnaire. The different findings conducted will analysed to determine the objectives of Chapter 4.

Chapter 4: Results and findings

The focus of Chapter 4 is on the outcomes of the empirical study. The research discovery is examined, resolved and assessed in this chapter. The captured data were analysed, interpreted and discussed. The reliability and validity of the measuring instrument is addressed and the descriptive statistics interpreted. The results of the one sample t-test, correlation and regression analysis, which answer to the empirical objectives and hypotheses formulated for this study, will be discussed.

Chapter 5: Conclusion and recommendations

An outline of the entire research study is provided in Chapter 5 and the conclusions formed from the study are proposed. Suggestions and recommendations were formed based on the results of the study in order to contribute to future research.

1.9 SYNOPSIS

The findings obtained from this study will further emphasise the importance of wrist-based fitness trackers to increase productivity and organisational methods in the user's lifestyle, which have an implied influence on users' intention to use wrist-based fitness trackers that incorporate the level of easiness, usefulness, perceived improved social image and perceived cost, due to the direct effect on Generation Y members' attitude towards the usage of such devices. Although academic research regarding wrist-based fitness tracker usage is limited, these new research findings fill the gap that exists in the literature regarding the general Generation Y consumer market, which also contributes to prior research studies of wrist-based fitness trackers and wearable activity-tracking devices in general. Considering that a large number of South African consumers form part of the Generation Y cohort and they are individuals that tend to associate themselves with high social statuses and trends. The possibility exists to increase development opportunities that could improve the adoption rate of wrist-based fitness trackers in South Africa. In order to strengthen the acceptance of wrist-based fitness trackers, users' behavioural patterns tend to change when using these devices, which leads to healthier physical patterns. Users would walk or run more often than usual, engaging in intensive workout programmes to improve their current physical health, increase cognitive functionality and possibly prevent disease. Therefore, wrist-based fitness trackers have a major market opportunity and device manufacturers and marketing practitioners should target the Generation Y consumer market within South Africa.

CHAPTER 2
ATTITUDE TOWARDS WRIST-BASED FITNESS TRACKER USAGE

2.1 INTRODUCTION

This chapter proposes to address the theoretical objectives set out in Chapter 1 in order to address the primary objective of this study, which was to determine the antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage in the South African context. Therefore, the main purpose of Chapter 2 is to review the literature with regards to a general overview of wearable technology (Section 2.2), consumers' attitude towards and perceptions of new technology (Section 2.2.1), as well as the development of the digital environment (Section 2.2.2). Moreover, an overview of the mobility of technological devices is provided in Section 2.2.3, while the general wearable fitness tracker market is highlighted in Section 2.2.4. Section 2.3 provides a discussion pertaining to wrist-based fitness trackers, including the benefits of using such devices (Section 2.3.1), as well as a brief discussion regarding the categories and types of wrist-based fitness trackers available in 2019 (Section 2.3.2). Section 2.4 provides a discussion on the target market of this study, namely the Generation Y cohort, followed by an analysis of the Generation Y cohort and technology (Section 2.4.1). Section 2.5 identified several technology adoption theories and models, which includes a discussion on the technology acceptance model (TAM). Section 2.6 reviews the antecedents of attitude towards wrist-based fitness tracker usage. These antecedents include attitude towards wrist-based fitness tracker usage (Section 2.6.1), perceived usefulness (Section 2.6.2), perceived ease of use (Section 2.6.3), perceived social image (Section 2.6.4) and perceived cost (Section 2.6.5). This chapter concludes with the proposed model of the antecedents of attitude towards wrist-based fitness tracker usage among South African Generation Y members, which is presented in Section 2.7.

2.2 OVERVIEW OF THE WEARABLE DEVICE TECHNOLOGY

Owing to the development of information technology, mobile devices are recognised as one of the most specialised and intelligent methods of communicating (Wang *et al*., 2014:16). Mobile devices are classified into different categories such as smartphones, tablets and wearable devices (Yang *et al*., 2016:256). Beal (2019) defines wearable technology as "a category of technology devices that can be worn by a consumer and often include tracking information related to health and fitness". Therefore, wearable devices are perceived as attachments, accessories or implants in clothes that are used externally to users' bodies (Raskovic *et al*., 2004:500). Reyes-

Mercado (2018:103) highlights that wearable devices also allow used to track, store and transfer information regarding the parameters that align with the specific physical activities of the individuals who make use of these devices. In a broad sense, most wearable devices enable users to measure their heart-rate data and body temperature, calculate the total amount of calories they burn during the day and display the elapsed time since their last physical activity. Accordingly, wearable devices track users' vital signs, which relate to their health and fitness metrics (Techopedia, 2019).

Cameron (2019) states that wearable devices are classified as one of the latest technological innovations after smartphones were launched. In addition, Kim and Chiu (2019:109) emphasise that the wearable device market has become one of the most popular market segments. Considering that wearable devices increased in popularity, new features and additions are constantly added to the growing wearable device market (So, 2019) to appeal to the increasing consumer needs. Nasir and Yurder (2015:1262) add that the growth of the wearable technology market is a consequence of increased consumer awareness and interest regarding wearable technologies. Another reason is due to consumers' increased health consciousness and a need to remain up to date with health statistics to prevent diseases (Callaway & Falkous, 2018). Additionally, Kalantari (2017:277) states that the wearable technology market is classified as a major megatrend that is reshaping the way users live. In addition, the shipments of global wearable devices reached 49.6 million units within the first quarter in 2019, whilst wrist-worn devices comprised most of the global wearable device market with a 63.2 percent market share (Framingham, 2019). Furthermore, the South African wearable device market consists of 3.5 million users, which is indicative of an increased interest and ultimately strengthens the acceptance of wearable devices in South Africa (Statista, 2019b).

Wearable technology devices comprise three broad classifications, namely notifiers (Mack, 2014), glasses (Sacco, 2013), as well as activity trackers (Mikhalchuk, 2017). Notifiers refer to consumers that are more likely to use a smartwatch, given that the device provides a combination of various smartphone features that offer useful information about the world around them (Stein, 2014), where the smartwatch is essentially an extension of the users' smartphone (Chang, 2017), thereby eliminating the constant use of a smartphone. Additionally, glasses enable users to create augmented virtual reality. This allows the user to view a sequence of computer-generated images that they can interact with (Metz, 2015), such as google glasses (Smallwood, 2015:153). Fitness trackers enable consumers to access and record specific data of their movements and motions with the assistance of technological sensors (Fox, 2019), such as accelerometers, gyroscopes,

compasses and motion sensors (Bulatovych & Tagiev, 2019), which allow them to have access to real-time feedback regarding specific health-related statistics.

According to Reyes-Mercado (2018:103), living a healthy lifestyle is vital for many consumers. Patel *et al*. (2015:459) found that wearable devices effectively guide users towards healthier habits and assist them to improve their lifestyle. Therefore, users feel motivated when wearing a fitness device that monitors their daily activity, training results and encourages them to be more physically active. In addition, users' attitude towards exercising improves when they reach a personal target and receive rewards for achieving pre-set goals, rather than aiming for a generalised perception of being healthier (Livingstone, 2019). Wearable devices are ultimately designed to inspire individuals to approach their training sessions with a positive mind-set, by receiving encouraging congratulatory messages through pop-up notifications and email-messaging when a personal goal is reached (Courtney, 2017). Additionally, wearable devices enable users to share their training results with their friends and family (Jooste, 2018) by means of social network platforms (Spann, 2016:1417), text messaging, as well as different applications (Roberts, 2019). In order to share their training experiences successfully, mobile devices such as smartphones, provide users with the opportunity to connect their fitness devices to their companion applications, allowing them to synchronise the recorded data. As a result, fitness and mobile applications are designed to be compatible with competitive fitness trackers where applications such as Strava, Endomondo, Run Keeper and MapMyFitness gather and store data from the majority of wearable devices on the market (Tagiev, 2019). Major fitness brands, such as Garmin, Fitbit and Samsung have companion applications for all their devices (Palermo, 2019), that enable the abovementioned devices to store and provide access to the recorded data (de Arriba-Pérez *et al*., 2016:1538). Klink and Athaide (2010:24) emphasise that consumers show more favourable attitude towards established brand names, because brand familiarity drives consumers to purchase newly launched products, whilst reducing their levels of uncertainty. Moreover, Hodgkins (2019) adds that the recorded data from well-known brands provides a reliable source of data based on health statistics or metrics.

Wearable devices mainly rely on engagement strategies, such as sustained user motivation, social competition and collaboration, as well as the effective feedback and storing of physical activities. Therefore, wearable device manufacturers should focus on the design of engagement strategies rather than on the specific features of the device. Consequently, these engagement strategies could ultimately have a positive influence on users' health benefits and promote the sustainable use of wearable devices (Patel *et al*., 2015:460). The wearable technology market indicates that users have an increased adoption tendency towards specific factors of wearable

technologies, namely the perceived level of easy operational usage of the wearable device, the flexibility of the device and the convenience that such devices offer to users (Kalantari, 2017:289). According to Lunney *et al*. (2016:119), consumers are eager to adopt wearable devices when they perceive these technologies as useful and easy to use. As such, wearable devices are perceived to be more successful in the growing wearables industry because users are eager to adopt the latest and improved technologies. To have a better perception of the antecedents of the attitude towards wrist-based fitness tracker usage amongst members of the South-African Generation Y cohort, a discussion regarding consumers' perceptions of and attitude towards new technology, the development of the digital environment, mobility of technological devices, as well as consumers' adoption of technology and wearable devices is outlined in the following section.

2.2.1 Consumers' perceptions of and attitude towards new technology

Stojanov (2017) emphasises that consumers are currently living in an era of advanced technology. The development of technology enables users to access useful resources at the convenience of their fingertips. This ultimately contributes towards a positive perception of technology in general. Furthermore, newly developed technology has led to several fascinating discoveries, such as temperature-controlled mugs (Rense, 2019), waterproof Bluetooth speakers (Vazharov, 2019), as well as wireless phone chargers (Linder, 2019). Improved facilities and luxuries have impacted upon the standard and perception of individuals' daily lifestyles, as well as their attitude towards new technology (Leonhard, 2016).

Chau *et al*. (2016:277) define attitude toward using a technology as "a person's overall judgement of using a technology and the technology itself". Kulviwat *et al.* (2007:1067) refer to attitude as an evaluative judgement towards the adoption of a technology. Therefore, individuals either have a favourable or unfavourable attitude towards new technology. This suggests that individuals with a favourable attitude towards new technology welcome technological changes, despite any uncertainty pertaining to the technology. However, individuals that have an unfavourable or negative attitude towards new technology are uncomfortable with change and experience or show disapproval and uncertainty that leads to resistance to change to new technologies (Edison & Geissler, 2003:138). Kim and Sundar (2014:466) explain that individuals perceive a technology as useful if they believe that it is easy and convenient to use. This suggests that individuals might have different attitudes regarding the adoption of a new technology and yet have positive intentions to adopt the technology, owing to the necessity and usefulness of the particular technology, whether it is a service or physical product (Kulviwat *et al*., 2007:1076). Moreover, Venkatesh and Davis (1996:451) state that consumers' attitude towards technology is positive when devices are simple to use, user-friendly and align with consumers' competencies to use the

technology effectively. As such, newly introduced technology, be it services or products, should emphasise elements and benefits in such a compelling way that individuals develop favourable attitude towards these new technologies (Lunney *et al*., 2016:218). This would result in an increasing amount of consumers who will ultimately adopt and use the new technology. Furthermore, consumers' favourable attitude towards technology is predominantly influenced by the digital environment, which contributes toward consumers' improved knowledge of specific technological devices. Therefore, a discussion regarding the development of the digital environment follows.

2.2.2 Development of the digital environment

The digital environment serves as an integrating factor in modern society and consists of a wide variety of technologies. Keyless entry devices, Bluetooth earpieces, GPS satellites (Sarokin, 2019), interactive windows, digital price tags (Gilliland, 2019) and wearable technology are among the various technologies that communicate digitally with the user as well as other devices (Godfrey *et al*., 2018:41). Woodford (2019) describes digital technology as devices that convert information into numbers, instead of words and pictures that are stored and displayed within the technological device.

Almost all types of wearable technology can connect to digital communication infrastructures that simplify the transmission and storing of data. This communication method can be classified as the 'Internet of things' (Godfrey *et al*., 2018:41). Rouse (2019) explains the 'Internet of things' as an ecosystem that comprises web-enabled smart devices that use sensors, processors, as well as communication hardware, to gather and respond to data that the device received. Therefore, most technological devices have the capability to connect to specific applications on mobile devices that allow individuals to access data easily and give out instructions. Moreover, Schull (2016:1) states that wearable technology can be considered a digital navigator that influences users' daily decisions, where a healthy eating regimen, daily steps taken, as well as users' sleeping patterns are closely evaluated and monitored. This suggests that digital devices can assist users to take responsibility for their state of health, while providing a thorough analysis that reinforces users' personal accountability (Cha, 2015).

The development of the digital environment is mainly driven by technological innovations, consumer behaviour and demand, as well as external environmental factors (Edmead, 2016). This suggests that the digital transformations are restructuring multiple areas of consumers' daily lives that also influence their choices regarding product consumption. As a result, several companies and brands respond to the demands of digital technologies, while simultaneously

embracing the transformation that digital technologies undergo (Jeanologia, 2014). Digital platforms also assist isolated communities that have limited health-services, leisure activities, as well as fitness related activities to interact through podcasts, YouTube videos, mobile applications and digital connectivity (Brabazon *et al*., 2015). Brown and Duguid (2000:13) conclude that it is extremely difficult to restrain from the digital environment. Nevertheless, individuals that continue to resist computers, personal digital assistants, the Internet and the World Wide Web, constantly take advantage of the processors that enable phones and other technological devices to be easier to use, appliances that are more trustworthy and utilities that are more predictable. According to Reddy (2018), the mobility of technological devices serves as the main factor that drives digital transformations. Hence, the following section will focus on the importance of mobility in technological devices.

2.2.3 Mobility of technological devices

Huang *et al*. (2007:588) refer to mobility as an important element that allows the user to access information anywhere at any time through a mobile device. This implies that the mobility of technological devices can guide and support users where and when it is necessary. Technological mobility is progressively changing with new technologies and devices, incorporating different levels of mobility and mobile capabilities, such as e-readers, wearables, tablets and smartphones (De Clerk & De Wit, 2016). Yang *et al*. (2016:258) add that users' productivity, with specific reference to wearable devices, can be improved through the mobility of the device. As such, users can view their e-mails, schedule meetings and tasks, evaluate information and communicate with their social groups at any given time and place. Additionally, a mobile fitness tracker, worn on the human body, allows the user to have access to recorded health metrics at any given time and place. Therefore, the mobility of technological devices serves as a vital element that positively influences individuals' perceptions of the usefulness thereof and favour the immediate access that technological devices, such as wearable fitness trackers, provide. Additionally, technological mobility provides easy, swift and timely access to information (Huang *et al*., 2007:588; Kim & Shin, 2015:531).

Owing to the mobility of technological devices, individuals can follow a more productive lifestyle, resulting in more favourable perceptions of and attitude towards technologies and subsequently, will lead to a greater tendency to adopt these technological devices. Wearable fitness trackers, as part of wearable device technologies and the focus of this research study, are elaborated on in the following section.

2.2.4 Wearable fitness trackers

Wearable devices are classified as a new innovative technology that consists of a small hardware capable of tracking and monitoring fitness metrics, whilst simultaneously being able to synchronise wirelessly to a computer or smartphone (Kaewkannate & Kim, 2016:433). These devices are worn on the human body, be it on one's wrist, ankle (Bell, 2019), head, clothes or worn as jewellery (Best, 2018). Therefore, wearable devices provide users with immediate, real-time feedback regarding health statistics. The global wearable device sales revenue is estimated to reach approximately R498.9 billion in 2019. This is a noticeable increase form the revenue generated in the earlier stages of wearable device sales, which indicated a sales revenue of approximately R220.4 billion in 2016 (Statista, 2019). South Africa, which had a market penetration rate of 6 percent captured in 2019, is expected to grow their user penetration rate to 6.2 percent in 2023. As such, South Africa's revenue will reach an expected growth rate of 5.3 percent, resulting in a market value equalling approximately R915 billion by 2023 (Statista, 2019b). In terms of the wearable device market, wrist-based fitness devices reflect the most promising possibilities in terms of popularity and growth amongst consumers, given that the wrist-based fitness tracker market consist of 47 percent of the overall wearable market (Statista, 2018).

The wearable device market includes several different types of devices. Accordingly, 10 types of wearable devices, as in 2019, are identified as smart clothing (Nirvanium, 2019), GPS embedded smart shoe soles (Beverly, 2016), smart jewellery such as necklaces, rings and earrings (John, 2018), smart glasses (Mikhalchuk, 2017), virtual reality headsets (Boughton, 2016), smart cycling helmets (Dean, 2019), chest straps (Duffy, 2019), digital and analogue wrist-bands (Sawh, 2019), fitness trackers with a display (Poddubnyi, 2019), as well as fitness trackers without a display (Peckham, 2019). Of these types of devices, wrist-based fitness trackers are identified as the segment with the most appealing possibilities within the wearable market (Statista, 2018).

2.3 WRIST-BASED FITNESS TRACKERS

Wrist-based fitness trackers, a type of wearable fitness tracker, refers to any device worn exclusively on the users' wrist that is capable of measuring fitness-related metrics. Wrist-based fitness trackers may or may not have a display and can interact with an application on a mobile device via Bluetooth that configures the users' activity data visually (Davis, 2018). Wrist-based wearable devices have gained more popularity compared to other wearable devices (Berglund *et al*., 2016), since these devices offer appealing possibilities that allow users to swiftly access recorded information (Domb, 2019). In addition, wrist-based fitness trackers have a substantial influence on users due to the increased awareness of their physical and cognitive activities, such

as users' healthy eating regimes and their methods of communicating with others (Al-Eidan, 2018:1). According to Lunney *et al*. (2016:115), wrist-based fitness trackers are capable of tracking users' physical activities, such as the total steps taken and the number of calories burnt, which is used to evaluate the intensity of their workouts. In addition, Choi and Kim (2016:777) explain that when consumers consider the purchase and use of such a device, they seek specific aspects, such as the elegancy of the device, positive brand reputation, as well as long-lasting durability. Yang *et al*. (2016:256) mention that most 'watch-type' devices receive e-mail messages, text messages and mobile notifications on their wrists, without the user struggling to first take out their cell phones. Nasir and Yurder (2015:1262) mention that wrist-based fitness trackers enable users to keep track of real-time health and fitness data through specific mobile applications, which enable them to collect, store and share nearly all types of health statistics. As such, wrist-based fitness trackers allow 24/7 data tracking, where it can wirelessly synchronise with a mobile Bluetooth device that, subsequently, provides more detail regarding the users' progress and activities (Lunney *et al*., 2016:115). The benefits that strengthen consumers' intentions to adopt wrist-based fitness trackers are examined in the subsequent section.

2.3.1 Benefits of wrist-based fitness trackers

Nasir and Yurder (2015:1267) state that lifestyle diseases such as hypertension, diabetes and obesity are rapidly increasing in the world's population. Furthermore, consumers' inactivity contributes toward various health problems that may include weight gain and being less productive in general (Health Fitness Revolution, 2019). Accordingly, as stated by the Healthy Living Alliance, almost 70 percent of women and 39 percent of men are overweight in South Africa (Africa Check, 2018). However, based on the nature and characteristics of wrist-based fitness trackers, which allow the user to monitor their health in real time, it may be a useful tool to prevent and/or reverse some of these health issues.

Lashkari (2019) strengthens the importance of wrist-based fitness trackers by emphasising that wearable fitness trackers enable users to track how active they are in their daily routines. Therefore, wrist-based fitness trackers may encourage users to reach their daily fitness goals, such as walking 10 000 steps or burning at least 2000 calories per day, depending on personal preference. Additionally, when the user fails to meet their daily step goal because of being too sedentary at work for instance, they are motivated to walk a few extra steps after work in order to meet the goal of the day (Lindberg, 2018). Without the use of a wrist-based wearable fitness device, the user would not be aware of their daily activity levels or what they can do to improve daily activity levels on a regular basis. Also, some wrist-based fitness trackers allow users to monitor what they are eating daily (Goldstein, 2018). Additionally, users have a constant reminder

on their wrists to form healthy habits, such as controlling their calorie intake and to stay hydrated (Staff, 2017). Furthermore, wrist-based fitness trackers enable users to evaluate the safety of their exercise regime by means of a heart rate sensor, which can measure data at given intervals (Chang, 2017) by means of a static sensor or on a 24/7 basis, using an optical heart rate-sensor (McGarry, 2018). Heart-rate monitors benefit cardiac patients and pregnant woman, particularly in guiding them to control their physical input regarding their daily exercise, which enables them to monitor when they must stop or alter their exercise routine (McGregor, 2015).

Another benefit that most wrist-based fitness trackers provide is the capability to measure and evaluate sleep patterns (Brain & Spine, 2018), ranging from basic to advanced sleep data. Accordingly, a thorough analysis of the user's sleep data is captured with more advanced models and pertains to how many movements the user made during the night in addition to showing REM, known as the rapid eye movements stage when individuals typically experience dreaming, light and deep phases of sleep. Devices with basic heart-rate sensors, on the other hand, enable the user to see the number of hours they are awake or asleep (Cardinal, 2019). Lynch (2019) mentions that most wrist-based fitness trackers are compact and lightweight, which make it easy and effortless for users to wear. Moreover, some devices allow users to choose between various interchangeable wristbands that enable them to customise their fitness device with different ranges of colours to suit their varying attire from the office to the sports field (Chan, 2018).

Wrist-based fitness trackers are mainly focused on being compatible with the user's needs. As such, users can track the route, speed, as well as the distance covered during their training session, while being able to reflect on the results afterwards or on a real-time basis (Scarano, 2019) These training sessions can include, amongst others, swimming, running, walking, cycling (Lea, 2019), as well as hiking (Lynch, 2019). Furthermore, most wrist-based fitness trackers can connect to fitness applications that are easily accessed on users' mobile phones, such as Endonomo, MyFitnessPal and Strava (Sawh & Alger, 2019), the device's companion application as well as by means of the desktop version installed on users' personal computers. In addition, various fitness applications allow users to share their training results with other users in their social networks. As such, users are motivated through observing the workout patterns of others and as a result try to outperform the results captured on the fitness application (Ryan, 2017). These benefits of wrist-based fitness trackers serve as a valuable contributor towards consumers' unique preferences when choosing a specific type of wrist-based fitness tracker to purchase. As such, the following section highlights the categories and types of wrist-based fitness trackers available.

2.3.2 Categories and types of wrist-based fitness trackers

Wrist-based fitness trackers are classified into three categories, namely fitness watches (Muller, 2019:60; So, 2019), sports or fitness bands (Henriksen *et al*., 2018:3; Muller, 2019:56) and smartwatches (Silbert, 2019).

A fitness watch can be described as a wrist-worn wearable device, that resembles an ordinary digital or analogue watch, capable of tracking various metrics relating to users' health and exercise regimes that monitors users' daily step counts, calories expended, steps taken, as well as the heart rate of users (Computer Hope, 2019). Fitness watches have a longer battery life, more advanced software, as well as stylish designs (So, 2019). In addition, newly launched fitness watches aim to incorporate fashion with sport. This new innovative strategy focusses on attractive and lightweight devices that are fashionably accepted within users' social standing (Palladino, 2018). Sawh (2019) explains that users can choose between a digital or performance analogue interface, where some devices allow the user to change the interface by choosing between over a hundred different designs. As such, users often use the digital interface when they are physically active to access fitness related information easily, whilst the analogue interface is more likely to be used within users' corporate or professional environments. Woods (2017) adds that users can download custom watch faces through applications on the users' mobile devices that may include different colours and display functionalities. Moreover, wrist-based fitness watches provide improved heart-rate monitoring capabilities on the comfort of users' wrists, whilst users' resting heart rates, including the lowest and highest heart rate is sensed and displayed (Garmin, 2019). Several advanced features of wrist-based fitness trackers include smart notifications, measurements of the amount of oxygen that the human body can process, the tracking of users' sleep patterns, as well as their swimming laps (Keating, 2019).

Fitness bands serve as a vital wrist-based wearable device that can assist consumers to achieve their fitness and movement goals (Sam Mobile, 2019). This specific type of wrist-ware offers the user different sport profiles to choose from, where cycling, running and elliptical training are amongst the several activities that fitness bands keep track of (Samsung, 2019). Bell (2019) adds that fitness bands can display important information regarding users' health and fitness metrics through an advanced touchscreen display. Fitness bands also incorporates LED lights that enable users to easily view/ access the information on their watch interfaces when wrist-movement is identified, whilst an automatic function enables users to customise the backlight functions of their fitness bands (Poor, 2019), this functionality is enabled by a gyroscope sensor. In addition, fitness bands are able to monitor users' heart rates and breathing patterns, which tracks their cardio fitness levels and measures their sleep patterns (Reliance Digital, 2019). Furthermore, fitness

bracelets are similar to fitness bands, where the emphasis is placed on the fashionability of the device, while having access to fitness-related metrics (Peckham, 2019). In addition, fitness bracelets are ergonomic and sleekly designed, which contributes toward the comfortability of fitness bands (Rear, 2019).

Kim and Shin (2015:527) state that smartwatches are mostly used as satellite technology that incorporate important data from a paired smartphone by means of Bluetooth connectivity, which ultimately provides more convenient and fast information. Chau *et al*. (2016:277) define a smartwatch as "a mini device that is worn like a traditional watch and allows for the installation and use of applications". Aitken (2019) emphasises that several smartwatches incorporate the functionality of fitness trackers, which include features such as heart rate monitoring, pedometers for step counting and measuring and tracking physical activity, such as running, swimming and cycling. Additionally, smartwatches are also capable of monitoring blood and users' sleeping patterns (Masterson, 2019). However, both smartwatches and fitness bands or watches are standalone devices that are used for different purposes (Driver, 2018). Khillar (2019) explains that a fitness tracker is a wearable device designed to keep track of users' daily physical activities that ultimately contributes towards a healthier lifestyle, whereas a smartwatch is a combination of a wristwatch, smartphone, as well as a fitness tracker that has fitness tracking capabilities and includes similar functions to smartphones.

2.4 GENERATION Y COHORT

Dulin (2008:44) states that a generational cohort gives clarity regarding different groups classified in society. In addition, Manheim (1952:6) adds that consumers can only share generational bonds when they are born into the same historical and cultural context. Therefore, it is evident that each generation comprises or experiences different social and historical events that shape their attitudes, ambitions and worldviews (Downdenr, 2019). Bevan-Dye (2016) defines a generational cohort as "the aggregate progeny of the preceding generation and parents of the next generation, born within a specified range of years, who go through the different stages of life together and whose values, attitudes and preferences are influenced by shared defining events and trends during their informative years that give rise to a generational consciousness and a process of social change".

A thorough search of the literature identified five categories of generations. According to Brosdahl and Carpenter (2011:549) these are the Silent Generation, the Baby Boomers, Generation X, Generation Y, as well as Generation Z (Wiedmer, 2015:55). The Silent Generation were born in the 1920's, the Baby Boomers in the 1940's, while individuals of Generation X were born in the

1960's. Given the wide disagreement on the start and end points for Generation Y, most studies indicate that individuals that form part of the Generation Y cohort were born during the 1980's (Robinson, 2018). Individuals of Generation Z were born in the 1990's (Wood, 2013:1). The purpose of this study was to focus exclusively on the Generation Y cohort, given that Generation Y individuals are most likely to adopt wearable technology (Muller, 2019). Moreover, Ruggeri (2017) emphasises that the Generation Y cohort is classified as the youth of today, which comprise individuals that were raised in a world of technology with different elements that motivate and drive their daily lifestyles (Kurian, 2017). Markert (2004:21) refers to the Generation Y cohort as individuals that were born between 1986 and 2005, who are connected, curious, technically capable, flexible and transparent in their daily lives (Abbot, 2019). Therefore, the Generation Y cohort has mastered several aspects of modern life, such as effective ways of communicating through technology (Bolton *et al*., 2013:255). As such, technology is vital to this Generation cohort.

2.4.1 Generation Y and technology

Canteneur (2016) classifies the Generation Y cohort as 'children of the Internet revolution'. This implies that individuals who form part of this cohort became familiar with developed information and communication technology through experimenting with several digital devices. Cabral (2008:125) emphasises that the highest percentage of social media users form part of the Generation Y cohort, because these individuals are unconsciously up to date with social media platforms as they feel a constant pressure to stay connected with their friends and family through technology. Cox (2019) identifies several social media platforms that the Generation Y cohort use daily, including Facebook, Twitter, Instagram, YouTube, Pinterest, LinkedIn, as well as Reddit. Furthermore, Generation Y members are described as digital explorers who are optimistic and collaborative, even when their personal or professional lives are displayed on social media (PostBeyond, 2019). This indicates that Generation Y members seek constant validation through social recognition. Schwarz (2008:80) identifies that Generation Y members have favourable attitude toward constant stimulation and entertainment. Even though these members can adapt to their surrounding environment rather easily, they are inclined to get bored because of their ability to process information at rapid speeds.

Thompson (2018) emphasises that members of the Generation Y cohort spend more than 10 hours online each week, where they either download video content or use streaming services. Furthermore, Lalonde (2018) states that wearable technology is most likely to be adopted by the Generation Y cohort, given that these individuals are actively involved in the movement of the 'quantified self' that relates specifically to their fitness tracking (Koch, 2018). Mangelsdorf (2019)

mentions that the Generation Y cohort are the most active and informed generation because they are constantly exposed to different wearable gadgets. Furthermore, according to South Africa's senses data, individuals between 15 and 34 years of age consisted of approximately 35.12 percent of the total population of 20 640 722, in 2018 (Stats SA, 2018). Moreover, the Generation Y cohort within South Africa are classified as technology-savvy entrepreneurs that are constantly seeking new opportunities (Actuarial Society, 2018). This suggests that individuals within this generation have a favourable attitude towards the economic future of South Africa since they feel that they are in control (GFK, 2019). Higley (2018) emphasises the importance of understanding the purchasing behaviour of and the subsequent opportunities to target the South African Generation Y cohort. Building a strong and meaningful relationship with the members of the Generation Y cohort in South Africa will ultimately result in consumer satisfaction. Furthermore, the market that is most probable to adopt wrist-based fitness trackers are aged between 18 and 33 years, forming part of this cohort. Therefore, the antecedents that influence this generation's attitude towards wrist-based fitness tracker usage needs to be investigated for device manufacturers and marketing practitioners to target this lucrative market segment effectively. These antecedents are embedded in several technology adoption theories and models.

2.5 TECHNOLOGY ADOPTION THEORIES AND MODELS

Amongst all wearable device technologies, wearable fitness trackers are the most popular (Bothun & Lieberman, 2016), where fitness trackers will remain the biggest wearable category based on unit sales (Wilson, 2019). Consequently, wearable fitness trackers are expected to be the next major market (Liu, 2019). Strengthening the aforementioned statements, the global wearable fitness tracker market is estimated to generate a revenue of US$48.2 billion or R71 914 000 000 by 2023 (Prescient & Strategic Intelligence, 2019). Technology adoption is mainly driven by connectivity, instant communication and prominent infrastructure systems. Technology adoption is defined as "the acceptance, integration and use of new technology in society" (Adika & Sweary, 2019). Consumers focus their attention on new ideas and products to stay connected with the world around them (Desjardins, 2018). Rubas (2004) states that technologies will only be adopted when they add value to the consumers, companies and nations that want to adopt the technology.

A search of the literature identified several theories pertaining to technology adoption, namely the innovation of diffusion theory (IDT) developed by Rogers (1983), the theory of reasoned action (TRA) developed by Fishbein and Ajzen (1975), the TAM developed by Davis (1989) and the theory of planned behaviour (TPB) developed by Ajzen (1991). From these several technology adoption theories, the diffusion of innovation theory is the first to provide an explanation about the

importance of consumers' adoption of new products. The IDT led the way for subsequent theories to be developed, resulting in the TAM, which provides further insights into consumers' acceptance of new technologies.

In an attempt to find specific determinants of technology adoption, Davis (1989) developed the technology acceptance model (TAM). The TAM is built on the theory of reasoned action (TRA), a social cognitive theory developed by Fishbein and Ajzen (1975), and the theory of planned behaviour (TPB), developed by Ajzen (1991). Accordingly, the TRA explains that behavioural intentions serve as in input to a specific behaviour that will lead to a particular outcome (Ajzen & Fishbein, 1980), such as adopting a new technology. This relates to a consumer's favourable or unfavourable attitude toward a behaviour, as well as their subjective norm regarding the behaviour (Fishbein & Ajzen, 1975:302). Similarly, the TPB proposes that consumers' behavioural intentions are affected by their attitude towards the behaviour, subjective norm and consumers' perceived behavioural control over the use of a particular technology (Taylor & Todd, 1995:139).

The TAM proposes that technology adoption is determined by behavioural intention that is influenced by attitude towards and the PU of the technology in question. Therefore, consumers tend to adopt technology more easily when they believe it will provide additional advantages (Rogers, 2003). According to Ajjan and Hartshorne (2008:73), technologies that are perceived as easy to use, have a higher possibility to be adopted by potential users, since this will have a positive influence on their attitude towards the technological device. Therefore, Tornatzky and Klein (1982:33) found that consumers have a higher adoption tendency towards technology when it is adaptable with their working environments and their value systems. The TAM has been used in various research studies regarding various types of technologies (Davis, 1989; Davis *et al*., 1989; Huang *et al*., 2007; Kim and Shin, 2015; Nasir & Yurder, 2015; Shin, 2007; Taylor & Todd, 1995) and found to be a valuable theory when aiming to establish the success of a particular technology in new emerging markets.

The TAM is classified as one of the most frequently used theories within the context of technology adoption (Nasir & Yurder, 2015:1262). In addition, Park *et al*. (2009:197) state that the TAM is designed to measure the importance of a user's perception of the PEOU and PU of the technology, in line with consumers' adoption behaviour of various technologies. This suggest that internal factors, namely perception, can have a significant influence on consumers' adoption of various types of devices, given that consumers are influenced through the abovementioned perceptions. As mentioned in Chapter 1, Section 1.1, PU ascribes the advantages that consumers believe they could derive from a technological device, whilst PEOU refers to the extent to which

a consumer believes that the usage of the technological device would be effortless (Davis, 1989; Kulviwat *et al*., 2007:1063).

Saaksjarvi (2003:91) emphasises that technology innovations should be compatible with consumers' needs, values, lifestyles and their past experiences. Consequently, consumers will develop higher adoption tendencies towards technology if new technological innovations fulfil these elements. The following section comprises a discussion regarding the definition, benefits, features and the categories and types of wrist-based fitness trackers.

2.6 ANTECEDENTS OF ATTITUDE TOWARDS WRIST-BASED FITNESS TRACKER USAGE

A comprehensive understanding regarding the possible antecedents of attitude towards wrist-based fitness tracker usage amongst members of the South African Generation Y cohort is obtained through the previous literature, as mentioned in Chapter 1. The findings of this study will allow wrist-based fitness tracker manufacturers to produce devices according to consumers' perspectives regarding the devices' improved productivity and timely access to activity-related information that has a direct influence on consumers' attitude towards the use of wrist-based fitness trackers. Moreover, the perceived ease of operational usage, perceived usefulness of devices, social recognition factors, the anticipated cost and specific brand names can add value to manufacturers regarding consumers' unique preferences of wrist-based fitness trackers. The results of this study will enable wrist-based fitness tracker advertisers to frame advertising messages positively, as well as create awareness for manufacturers to produce more affordable devices or sell these devices on an interest free basis to encourage increased adoption. Wrist-based fitness trackers can have a substantial influence on professional athletes, healthcare professionals, marketing practitioners and health-conscious consumers. It is evident that wrist-based fitness trackers provide several benefits in order to fulfil each consumer's specific and unique preferences. Therefore, the availability of specific features and benefits of wrist-based fitness trackers will ultimately have an impact on the adoption tendencies of consumers.

It is known that consumers' attitudes, personal innovativeness and health interests significantly influence their intention to adopt wearable fitness trackers (Lee & Lee, 2018:154). Furthermore, the previous literature pertaining to various factors that influence the adoption of smart wearable devices found that both PU and PEOU influence consumer adoption tendencies, along with aesthetics or attractiveness of the device, the efficiency of the device, as well as the time saving capabilities and dependability of these wearable devices (Adapa, 2018:407). Research regarding wearable activity-tracking devices suggests several important factors that influence the adoption

thereof, including wearability acceptance, a compelling design, functionality, cost (Dvorak, 2008), fashion technology perception, visibility, familiarity (Chuah *et al*., 2016), social influence, perceived ease of use, potential risk (Rauschnabel *et al*., 2016), perceived enjoyment, personnel innovativeness in information technology (PIIT), perceived self-expressiveness, attitude (Choi & Kim, 2016), perceived value and brand name (Yang *et al*., 2016). However, a recent study (Muller, 2019) pertaining to South African Generation Y students' attitude towards and intention to use activity-tracking devices, established several factors, namely attitude towards wearable activity-tracking devices, PEOU, PU, perceived importance of brand name and subjective norm as important determinants of the target population's intention to use such devices, thereby confirming the applicability of both the theory of reasoned action (TRA) and technology acceptance model (TAM) in the South African context. As such, South African Generation Y students have a profound positive attitude towards and intention to use wearable activity-tracking devices (Muller, 2019), where all the factors contributed significantly to these findings. Ajzen and Fishbein (1980) developed the TRA to predict consumers' behaviour, which could ultimately determine users' intention to use technological devices. Accordingly, the TAM was developed from the TRA in order to describe users' technology usage behaviour (Davis, 1986).

Even though the TRA and TPB are valuable tools used to predict consumer behaviour and technology adoption, this study adapted the TAM since this model provides practitioners with an improved understanding of consumers' perceptions, which can be used to incorporate several trust-building strategies to encourage technology adoption (Nasir & Yurder, 2015:1266). Furthermore, the TAM has been applied to several studies regarding consumers' adoption behaviour regarding various forms of technologies and technological devices, especially recently introduced technologies of which wearable fitness devices form an integral part (Park *et al*., 2009; Sanchez & Hueros, 2010; Lee, 2009; Choi & Kim, 2016; Nasir & Yurder, 2015; Kim & Shin, 2015; Muller, 2019; Shin, 2009a; Lunney *et al*., 2016; Wu & Wang, 2005). As such, the TAM was deemed suitable to apply and extend to understanding the antecedents of attitude towards wrist-based fitness tracker usage amongst South African Generation Y members. The TAM is extended within this study to include attitude towards wrist-based fitness tracker usage, PU, PEOU, perceived social image and perceived cost. These factors are discussed in the succeeding sections.

2.6.1 Attitude towards wrist-based fitness tracker usage

Eagly and Chaiken (1993:582) define attitude as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour". Based on this definition, attitude towards technology can be described as the positive or negative feelings toward using a

new technological device (Nasir & Yurder, 2015:1263). Chau *et al*. (2016:280) indicate that attitude is positively associated with users' intentions to adopt wearable devices. This implies that users with a positive attitude towards technological wearable devices will ultimately have positive intentions to purchase such devices.

According to Karahanoglu and Erbug (2011:26), certain users have a positive attitude towards new products, where other users may reject the use of these technologies for various reasons, such as losing interest in using the new technology (Kim, 2016). Other reasons relate to the technology being too complex to use, not flexible enough, the switching costs between old and new technology being too high, as well as the loss of value that occurs when old and new technology are compared (Murthy & Mani, 2013:5). In addition, Lin and Kreifeldt (2001:263) identify two main reasons why users reject wearable technology, namely the device lacking functionality or the device being perceived as uncomfortable to wear. Carp (2015) adds that certain users perceive wearable devices as unfashionable, which emphasises that these devices fail to meet consumers' social and fashion standards. This might result in users having a less favourable attitude towards technological devices. However, when a device is useful to the user and can add to their social standing among peers, consumers tend to outweigh the negative aspects by considering what they can gain from using new technology (Simms, 2014). Chuah *et al*. (2016:281) add that consumers who perceived wearable devices as a technological attribute, rather than a visible component, show an increased level of usefulness towards wearable devices. Garris (2018) concurs, stating that wearable devices assist users with daily workouts, responses on physical progress, as well as the sharing of their fitness goals with relevant others. Wearable devices positively contribute towards users' healthy habits and well-being through the monitoring of their eating regimens, and in some cases, their sleeping patterns. Again, this might motivate users to have a positive attitude towards technological devices. Therefore, these formed attitudinal reasons will have a significant influence on their intention to use wrist-based fitness trackers.

Previous research found various significant relationships between consumers' attitudes and intentions to adopt watches (Chuah *et al*., 2016:280), attitudes and intentions to use smartwatches (Kim & Shin, 2015:533; Lee, 2009:138), as well as attitudes and usage of virtual learning platforms (Sanchez & Heuros, 2010:1638). In line with these findings, this study proposed that if consumers have a positive attitude towards wrist-based fitness tracker usage, they are inclined to have a positive intention to adopt these devices. Hence, the influence of an individual's attitude towards using wearable fitness trackers was evaluated in this study, with the implied effect on the subsequent intention to use such devices. Attitude was measured using the

adapted scale of Kim and Shin (2015) as developed by Venkatesh *et al*. (2003) and subsequently, measured participants' attitudes in terms of whether they felt that using a wrist-based fitness tracker is a good idea, whether they had a favourable attitude towards using a wrist-based fitness tracker in general, whether they liked the idea of using a wrist-based fitness tracker and whether they thought that using a wrist-based fitness tracker is beneficial overall.

Besides users' attitudes, the TAM suggests that two key factors determine technology acceptance, namely PU and PEOU (Lunney *et al*., 2016:115). Moreover, both PU and PEOU (Section 2.6.2 and 2.6.3) are suggested to determine users' attitude towards using new technology (Kim & Sundar, 2014:466).

2.6.2 Perceived usefulness

Wearable devices are perceived as more useful when they offer high-quality mobile applications, minimise delay and have long-lasting battery life, as opposed to technological devices which lack in functionality. In addition, Yang *et al*. (2016:266) explain that wearable devices must correlate with users' existing IT products, such as smartphones, to synchronise data or to transfer relevant information. Perceived usefulness refers to the value that users believe they would find when using wearable fitness technology (Lunney *et al*., 2016:115). Chuah *et al*. (2016:278) and Yang *et al*. (2016:258) emphasise that wearable devices can assist users to improve their productivity by means of being more organised, scheduling meetings or tasks, accessing information, as well as communicating with their peers at any given time and place. Davis (1989:334) states that perceived usefulness is a profound indicator of user acceptance of technological devices. This implies that devices that are perceived as highly useful will have the possibility of being adopted. Perceived usefulness and attitude will have a positive influence on users' intention to adopt and use technological devices (Kim & Shin, 2015:528). It has been proven throughout previous research, by means of the TAM, that PU and PEOU significantly influence users' technology adoption behaviour, as well as their attitude towards using various technologies (Davis, 1989; Toft *et al*., 2014:393; Kim & Shin, 2015:527). For instance, prior research indicates that PU has a positive influence on users' intentions to use technological devices (Park & Chen, 2007:1357; Lee, 2009:138; Kim & Sundar, 2014:467; Shin, 2012:319), as well as PU and the perceived value of technological devices (Yang *et al*., 2016:263). Similarly, PU and PEOU had a significant impact on users' attitude towards a device or some form of technology (Morris & Dillon, 1997:63; Sanchez & Hueros, 2010:1637; Ajjan & Hartshorne, 2008:77-78; Chau *et al*., 2016:280). Given the lack of research regarding wrist-based fitness trackers, it is likely that the PU of these devices might have an influence on users' attitude towards using wrist-based fitness devices.

This study suggests that if consumers perceive wrist-based fitness trackers as highly useful, they are likely to have a positive attitude towards using a wrist-based fitness tracker device. As such, this study evaluated the influence that PU will have on individual's attitude towards wrist-based fitness tracker usage, where intention to use can be implied based on the expected outcome as per the TAM. As a result, the scales of Shin (2007 and Park and Chen (2007) were adapted and subsequently measured participants PU in terms of whether they felt that a wrist-based fitness tracker could make the tracking of activities and training more effective, whether wrist-based fitness trackers could help them organise their daily activities and training better, whether wrist-based fitness trackers could increase their productivity, whether a wrist-based fitness tracker was useful to them in general, whether a wrist-based fitness tracker was helpful to improve their physical performance in general and whether a wrist-based fitness tracker provided useful activity-related information to them.

2.6.3 Perceived ease of use

Davis *et al*. (1989:320) describe perceived ease of use as the degree to which an individual believes that using a technology will be simple. Furthermore, PEOU can be interpreted as an important factor that relates to consumers' assessments of the effort involved in learning and using technology (Kulviwat *et al*., 2007:1063). Perceived ease of use is also a vital element that determines consumers' attitudes, as well as the perceived usefulness of technology (Kulviwat *et al*., 2007:1060). Therefore, users are likely to consider a technological device as more useful, if they perceive that it is easier to use (Chuah *et al*., 2016:277). Accordingly, PEOU remains a strong influencer of PU and attitude, which subsequently effects users' intention to use a particular technology (Huang & Lin, 2007:589). Lunney *et al*. (2016:118) emphasise that consumers are more likely to continue using technology when they maintain a positive attitude towards devices. Therefore, it is evident that attitude, PU and PEOU have a great potential effect on the adoption of wrist-based fitness trackers.

In accordance with previous research, various significant relationships were found between consumers' PEOU and attitude towards smartwatches (Kim & Shin, 2015:533), PEOU and perceived usefulness of Internet banking (Lee, 2009:138) and PEOU and wearable fitness technology usage (Lunney *et al*., 2016:117). This suggests that if consumers perceive wrist-based fitness trackers as easy to use, they are likely to have a positive attitude towards using wrist-based fitness trackers. In addition, this study, in establishing the TAM as a model describing Generation Y members' attitude towards wearable fitness tracker usage, will examine the traditional paths between PEOU and attitude towards wearable fitness trackers. Hence, this study adapted the scales of Kim and Shin (2015) and Kuo and Yen (2009) to measure participants'

PEOU in terms of whether they thought using a wrist-based fitness tracker is simple, whether it was perceived as extremely easy to be familiarised with the use of a wrist-based fitness tracker, whether it was easy for them to measure their activity through using a wrist-based fitness tracker, whether they found that a wrist-based fitness tracker could easily measure their activity and whether using a wrist-based fitness tracker did not require a lot of mental effort for them.

2.6.4 Social image

Social image, derived from the IDT, is described as the respect and admiration that individuals expect to gain from significant others in relation to a certain performed behaviour (Lin & Bhattacherjee, 2010:167). In terms of wearable technology adoption behaviour, social image can be defined as the "extent to which users may derive respect and admiration from peers in their social communities through wearable device usage" (Yang *et al*., 2016:259). Tunca and Fueller (2009:288) focus attention on how often consumers respond to social pressure to make an acceptable impression within their surrounding groups. This leads to consumers expecting improvement of their social image when purchasing newly developed IT devices. Moreover, wearable devices are mostly used as an accessory, which allows wearable device adopters to display their innovative technological devices to their peers and friends (Yang *et al*., 2016:266). Image is considered a relevant and desired value for users of wearable devices, because it also plays a fashion and social role (Adapa *et al*., 2018:400). In addition, Lin and Bhattacherjee (2010:168) indicate that social image serves as a predictor of usage intention, whereas the effect of beliefs is mediated by the user's attitude towards the particular technology. Thus, users' perceptions of social image through using a wearable device is positively related to their attitude towards the usage of such devices. Even though social image has a significant influence on perceived value and attitude, both factors indicated that users have higher intentions to use devices because of social image improvement.

Previous research found several significant relationships between social image and the perceived value of wearable devices (Yang *et al*., 2016:266), social image and attitude towards interactive hedonic technologies (Lin & Bhattacherjee, 2010:173) and perceived social image and purchase intention of wearable devices (Jeong *et al*., 2017:407). Consequently, this study suggests that if consumers perceive that using a wrist-based fitness tracker will enhance their social image, they are likely to have a positive attitude towards using these devices and will subsequently have a positive implied usage intention of these devices. As such, the influence that social image will have on an individual's attitude towards wearable fitness tracker usage was evaluated. For this reason, this study adapted the scale of Yang *et al*. (2016) to measure Generation Y consumers' perceived social image in terms of whether they felt that wearing a wrist-based fitness tracker

would make a good impression on their peers and friends, whether they felt that wearing a wrist-based fitness tracker improved their social image amongst peers and friends, whether a wrist-based fitness tracker gave them social approval and whether a wrist-based fitness tracker helped them feel accepted amongst their peers and friends.

2.6.5 Perceived cost

Consumers tend to compare the benefits that products provide with the cost of products (Shin, 2007:174), which can be related to the price paid for the item or the effort and time expended to obtain the item. Moore and Benbhasat (1991:194) describe cost as the degree to which a consumer perceives that using a specific technology will cost money or how the consumers perceive price compared to their disposable income. Consumers' attitudes and behavioural intentions are determined by their valuation of a particular product, which relates directly to consumers' perceptions of costs. Owing to consumers' attitude and purchasing behaviour, their intentions are mainly being determined by their perceptions of cost. Accordingly, practical implications addressing cost concerns depend on the strategies and actions of device manufacturers, marketers and advertisers, which should be based on a more detailed insight regarding consumers' perception of affordability and their willingness to pay for these devices (Kim & Shin, 2015:531).

Consumers deal with different costs when comparing or switching to different brands of products (Chen & Hitt, 2002:257; Pavlou *et al.*, 2001:159). Furthermore, consumers may perceive the cost of a device as a burden that may create an issue for non-users, regardless of their perceived usefulness, enjoyment and attitude towards the device (Shin, 2009b:193). In addition, Wu and Wang (2005:726) found that cost has a significant negative effect on consumers' behavioural intention to use technology. Therefore, it is evident that several wearable device users may not purchase a specific device owing to price barriers that exist, along with the fear that the device might not deliver expected value in accordance with the price paid. It is therefore suggested that device manufacturers offer devices that adhere to the value-for-money principle to ensure the optimal adoption of wrist-based fitness trackers.

Previous research provides evidence of several significant negative relationships between consumers' perceived cost and behavioural intentions to use mobile commerce (Wu & Wang, 2005:726), perceived cost and attitude towards using digital multimedia broadcasting (Shin 2009b:185), as well as perceived cost and intention to continue to use smartwatches (Kim & Shin, 2015:534). This suggests that if the cost of wrist-based fitness trackers is high, consumers are inclined to have a negative attitude and intention to use these devices, which will ultimately have

a negative influence on consumers' intentions to continue to use these devices. Therefore, this study evaluated the influence of perceived cost on the Generation Y cohorts' attitude towards wearable fitness tracker usage. Consequently, this study adapted the scales of Kim and Shin (2015) and Shin (2009a) to measure participants' perceived cost in terms of whether they felt that wrist-based fitness trackers are a waste of money, whether they felt that wrist-based fitness trackers were too expensive, whether wrist-based fitness trackers do not offer good value for money and whether wrist-based fitness trackers were just an expensive gimmick. Based on the abovementioned factors, a model is proposed in the preceding section that addresses the empirical objectives of this research study.

2.7 PROPOSED MODEL OF THE ANTECEDENTS OF ATTITUDE TOWARDS WRIST-BASED FITNESS TRACKER USAGE

This chapter reviewed the literature of wrist-based fitness tracker adoption tendencies and the Generation Y cohort's technology usage. As such, a deeper insight into wearable fitness trackers, technology adoption theories and factors that influence users' attitude towards wrist-based fitness tracker usage is provided. This section integrates the reviewed literature in order to propose a model that depicts the antecedents of the attitude towards wrist-based fitness tracker usage among South African Generation Y consumers. Figure 2-1 shows the proposed model and the hypothesised antecedents of wrist-based fitness tracker usage amongst members of the Generation Y Cohort, in accordance with relative literature.

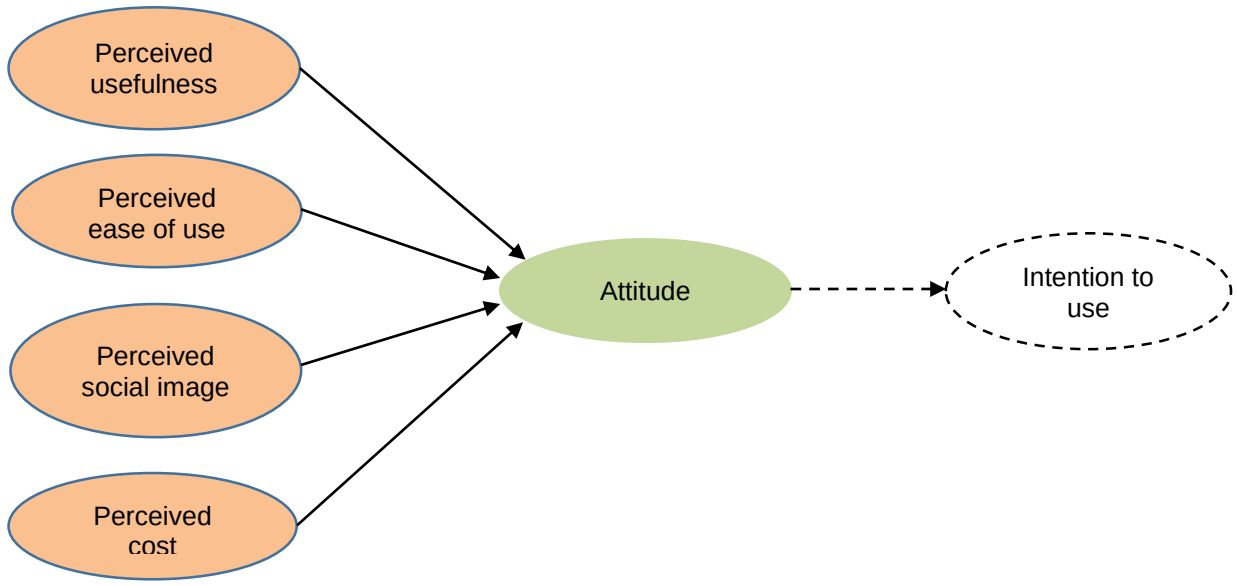


Figure 2-1: Proposed model of the antecedents of attitude towards wrist-based fitness tracker usage

In accordance with the primary objective of this study and subsequent empirical objectives, this proposed model extends the traditional TAM to determine whether PU, PEOU, perceived social image and perceived cost significantly influence Generation Y members' attitude towards wrist-based fitness tracker usage, which, if found significant, will also have an implied effect on users' intention to use wrist-based fitness trackers.

2.8 SYNOPSIS

The purpose of this study was to determine the antecedents that influence Generation Y members' attitude towards wrist-based fitness tracker usage in the South African context. This chapter provided a broad literature review contributing to the study. Section 2.2 encompassed a general perception regarding wearable technology, where consumers' perceptions of and attitude towards new technology (Section 2.2.1), the development of the digital environment (Section 2.2.2) and mobility of technological devices (Section 2.2.3) were discussed. The wearable fitness tracker market was delineated in Section 2.2.4, where Section 2.3 provided a discussion pertaining to wrist-based fitness trackers that included the benefits of using such devices (Section 2.3.1), as well as a brief discussion regarding the categories and types of wrist-based fitness trackers available in 2019 (Section 2.3.2). Section 2.4 provided an analysis on the target market of this study, namely the Generation Y cohort, followed by a discussion pertaining to the Generation Y cohort and technology (Section 2.4.1). Section 2.5 identified several technology adoption theories and models, which included a discussion on the technology acceptance model (TAM). Section 2.6 reviewed the antecedents of attitude towards wrist-based fitness tracker usage among the Generation Y cohort, where the TAM was discussed and extended to incorporate two additional factors. Thereafter, a detailed discussion pertaining to consumers' attitude towards wrist-based fitness trackers (Section 2.6.1), perceived usefulness (Section 2.6.2), perceived ease of use (Section 2.6.3), perceived social image (Section 2.6.4) and perceived cost (Section 2.6.5) was provided. The resulting proposed model of the antecedents of attitude towards wrist-based fitness tracker usage among South African Generation Y members was presented in Section 2.7.

The following chapter outlines the research design and methodology that relates to the empirical objectives of this study. The marketing research process, research approach, research design, sampling strategy, data collection method, pre-testing of the questionnaire, administration of the questionnaire, preliminary data analysis, as well as the statistical analysis is analysed.

CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Marketing research is a crucial element concerning the collection and evaluation of specific data (Chisnall, 1992:5; Hair *et al*., 2008:4). A comprehensive description of marketing research is the collection, evaluation and interpretation of data regarding marketing problems, where scientific approaches are supplied (Wiid & Diggines, 2009:5). Malhotra (2015:28) defines marketing research as "the systematic and objective identification, collection, analysis, dissemination and use of information for the purpose of assisting management in decision making related to the identification and solution of problems and opportunities in marketing". Marketing research serves as a vital contribution towards resolving problems and making alternative decisions.

As specified in Chapter 1, the primary objective of this study was to determine the antecedents that influence Generation Y members' attitude towards wrist-based fitness tracker usage in the South African context. This primary objective, subsequently, was categorised into seven empirical objectives (refer to Section 1.3.3), which guided the collection of the data to answer the following:

- Determine South African Generation Y members' attitude towards wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived usefulness of wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived ease of use regarding wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived social image regarding wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived cost of wrist-based fitness tracker usage.
- Determine the relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and South African Generation Y members' attitude towards wrist-based fitness tracker usage.

- Determine the influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on South African Generation Y members' attitude towards wrist-based fitness tracker usage.

Chapter 3 identify the different research and methodological approaches that were used to compile this portion of this research study. The marketing research process is elaborated on, in Section 3.2. Section 3.3 explains the research approach that was followed, whereas Section 3.4 describes the research design, whilst Section 3.5 discusses the sampling strategies. Section 3.6 analyses the method used to collect the data for this research study. The pre-testing and administration of the questionnaire are explained in Section 3.7 and Section 3.8 respectively. Finally, Section 3.9 specifies the preliminary data analysis and Section 3.10 identifies the statistical methods used to evaluate the data.

3.2 MARKETING RESEARCH PROCESS

Hair *et al*. (2013:27) explain that managers and researchers are advised to interpret the marketing research process as a function of managing information. Information research involves the changes that occur in the market research industry and can influence the decision makers in the organisation. As such, a more suitable name for the traditional marketing research process is currently known as the information research process, which explains a systematic method that collects, analyses, interprets and transforms data to reach an appropriate marketing decision.

Zikmund and Babin (2010:50) state that the different stages of the research process overlap continuously. As such, marketing research is interpreted as a procedure that is oversimplified because it has the same order and sequence of activities. However, marketing research is classified as a process that follows a general pattern. Malhotra (2015:204) suggests an easy-to-follow method that consists of six steps, as illustrated in Figure 3-1.

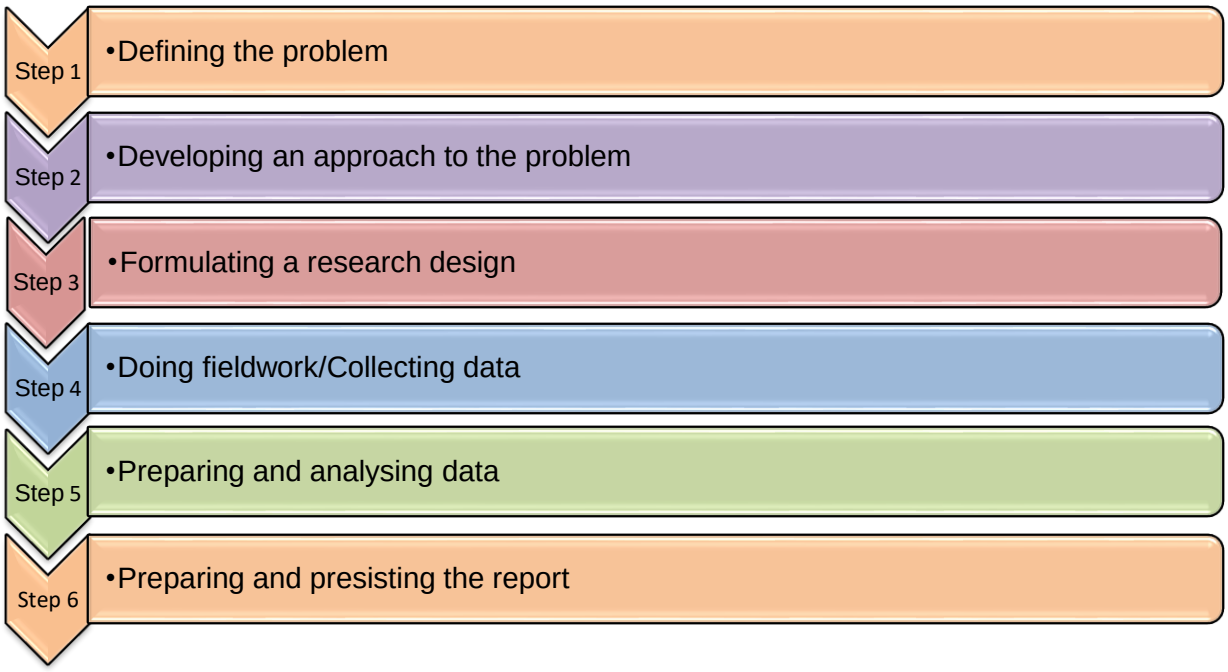


Figure 3-1: Marketing research process (Malhotra, 2015:32)

The six steps shown in Figure 3-1 specify the various tasks that the researcher should follow when the marketing research project is undertaken. The steps consist of defining the problem, thereafter an approach to the problem needs to be developed and then the research design has to be formulated. The research design describes the procedures that have to be followed when collecting the data for the study. Thereafter, fieldwork will be conducted to collect the data, whereby the preparation and analysis of the data followed. Lastly, the findings collected during the research process will be prepared and the report with the findings will be presented (Malhotra, 2015:32-33; Tomasetti, 2018).

The research problem was identified in Chapter 1 (refer to Section 1.2), where it was deemed fit to propose and test various antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage in the South-African context. Considering the problem definition and objectives of the study, one primary objective, five theoretical objectives and seven empirical objectives were developed (refer to Section 1.3).

The following segment delineates the second step within the marketing research process, namely developing a research approach to the problem.

3.3 RESEARCH APPROACH

A research approach is described as a process that incorporates steps from broad assumptions to comprehensive data collection methods, analysis and interpretation. Three types of research approaches are identified, namely qualitative, quantitative and mixed methods of research (Creswell, 2013:3).

Quantitative research consists of numerical data that employs methods such as experiments and surveys to obtain assessable data for statistical procedures to be applied (Zikmund & Babin, 2010:92). Using a quantitative method demands survey preparation, testing, validation and sample identification (Hair *et al*., 2013:77). In contrast, qualitative research is used to assess and evaluate non-numerical information (Gunnel, 2016) and is subjective in nature. This enables data categorisation through witnessing the experience in its natural setting, rejecting predetermined hypotheses, therefore, making use of crucial researcher judgement (Berrios & Lucca, 2006:181; Malhotra, 2015:246). For some research projects, a mixed method approach is necessary, where qualitative data serve as the input to quantitative data to be collected. This occurs when the objective of the research is not clear and it becomes evident once a qualitative study has been completed (Rucker, 2018). The mixed method focuses on collecting, analysing and mixing both quantitative and qualitative data in a single study or a series of studies (Creswell & Clark, 2007:5), which provides a better understanding of research problems than when using separate approaches (Waterman, 2012:159).

This study followed a quantitative approach, whereby self-administered survey questionnaires were administered to a large group of respondents. Statistical measurement and analysis of the information received was evaluated. In accordance, the questionnaire consisted of scales from previously validated studies. The succeeding section describes the research design used in this study.

3.4 RESEARCH DESIGN

A fundamental purpose of any research design is to solve marketing research problems (Chisnall, 1992:23; Malhotra, 2015:85). The research design can be described as a framework for the research project that is utilised to guide the process of the collection and evaluation of the data, where a particular problem is solved in a cost-effective manner (Wiid & Diggines, 2009:54). Burns and Bush (2010:98) state that advanced decisions can be made directly after the basic research design is identified that contributes towards the planning of the research project. Research designs are classified into three main groups, namely exploratory, descriptive and causal

research (Chrisnall, 1992:23; Hair *et al*., 2013:36-37; Silver *et al*., 2013:54). Figure 3-2 illustrates the three research designs.

3.4.1 Exploratory research

Exploratory research is used to obtain background information to define concepts and to clarify problems and hypotheses (Burns *et al*., 2017:94). Malhotra (2015:85) adds that exploratory research is used in situations where the research problem is addressed precisely and a relative course of action is taken. Exploratory research does not provide conformation from which one can make decisions (Shukla, 2008:32), since it is an informal and unstructured approach that is flexible and broad in nature (Burns & Bush, 2014:101). As such, several approaches can be used when conducting exploratory research, such as interviews, focus groups (Pratap, 2018), surveys and observations (Bhat, 2019a). In addition, Bhasin (2019) mentions that exploratory research establishes a strong foundation when choosing a specific research design, along with variables that are important for the study. This suggests that exploratory research enables the researcher to save time and resources, which ultimately contributes to the usefulness of the study (Bhat, 2019a).

3.4.2 Causal research

Causal research determines a cause-and-effect relationship through the execution of experiments (Dawn & Churchill, 2010:59). Causal research does not state that two or more variables are associated with one another, but it predicts that one variable, categorised as an independent variable, will affect another variable, categorised as a dependent variable (Berndt & Petzer, 2011:32). In addition, researchers manipulate the independent variables to determine the effect they have on the dependent variables (Jefferys, 2018). Pratap (2018) explains that causal research is highly structured, where control procedures are used during experimental designs. DeFranzo (2014) corroborates this statement by emphasising that causal research is complex, subsequently, contributing towards a level of uncertainty of the causal relationship. This implies that the researcher can never be entirely sure of whether there are any other factors influencing the relationship.

3.4.3 Descriptive research

Conclusive research takes on two important research designs, namely causal research and descriptive research. Descriptive research is used in the majority of research studies (Feinberg *et al*., 2013:57). Descriptive research aims to determine the existing elements of a specific target population (Hair *et al*., 2013:373). Moreover, descriptive research is based on a scientific

approach that focuses on observations and descriptions of a certain behaviour without influencing the subject (Shuttleworth, 2019). Hale (2018) emphasises that descriptive research can be described as a set of observations of the collected data. This implies that conclusions cannot be made from the data when considering the specific cause and effect relationship. Furthermore, a descriptive research design consists of either a longitudinal or a cross-sectional method. A longitudinal method measures the same sample units of a population repeatedly over a specific timeframe (Burns *et al*., 2017:99), which is valuable when analysing changes over time (Wiid & Diggines, 2009:56). However, a cross-sectional study, measures units from a sample of the population at single point in time (Burns *et al*., 2017:99), where the sample of the elements also provide an accurate representation of the target population (Wiid & Diggines, 2009:56).

The main purpose of this study was to gather and evaluate data regarding the antecedents of the attitude towards wrist-based fitness tracker usage amongst members of the South African Generation Y cohort. As a result, a descriptive research design was chosen to collect the relevant data. The following section explains the sampling strategy used in the research study.

3.5 SAMPLING STRATEGY

Since a suitable research approach is chosen, a sampling strategy should be selected and implemented. The process when choosing the sample from a population is called sampling (Wiid & Diggines, 2009:193), where a subgroup of the elements within the population, called a sample, is selected for participation in a study (Malhotra, 2010:371). According to Bernarte (2019), the sampling strategy outlines how the sampling decision, in accordance with the target population, sampling frame, sampling size and the sample method, were used.

Sampling includes its own fundamental terminology, which includes the population, census and a sample (Burns *et al*., 2017:238). The population is described as the collection of components that share a common set of characteristics, where information about the population variables may be procured through a census or a sample (Malhotra, 2010:371). A census describes circumstances where data are obtained from every member of the population of interest (Hair *et al*., 2013:328; McDaniel & Gates, 2001:328). A sample, on the other hand, describes a subset of the population, which represents an entire group of individuals from whom the information is required (Burns & Bush, 2014:239; Tustin *et al*., 2005:337).

Landreneau and Creek (2008) describe a sampling strategy as a plan that is set to ensure that the chosen sample regarding the research study are a true representation of the population from which the sample was drawn. As such, a discussion pertaining to the sampling strategy serves

as a cardinal element within research, where it ensures that the obtained sample will reflect qualities desired in a specific group. Therefore, the strategy will clearly indicate the sample size and other important features in terms of examination within every group that is studied (Otieno, 2016).

The following sub-sections describe the sampling strategy that was used pertaining to the specific target population, sampling frame, sample method and the sample size of this study.

3.5.1 Target population

Bajpai (2015:259) describes a target population as the gathering of the objects from which the researcher wishes to collect essential data in order to reach an appropriate and accurate conclusion. An inappropriate definition of the target population will lead to misleading results. As such, the target population must be defined very carefully, where the research objective serves as an important factor that should be considered when decisions regarding the target population are made. Reddy and Acharyulu (2008) reflect on the basic drawback when developing a sampling plan, which relates to the specification of particular characteristics so that the research objective can be achieved. As such, a particular population must be defined considering the elements, sampling units, extent and time.

For the purpose of this study, the target population was defined as all South African Generation Y members that range between the ages of 18 and 33 years, who participate in registered parkrun events during 2019.

3.5.2 Sampling frame

The sampling frame comprises a list of elements from which the sample may be drawn. The sampling frame is also known to as the ‘working population’, since these specific units will ultimately provide units involved in the analysis (Babin & Zikmund, 2016:342). Sekaran and Bougie (2016:240) identify several examples of a sample frame, which may include a set of directions such as an organisation’s payroll, a telephone directory, class rosters or a map.

The sampling frame for this study consisted of the 221 registered South African Parkrun events as of 2019. A single cross-sectional, non-probability convenience sample of three parkrun events, located in the Free State Province and the Gauteng province in South Africa was selected, of which two parkrun events were situated in the Free State province and one in the Gauteng province.

3.5.3 Sampling method

The sampling method used within a research study serves as a critical determinant when sample units are selected. There are two main sampling strategies, namely probability and non-probability sampling (Berndt & Petzer, 2011:173). Probability sampling uses random sampling techniques to generate a sample, which also enables researchers to create a sample that accurately represents a real-life population of interest (Foley, 2018). According to Trochim *et al*. (2015:92), probability sampling strategies provide secured external validity and minimises the chance of biased results. As such, probability sampling provides a detailed description regarding a sample and research results. In contrast, non-probability sampling refers to a method where samples are chosen based on the subjective judgement of the researcher, rather than random selection, where not all members of the population are given a chance to participate in the research study (Bhat, 2019b). According to Berndt and Petzer (2011:173), a probability sampling method requires a sampling frame from which a sample can be drawn, whilst with non-probability sampling, the sample can be drawn directly. Therefore, probability sampling provides estimates of precision, which contribute towards the chance to generalise the results of the research study. In contrast, non-probability sampling is a quicker and more cost-effective method that has a higher response rate (Bhat, 2019b). This might generate approved estimates of a characteristic of a target population (Malhotra, 2010:376).

The probability and non-probability sampling methods are categorised into sub-groups, as illustrated in Figure 3-3.

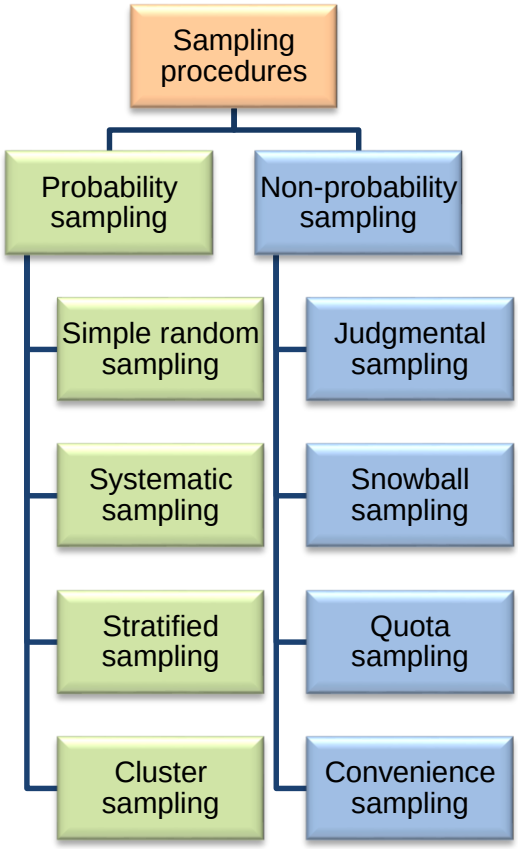


Figure 3-3: Probability and non-probability sampling methods (Mooi *et al*., 2017:44)

As presented in Figure 3-3, probability sampling methods consist of simple random sampling, stratified sampling, systematic sampling and cluster sampling (McDaniel & Gates, 2010:335). Simple random sampling is a method where distinct units are designated from units in the population, which results in the various possible combinations being equally likely to be chosen within the sample (Thompson, 2012:11). Systematic sampling, on the other hand, describes a method in which random selection is made within the first element for the sample, where subsequent elements are chosen through using a fixed interval until the expected sample size is achieved (Daniel, 2012:147). Kim *et al*. (2013:186) describe stratified sampling as the classification of a population into mutually exclusive groups, referred to as strata. Thereafter, a simple random sample from each stratum is chosen for the research project through a random process. Contrastingly, cluster sampling involves a sampling strategy where clusters of participants that represent the population are used. This method is often used when the population is too large for random sampling (Jackson, 2016:98).

The four different non-probability sampling methods are judgement sampling, quota sampling, snowball sampling and convenience sampling (McDaniel & Gates, 2010:335). Judgement

sampling, also referred to as purposive sampling, is applied when specific skills are needed to form an exemplary subset of the population. Additionally, judgement sampling can be described as a design that choses participants for a sample that is based on an experienced individual's belief that the chosen participants will fulfil the requirements of the study (Hair *et al*., 2008:136). In quota sampling, a population is classified into different groups, where quotas are then set on the number of elements, which can be chosen from each group. Quota sampling also serves as a technique that is dependent on availability to accurately determine which elements will be incorporated in the sample (Monette *et al*., 2011:153). Barazani (2019) explains that snowball sampling includes participants who are already included in the sample, where these participants are requested to ask other individuals who may be suitable for the sample, to participate in the research.

Clow and James (2014:231) define convenience sampling as "individuals or objects that are convenient for the researcher to survey". Convenience sampling also serves as a suitable approach that is inexpensive and time-efficient compared to the other methods. This makes the sampling units obtainable, easy to evaluate and cooperative (Malhotra, 2010:377). Silver *et al*. (2013:157) add that convenience sampling is a procedure that quickly and easily collects sample elements, where the sample that is the easiest to reach, is chosen and surveyed. Etikan *et al*. (2016:2) explain that convenience sampling is a type of non-random sampling where members of the target population meet the practical criteria, such as geographical accessibility, availability at a certain time or the willingness to contribute towards the study. As such, convenience sampling can be approached in different formations, such as mall intercepts (Sarstedt & Mooi, 2014:43), volunteers (Rossi *et al*., 2013:226), river samples (Olivier, 2011) and church groups (Berndt & Petzer, 2011:174). Therefore, convenience samples do not allow calculated and specific accuracy. As such, caution should be taken when the results of the data collected from convenience samples are interpreted (Malhotra, 2010:377). Convenience sampling is used regularly in various studies, especially in the earlier stages of research studies (Hair *et al*., 2008:136).

This study comprised a single cross-sectional, non-probability convenience sample of 450 Generation Y participants, partaking in the selected three registered parkrun events, aged between 18 and 33 years.

3.5.4 Sample size

Malhotra (2010:374) describes a sample size as the number of elements included in a research study, where important decisions require precise information. This leads to the need for larger

samples that could be costlier. Wiid and Diggines (2009:208) explain that a sample size forms part of a definite proportion of the population size that is required to reflect the worth of the population parameter. Ultimately, the sample size does not solely depend on the population parameter, but also on the behaviour variable within the population. That being the case, the assumption is made that the standard error and the confidence level will have an influential effect as a result of the sample size chosen.

A sample size of 450 parkrun-participants was selected for this study. This sample size is in the range of other studies similar in nature, such as Dwivedi *et al*. (2016) (sample size of 525), Muller (2019) (sample size of 480) and Ooi and Tan (2016) (sample size of 459), deeming it sufficiently large.

3.6 DATA COLLECTION METHOD

Brendt and Petzer (2011:202) point out that data collection is a vital aspect in a research study, since the entire planning process is implemented in the data collection process. Data collection can be described as the task of gathering feedback from a sample or from a group of individuals that is identified in the earlier stages of the research study. Dudovskiy (2019) elaborates that data collection methods can be divided into two categories, namely secondary methods and primary methods. Secondary data refers to data that has already been published in journals, books and newspapers. In contrast, primary data is first hand data collected by a researcher for a specific problem at hand (Shurbi, 2017). In addition, primary data are classified into two sub-groups, namely qualitative and quantitative data. Qualitative studies do not involve numerical numbers, but rather collect data that resemble feelings, words and emotions. This data collection method includes interviews and questionnaires, consisting of open-ended questions, observation and case studies. Quantitative data collection, on the other hand, is focused on different types of formats and mathematical calculations, where the data analysis includes questionnaires that consist of close-ended questions.

The most popular data collection methods used in quantitative studies are the survey and observation methods (Berndt & Petzer, 2011:202). According to Bajpai (2011:140), a survey can be described as the collection of information through participants for any predetermined research objective. In a survey method, a structured questionnaire is mostly used to gather data (Feinberg *et al*., 2013:236; Shukla, 2008:47-48) about respondents' demographics, attitudinal aspects and intentions (Bajpai, 2011:140). Surveys also consist of many different designs, such as door-to-door interviews, mall interviews, telephone interviews, computer-assisted interviews, mail surveys and executive interviews (Silver *et al*., 2013:169-171). In contrast, an observation method refers

to primary data collection that avoids depending on any cooperation and involves following or sensing behaviour and actions in some way. Observations can be classified as covert, overt or mechanical. The observation method can be used to identify issues and carried out by individuals or machines, but it is not associated with problem-solving research (Bradley, 2013:141).

This study employed a quantitative approach using the survey method, where a structured self-administered questionnaire was used to collect the necessary data. The questionnaire was submitted to the Ethics Committee of the Faculty of Economic and Management Sciences at the North-West University for ethics clearance (Ethics Clearance Number: 00097-19-A4). Once an ethical clearance certificate was obtained, the relevant organiser of each parkrun event was contacted telephonically and through email messaging to make the necessary arrangements to collect the data on the agreed upon date. The meeting also requested permission from the run directors at each parkrun event for the fieldworkers to administer the questionnaires before and after the parkrun event. After permission was obtained, the questionnaire was personally distributed by the researcher at each parkrun event, with the assistance of two trained fieldworkers. The participants were approached well in advance, where a table was set up before the events started. After participants completed the parkrun, they received time to recuperate before being approached to collect the data. The participants were informed of the research study's objectives, where voluntary cooperation was requested in completing the questionnaire. Participants were guaranteed that the completion of the questionnaire was anonymous and that their responses were recorded for statistical purposes only. The research questionnaire's design, content and layout will be analysed in the next sections.

3.6.1 Questionnaire design

A questionnaire is a structured instrument that comprises a variety of questions to be answered by a respondent. The questions can be presented verbally or written, which ultimately forms part of the data collection process (Malhotra, 2010:335). Burns *et al*. (2017:216) emphasise that a questionnaire is at the centre of the research process, where it transforms the research objectives into precise questions. Questionnaires also have key functions where the appearance, wording and question flow serve as vital elements that keep the respondents motivated when completing the questionnaire.

The design of a questionnaire is a crucial factor to consider since the formulation of a poor questionnaire will produce unreliable and perhaps insufficient information (Brace, 2018:9). In order to avoid these mistakes, ordinary and simple words should be used for the selected population to understand clearly what is being asked (Rios & Campo, 2013:98). Denscombe

(2010:167) states that questionnaires are mostly productive when the information provided is short and uncontroversial and when respondents can understand the questions regarding their age, intellect and language. Wiid and Diggines (2009:172) state that encouraging participants to complete the questionnaire successfully can strengthen their enthusiasm to participate, which will have a direct effect on the success of the questionnaire. Furthermore, Hyman and Sierra (2010:86-87) emphasise that self-administered questionnaires can be categorised as paper-and-pencil questionnaires or electronic questionnaires. Paper-and-pencil questionnaires can be dropped off for retrieval at an arranged time and place or can be delivered through mail, magazine or newspaper enclosures. Self-administered questionnaires, on the other hand, can be delivered through email messaging, a web site or an interactive kiosk in a place such as a shopping mall. Iacobucci and Churchill (2010:221) state that an appealing physical appearance of a questionnaire, combined with an understandable introduction and cover letter, is crucial when cooperation of participants is required. In addition, Dornyei and Taguchi (2010:12) point out that questionnaires that are too long become ineffective. As a principle, questionnaires should stay within a four-page limit and should not exceed 30 minutes to complete. This principle assures convenience for participants when completing the questionnaire. The length of the questionnaire can be regulated through the removal of redundant questions (Struwig & Stead, 2010:96).

The questionnaire used in the research study was guided by the above-mentioned recommendations. The questions were formulated in line with the empirical objectives of this study as indicated in Chapter 1. Unambiguous and simple English terminology were used to construct the questions. A cover letter attached to the questionnaire included the purpose of the research study, appropriate contact details and the reason this research study focused on Generation Y participants were included. Furthermore, a statement of consent was embedded in the cover letter, where participants voluntarily agreed to partake in this research study.

3.6.2 Questionnaire content

The questionnaire format is a systematic design that includes a variety of rational activities by which researchers choose the relevant scales and design the questionnaire format in such a way that it meets the data requirements (Hair *et al*., 2013:190). Malhotra (2015:245) identifies two main types of questions, namely structured and unstructured questions. A structured question pre-specifies the set of response possibilities, as well as the format of responses. These structured questions could be multiple-choice, dichotomous or scale-type questions. Contrastingly, an unstructured questionnaire comprises open-ended questions that give participants the freedom to answer the questionnaire in their own words. Hair *et al*. (2013:190) state that the researcher classifies the type of data in the questionnaire as nominal, ordinal,

interval or ratio analysis. Nominal scales are described as the most elementary level of measurement, where values are allocated to an object that makes it easier to identify and classify variables (Zikmund & Babin, 2010: 241). In contrast, Hair *et al*. (2013:162) describe an ordinal scale as a scale that enable respondents to convey corresponding dimensions between the answers to a question, whereas the ratio scale is classified as the highest-order scale. This scale consists of all the properties of the interval scale, combined with an attribute of having an absolute zero point (Clow & James, 2014:262). Malhotra (2015:212) adds that ratio scales enable the classification and ranking of objects, whilst intervals or differences can be compared. In addition, the three most frequently used itemised rating scales are identified as the semantic differential scale, the Stapel scale and the Likert scale (Cant *et al*., 2008:141; Iacobucci & Churchill, 2010:239; Malhotra, 2010:308; Wiid & Diggines, 2013:156).

The semantic differential scale consists of two opposing adjectives used to describe the scale ends, where respondents are obligated to either choose between the scale ends, or anywhere in-between (Bernd & Petzer, 2011:192). The semantic differential scale can be described as a unique bipolar ordinal scale that captures an individuals' attitude with regards to a given object (Hair *et al*., 2013:172). Moreover, the scale consists of three dimensions, namely evaluation, potency and activity. The evaluation dimension incorporates words such as helpful or unhelpful, whilst the potency dimension incorporates words like strong or weak. Lastly, the activity dimension includes words such as fast or slow, this also indicates that these three dimensions appear clearly, regardless of the object being evaluated (Iacobucci & Churchill, 2010:241). Individual items on a semantic differential scale can be scored on a -3 to +3 or a one to seven scale. The data is evaluated by means of a profile analysis, which calculates and compares mean values on each rating scale using statistical analysis or plotting (Malhotra, 2015:222). McDaniel and Gates (2007:304) add that any negative word should be allocated randomly on the left and right side, to force participants to read before they respond. The semantic differential scale is appropriate for analysing the strengths and weaknesses of a product or brand image.

Malhotra (2015:222) defines the Stapel scale as "a non-comparative vertical scale for measuring attitudes that consists of a single adjective in the middle of an even-numbered range of values, usually ten". The Stapel scale consists of 10 categories, numbered from -5 to +5, with the absence of a neutral or zero point. The Stapel and semantic differential scale are similar to each other, where the only difference occurs when the Stapel scale utilises one anchor as well as a positive and negative numerical scale (Clow & James, 2014:301). Iacobucci and Churchill (2010:243) further state that a Stapel scale does not conduct two opposing terms, but rather one term that does not include bipolar adjectives. Malhotra (2010:311) identifies various advantages of the

Stapel scale, such as not requiring a pre-test of the phrases and it can be administered over the telephone. However, the Stapel scale might be complicated and difficult to apply. The Stapel scale can be classified as the scale that is used least when compared with the other two itemised rating scales. Clow and James (2014:302) add that Stapel scales can lead to misinterpretations when non-neutral anchors are used, while these scales also take up more space on self-administered questionnaires and are less desirable than a semantic scale. The data gathered through using a Stapel scale can be evaluated in a similar manner as a Likert or semantic differential data, where the results of a Stapel scale are similar to the semantic differential scale (Malhotra, 2015:223).

The Likert scale, which is also known as the summated scale (Aaker *et al*., 2011:259), requires respondents to designate the degree to which they agree or disagree with various statements about a specific subject (Hair *et al*., 2013:171). The Likert scale can be defined as "a non-comparative measurement scale that typically has five response categories, ranging from strongly disagree to strongly agree, which requires the respondents to indicate the degree of agreement or disagreement with each of a series of statements related to the stimulus objects." (Malhotra, 2015:219). In addition, using the Likert scale enables the recording of the magnitude of respondents' feelings since they are requested if they agree or disagree with the statement (Burns & Bush, 2014:208). Researches mostly modify the Likert scale to consist of five, six or seven points. However, the six-point Likert scale obligates respondents to choose between a negative or positive answer, whilst a midpoint will indicate the unpredictability of the participant (Shiu *et al*., 2009:422). Burns *et al*. (2017:210) specify a particular application question that is commonly used as an effective approached in Likert scales, namely lifestyle inventory. The lifestyle inventory measures individuals' activities, interests and opinions. In addition, this approach considers the values and personality traits of individuals that clearly reflects their work, leisure time and purchases. Zikmund and Babin (2013:255) emphasise that the Likert scale is classified as the most commonly applied format in marketing research, given that it is understandable and easy to administer. Iacobbucci and Churchill (2010:241) add that the Likert scale also measures the intensity of what the participants' feel about the specific object that is being measured. However, Malhotra (2010:309) states that respondents may take longer to complete the Likert scale compared to other itemised rating scales, since the participant is obligated to read each statement. Therefore, Likert scales are most effective when used in research designs that consist of self-administered surveys, online surveys or personal interviews (Hair *et al*., 2013:172).

The questionnaire in this research study was developed to achieve the empirical objectives of the research study as constructed in Chapter 1. In order to achieve these objectives, this research study adapted previously validated scales. These scales intended to measure participants'

attitude towards wrist-based fitness tracker usage (four items), PU (six items), PEOU (five items), perceived social image (four items) and perceived cost (four items). Attitude was measured using the adapted scale as used by Kim and Shin (2015), who reported a Cronbach alpha value of 0.95 as developed by Venkatesh *et al.* (2003), who reported a Cronbach alpha value of 0.84. The PU of wrist-based fitness trackers was measured by combining and adapting the scales of Shin (2007) and Park and Chen (2007), who reported Cronbach alpha values of 0.98 and 0.97 respectively. Similarly, the PEOU of wrist-based fitness trackers was determined by combining and adapting the scales of Kim and Shin (2015), who reported a Cronbach alpha value of 0.89 and the scale of Kuo and Yen (2009). For the latter scale, no definitive Cronbach alpha value was reported, except that the Cronbach alpha values for the scales used in the study fell between 0.76 and 0.89. The perceived ease of use scale and the PU scale were built on the foundations of the TAM, as developed by Davis (1989), proven as successful and reliable determinants of technology adoption over several decades (Ismail & Masinge, 2012; Lee, 2009; Luarn & Lin, 2005; Masinge, 2010; Ozag & Duguma, 2004; Wu & Wang, 2005; Wu *et al*., 2008; Lin & Bhattacherjee, 2010:166; Kim & Shin, 2015:534).

Perceived social image was measured by adapting the scale of Yang *et al.* (2016), where a Cronbach alpha value of 0.95 was recorded. The perceived cost of wrist-based fitness trackers was determined by adapting the scale of Shin (2009a) and Kim and Shin (2015), where the latter study produced a Cronbach alpha value of 0.72 and the former study did not reveal a definitive value for the particular construct, but ranged from 0.72 to 0.91. As such, the reliability of the constructs is implied since all values fall above the recommended range of 0.60 – thus, internal consistency reliability of the measurement instrument used in this study is assumed. The items in every construct were measured on a six-point Likert scale (1=strongly disagree, 6=strongly agree) based on the participants' agreement or disagreement with the statements.

The questionnaire comprised three sections, including a section designed to collect the participants' demographical data (Section A), such as how often they attend parkrun events, reasons for attending parkrun events, province of the parkrun they attend, country of origin, province of origin, highest education, gender, ethnic group, home language, age and how often respondents' train. Furthermore, the questionnaire included a section aimed at gathering background information with regards to wrist-based fitness trackers (Section B). In this section, questions related to whether participants owned a wrist-based fitness tracker, evaluating whether these devices would improve their activity level and whether a wrist-based fitness tracker encouraged them to be physically more active. Furthermore, the background information questions aimed at uncovering whether the participants attended parkrun events more often

because of their wrist-based fitness tracker. In addition, questions were included that related to participants' most recognised wrist-based fitness tracker brand, features of wrist-based fitness trackers that they considered important, as well as how much money they were willing to spend on a wrist-based fitness tracker.

3.6.3 Questionnaire layout

Malhotra (2015:525) emphasises the importance of the format, spacing and positioning of questions, because it can have a remarkable effect on the results. Therefore, the correct layout is a vital aspect when designing and using questionnaires. The format and layout of the questionnaire should provide respondents with content that is easy to read, allowing them to follow instructions effortlessly. Therefore, if the layout of the questionnaire is disregarded, the quality of the data will be impacted negatively (Hair *et al*., 2013:199). Moreover, a questionnaire that is laid out neatly and professionally will have a higher response rate, given that it simplifies the reading process for the respondents and reduces confusion (Berndt & Petzer, 2011:196).

A questionnaire should comprise several sections to gather different types of information (Malhotra, 2010:352). The questionnaire of this research study was divided into three sections, namely Section A, Section B and Section C (refer to Annexure A). Section A (A1 - A11) was designed to collect specific demographic information from participants. Section B (B1 - B4) gathered participants' background information with regards to wrist-based fitness devices. The last section, Section C (C1 – C23), measured the antecedents of Generation Y park runners' attitude towards wrist-based fitness tracker usage.

Despite these devices being available to consumers for some time, research on the topic remains limited. Bearing in mind that wrist-based fitness trackers are considered a new technology in South Africa, various scales of a similar nature, used in various wearable technology and devices, smartwatches and new technological products research, were used to collect the data for this research study. Table 3-1 comprises the five possible factors that could determine the participants' attitude towards wrist-based fitness tracker usage, as used in previous research studies.

Table 3-1: Possible factors influencing attitude towards writs-based fitness tracker usage

Factors	Author/s
Perceived attitude	Ajjan and Hartshorne (2008); Choi and Kim, (2016); Kim and Shin, (2015); Sanchez and Hueros (2010); Taylor and Todd, 1995; Venkatesh *et al*., (2003)
Perceived usefulness	Davis, (1989); Featherman and Pavlou (2003); Kulviwat *et al*., (2007); Lee, (2009); Shin, (2007); Taylor and Todd, (1995); Chuah *et al*., (2016)
Perceived ease of use	Davis, (1989); Davis *et al*., (1992); Huang *et al*., (2007); Kim and Shin, (2015); Nasir and Yurder (2015); Taylor and Todd, (1995)
Perceived social image	Lin and Bhattacherjee, (2010); Muller (2019); Venkatesh *et al*., (2003); Yang *et al*., (2016)
Perceived cost	Huang *et al*., (2003); Kim and Shin, (2015); Moore *et al*., (1991); Shin, (2009); Wu and Wang, (2005)

3.7 PRE-TESTING OF THE QUESTIONNAIRE

Pre-testing is done for face and content validity of the questionnaire. Content validity refers to how precise a measurement tool identifies different aspects of each specific construct in the questionnaire (Clause, 2018). In addition, Shuttleworth (2016) defines face validity as “a measure of how representative a research project is ‘at face value’ and whether it appears to be a good project”. Rubin and Chisnell (2008:174) emphasise that the pre-testing of a questionnaire is considered as an integral element in the test design process. The purpose of a pre-test highlights the particular test objectives. These objectives include an evaluation of participants’ first impressions, classifying participants into different groups or to initiate the degree of competence. A pre-test also serves to identify and repair issues that respondents experienced while completing the survey, to improve the validity and variability of the questionnaire (Burns *et al*., 2017:230). The pre-testing also contributes towards ensuring that the questionnaire is suitable for the survey in terms of language and structure, which allows the researcher to ensure that the information gathered from the population is collected by the research instrument (Bajpai, 2011: 86; Reynolds & Diamantopulos, 1996:1).

Bajpai (2011:87) identifies two common strategies to pre-test a questionnaire, namely protocol analysis and debriefing. With protocol analysis, respondents are asked to ‘think aloud’ when they answer questions. This strategy provides detailed information about the participants’’ reactions towards each specific question, which is then analysed and corrected accordingly. In contrast, the debriefing approach refers to an interview after the questionnaire is completed, whilst participants are only informed that the questionnaire was a pre-test afterwards. This strategy is

used to motivate participants to share their different viewpoints regarding the questionnaire as well as discuss faults detected in the questionnaire.

Pre-testing the questionnaire is conducted with between five to 10 respondents, who are pertinent field researchers or actual participants, after the design of the questionnaire is completed to remove any potential problems within the design of the questionnaire (Zikmund & Babin, 2013:183). Hair *et al*. (2013:39) explain that respondents should reflect on issues such as simplicity of instructions and questions, the order of the topics and any other subject within the questionnaire that is difficult to understand. The pre-test will confirm that the study is viable before expense and time are used in the data collection process (Wong, 2015).

The questionnaire of this study was pre-tested through the debriefing approach. First, four academic staff members and two non-academic members, were asked to partake in the de-briefing process to pre-test the questionnaire. Among the four academic staff members, two were English first language speakers with limited knowledge of wrist-based fitness trackers. The other two academic staff members were English second language speakers with knowledge pertaining to wrist-based fitness trackers. Furthermore, of the two non-academic members, one was an English first language speaker with knowledge pertaining to wrist-based fitness trackers, while the second non-academic member was an English second language speaker with limited knowledge of the topic. The purpose of this approach to the study was to confirm that both first language and non-English first language speaking participants, as well as that both individuals with limited or full knowledge of wrist-based fitness trackers would be able to understand and complete the questionnaire easily. It took the participants approximately 15 minutes to complete the questionnaire, which is adequate according to McDaniel and Gates (2007:352). After the pre-testing of the questionnaire, feedback was evaluated and the wording of certain items where slightly adapted to make it more understandable in the multilingual environment that is characteristic of South Africa. The final questionnaire, with a cover letter (refer to Annexure A), was distributed for the main survey.

3.8 ADMINISTRATION OF THE QUESTIONNAIRE

According to Shiu *et al*. (2009:486), the administrating process pertaining to the questionnaire entails the gathering of information. Moreover, Ekinci (2015:29) states that the proposed method of questionnaire administration will serve as a strong influencer on the questionnaire design, where the accessibility of the sample often influences the type and administration of questionnaires. The process of administrating the questionnaire for this study was accomplished

in September 2019, using a sample of 450 Generation Y parkrun participants. Three parkrun events were utilised to distribute 450 questionnaires.

The relevant organiser of each of the three parkrun events was contacted telephonically and through email messaging to elaborate on the study and the objectives. The meeting requested approval from the run director at each of the parkrun events for the questionnaire to be administered by the trained fieldworkers before and after the parkrun event. After an appropriate date and time was scheduled, the questionnaire was distributed personally by the researcher and with the assistance of two fieldworkers to the physical venues where participants were approached. The participants were approached well in advance where a table was set up before the parkrun event started. After participants completed the parkrun, they received time to recuperate before being approached to collect the data. Participants were informed regarding the study and its objectives, where voluntary cooperation was requested in completing the questionnaire. Participants were guaranteed that the completion of the questionnaire was anonymous and that their responses were recorded for statistical purposes only. After the participants completed the questionnaire, the questionnaires were instantly returned to the researcher. The questionnaire took approximately 15 minutes to complete. The final data obtained from the study, was tabulated and assessed, as shown in Chapter 4. The main aim of collecting the data from this study was to draw conclusions and make applicable recommendations.

3.9 PRELIMINARY DATA ANALYSIS

Grbich (2013:21) describes the preliminary data analysis as a continuous process of checking and tracking data to analyse the research results. Preliminary data analysis also identifies areas that require more attention in terms of following up the data that was collected and questioning where the results are leading. The data-preparation process is described by Malhotra (2010:453) as the preparation of a preliminary plan of data analysis, questionnaire checking, editing, coding, transcribing, data cleaning, adjusting the data statistically and selecting a data analysis strategy. Additionally, Iacobucci and Churchill (2010:350) emphasise that preliminary data analysis consists of data editing, coding and tabulation.

Brown *et al*. (2014: 351) refer to editing as the inspection and correction of data that are received from every specific element of the sample. The editing process enables critical reviewing of questionnaires that have incomplete answers, invalid or unreliable responses and answers that reflect a lack of interest. Wiid and Diggines (2009:230) elaborate that the researcher must consider following specific criteria when the questionnaires are edited, namely cheating by the

interviewer, compliance with sampling requirements, relevance of the answers, completeness of the question and sections, comprehensiveness and unambiguity of answers, comprehensibility of answers, legibility and clarity of the respondents handwriting and inconsistencies.

Coding refers to the process of allocating a numerical score, or any other character or symbol, to data that was previously modified. The main purpose of coding is to represent a specific explanation in data by allocating a measurement symbol to several categories of responses, which can be a number, letter or a word (Zikmund & Babin, 2013:363). If the questionnaire only comprises structured questions or a few unstructured questions, the data needs to be pre-coded. This implies that codes are assigned before fieldwork is conducted. In contrast, if questionnaires comprise of unstructured questions the data are coded afterward. Therefore, codes are assigned after the questionnaires have been returned from the fieldwork process (Malhotra, 2010:454). Transcribing the data requires the transferring of the coded data from questionnaires or coding directly into computers through keypunching, optimal recognition, digital technologies, bar codes or other technologies (Malhotra, 2010:459).

Wiid and Diggines (2009:235) explain that data cleaning analyses the internal consistency of all possible and impossible codes. Data cleaning refers to identifying and correcting errors that occurred while the data was being entered. The data cleaning process is also time-consuming and expensive, therefore, the need for data cleaning will depend on the quality of the information provided. Osborne (2013:9-10) emphasises that data cleaning is crucial, because it affects the validity of quantitative approaches directly. As such, data cleaning can identify and deal with ineffective scores as well as missing responses.

The questionnaire was pre-coded with the assistance of a statistician where a manual keypunching method was used. Responses that indicated any nationality other than South African and age responses outside the 18 – 33 years of age category were rejected. Moreover, questionnaires that were incomplete by more than 10 percent, which is, more than five missing values, were also rejected.

The statistical analysis procedures used to present the data obtained from the survey are discussed in the succeeding section.

3.10 STATISTICAL ANALYSIS

Statistical analysis refers to a method that is used to analyse data, determine significance and to specify the relationships between sets of data (Wiid & Diggines, 2009:242). Statistical analysis,

therefore, can be defined as the science of examining large amounts of data to investigate the primary patterns, trends and hidden perceptions (Bhakuni, 2018).

SPSS is a consolidative software package that assists in several stages of the marketing research process, such as defining the research problem, developing a research approach, formulating the research design, up to the analysis and presentation of the data (Malhotra, 2010:59). The captured data were analysed using SPSS Version 25.0 for Microsoft Windows. The following statistical techniques were used on the empirical data sets:

- Exploratory factor analysis
- Reliability and validity analysis
- Descriptive statistical analysis
- One sample t-test
- Correlation analysis
- Regression analysis

3.10.1 Exploratory factor analysis

Factor analysis involves evaluating a set of items to establish primary constructs through decreasing a larger number of items into smaller sections (Clow & James, 2014:311). Factor analysis is used to describe a set of processes that reduce and summarise the data, which have the purpose to identify simple patterns (Bradley, 2013:321). Brown (2015:1) differentiates between two types of factor analysis, namely confirmatory factor analysis and exploratory factor analysis.

Confirmatory factor analysis includes the testing of a hypothesis to indicate that a relationship exists between the observed variables and its underlying latent constructs (Malhotra, 2010:727). Struwig and Stead (2010:142) add that a confirmatory factor analysis either confirms or discards the predicted factor structure. In contrast, exploratory factor analysis refers to several extraction and rotation methods that are formulated to represent unobserved or latent constructs (Osborne & Banjanovic, 2016:3). Exploratory factor analysis predicts that there are latent variables that originate from the observed variables, whilst the calculations and results can be explained differently based on each assumption. Pallant (2013:190) emphasises the importance of assessing the sampling adequacy before a factor analysis can be done. As such, Hair *et al*. (2010:640) suggest that a five to one ratio needs to be considered, which implies that five observations should be present for every item that will be factor analysed. Furthermore, two

measures are identified to evaluate whether the sample is appropriate (Kaiser-Meyer-Olkin) to conduct a factor analysis and whether sufficient correlations are present (Barlett's test of Sphericity) (Yong & Pearce, 2013:85; Hinton *et al*., 2004:349). Pallant (2013:190) states that a factor analysis can be considered sufficient if the Kaiser-Meyer-Olkin index has a value greater than 0.6 and a significant Barlett's test of sphericity value. Malhotra *et al*. (2010:643) distinguish between two basic approaches to extract factors, namely common factor analysis and principal component analysis. Common factor analysis is estimated based solely on common variance, which is sufficient when the main objective is to identify the underlying dimensions, as well as the common variances. Contrastingly, principal component analysis is used to analyse the minimum number of factors that will contribute towards the maximum variance explained in the data. Osborne and Banjan (2016:5) describe an extraction method as one of a series of methods that evaluate the correlation between variables, whilst dormant variables are removed from the dataset. Yang (2005:190) divides extraction methods into two different groups, namely maximum likelihood and principal axis factoring. Maximum likelihood is interpreted as a general-purpose tool for speculation that incorporates the assessment of statistical significance, calculating confidence intervals, model assessment, as well as prediction (Millar, 2011:3). Pituch and Stevens (2016:364) describe principal axis factoring as a factor extraction approach that supports the common factor model, where predictions of commonalities replace the ones that are used in the diagonal of the correlation matrix.

Exploratory factor analysis was used in this study by means of a principal component analysis, using a varimax rotation. The succeeding section focusses on the reliability analysis.

3.10.2 Reliability analysis

Reliability is the extent to which a scale can transcribe the same or similar measurement results in numerous trails, which implies that reliability is a measure of consistency in measurement (Hair *et al*., 2008: 151, Hair *et al*., 2013:165). Bradley (2010:60) adds that a scale can only be reliable when a recurrent measurement gives results consistently. Wiid and Diggines (2009:109) identify two types of errors, namely random and systematic error. Random error produces inconsistency if the same measuring instrument is used (Iacobucci & Churchill, 2010:254), whilst a systematic error represents stable elements that effect the observed scores in a similar manner that the measurement is made (Malhotra, 2015:225). The evaluation of reliability analysis can be understood through using different methods, namely test-retest, alternative forms and internal consistency methods (Malhotra, 2010:318-319).

The test-retest reliability repeats the scale measurement with a similar sample of respondents at two different points in time, where it also assesses two different samples of respondents from the same target population under similar conditions (Hair *et al*., 2013:165). Iacobucci and Churchill (2010:259) strengthen the importance of the waiting-period between the administration of the measure, where the interval between the two tests must fall in the range of two to four weeks to avoid the results to be affected negatively. Malhotra (2010:319) adds that the degree of similarity between the two measurements is analysed through calculating the correlation coefficient. Therefore, the higher the correlation coefficient is, the greater the reliability will be. Hair *et al*. (2013:165) point out that the test-retest reliability approach identifies if there are any random variations present, which are revealed by the scores between the two samples. The scale will only be contemplated as stable and reliable if there are only a few differences are present between the first and second administrations of the scale.

The alternative forms reliability method evaluates the reliability and requires two equivalent forms of the scale to be constructed, while the exact same respondents are evaluated at two different points in time (Malhotra, 2010: 319). Wrenn *et al.* (2007:139) explain that the process of correlating the results will provide a measure of the reliability of the forms. According to Beri (2013:148), the major problems that are related to alternative-form reliability is that the comparing process is time consuming as well as expensive when it is compared with other approaches. Malhotra (2010:319) states that the two forms should be identical in terms of content, which demands that the alternative scale elements should have similar means, variances and intercorrelations. As such, a low correlation indicates that the scale is unreliable, or the forms are not identical.

Internal consistency reliability refers to the usage of one measuring instrument and evaluating its reliability through making use of various samples or various items within each scale. This ultimately eliminates issues that can occur with the second administration of the survey instrument (Clow & James, 2014:268). Zikmund and Babin (2010:249) distinguish between two categories in which internal consistency can be analysed, namely split-half reliability and coefficient alpha, which is also known as Cronbach's alpha (Cant *et al*., 2008:235). Split-half reliability is known as the simplest measure of internal consistency, where the items on the scale are divided into two halves, while the resulting half scores are correlated. High correlations suggest high internal consistency of the two halves (Malhotra, 2010:319). Iacobucci and Churchill (2010:259) state that coefficient alpha serves as a more acceptable method to evaluate the internal similarity of a set of items, where all the items are used simultaneously and not just evaluating half of the items. Clow and James (2014:269) add that a higher Cronbach alpha score will lead to a more reliable

and trustworthy measure. The coefficient alpha varies from 0 to 1, where a value of 0.6 or less will result in an insufficient internal consistency reliability (Malhotra, 2010:319). One important ascendancy that the Cronbach alpha value provides is that researchers can decide to discard items and retest the construct for reliability if the construct is not a good measure or if the correlation with the other items is low (Clow & James, 2014:269). Malhotra (2010:319) states that the coefficient alpha may be expanded artificially and inappropriately through including unnecessary scale items. As such, the Cronbach alpha is likely to increase with more scale items, whilst internal consistency reliability can only be assured when unnecessary scale items are removed.

This study used an internal consistency reliability approach to determine the reliability of the scale by calculating the Cronbach alpha value for the entire measurement instrument as well as for each individual construct.

3.10.3 Validity analysis

The validity of a scale refers to the degree to which dissimilarities in observed scale scores represent accurate differences between objects based on the characteristic that is being measured, instead of systematic or random error (Malhotra, 2010:320). Cant *et al*. (2008:235) add that a scale will represent perfect validity if random or systematic error is absent. Validity describes the trustworthiness of responses towards a measure (Burns & Bush, 2014:214).

Berndt and Petzer (2011:109) classify validity into two categories, namely internal and external validity, where internal validity regulates if a change in a dependent variable can be the result of the introduction of an independent variable. Iacobucci and Churchill (2010:107) state that external validity, on the other hand, is required when the researcher wants to generalise the data obtained. There are three concepts involved when measuring scale validity, namely content validity, criterion validity and construct validity (Cant *et al*., 2008:235; Iacobucci & Churchill, 2010:256; Malhotra, 2010:320).

Silver (2013:104) classifies content validity as one of the most common forms to address validity in the practical field, where it is tested to determine if the domain of the construct is specified. Clow and James (2014:270) define content validity as a systematic process that evaluates the adequacy of the items that is used to measure a construct. Content validity is also known as face validity, because it is evaluated through looking at the measurement to establish the domain being sampled. Therefore, the lack of content validity is clearly identified if the actual items differ from the possible domain (Iacobucci & Churchill, 2010:257). Hair *et al*. (2013:167) emphasise that the face validity of a scale is concerned with the researchers' assessment of whether statements

measure what they are supposed to measure. Content validity necessitates a more subjective evaluation where it determines if a construct represents all the dimensions of the item. As such, researchers need to use their expert judgement to determine face validity accurately. Given the subjective qualities of content validity, this method alone is not enough to measure the validity of a scale, therefore criterion validity needs to be examined to obtain a more formal evaluation (Malhotra, 2010:320).

Malhotra (2010:320) states that criterion validity evaluates whether the measurement scale performs as predicted when compared to other variables selected. Criterion validity also allows the evaluation of the usefulness of the measure as a predictor of a different characteristic of the individual (Iacobucci & Churchill, 2010:256). McDaniel and Gates (2007:281) classify criterion validity into two different subsets, namely predictive and concurrent validity. Predictive validity evaluates the extent to which a measurement can predict future actions or behaviour (Clow & James, 2014:271). In contrast, concurrent validity evaluates the relationships between the measure and the criterion variable that occurs at the same point in time. If the correlation of variables is high, the measure will most likely have a predictive validity (Iacobucci & Churchill, 2010:256).

Clow and James (2014:271) explain that construct validity evaluates the extent to which the measurement detains the construct and how well it connects with underlying theories logically. According to Hair *et al*. (2013:167), construct validity is classified into different groups, namely convergent validity and discriminant validity, which is examined after the data is collected and is applicable when multi-scales are used. Convergent validity describes the degree to which the scale correlates positively with other measures of the exact same construct (Malhotra, 2010: 321). Discriminant validity refers to a method that demands that the measure does not correlate too highly with unrelated measures (Iacobucci & Churchill, 2010:256). Discriminant validity is measured through the Heterotrait-Monotrait Ratio of correlation (Henseler *et al*., 2015:121), whereby discriminant validity is evident when the ratios of the HTMT are below 0.85 (Phillips & Furness, 1997:14). Nevertheless, some authors claim that a ratio below 0.90 is acceptable (Gold *et al*., 2001:202). Malhotra (2010: 321) distinguishes nomological validity as a category of construct validity, which describes the level that the scale correlates in a theoretically expected manner, while measurements of different but related constructs are present.

The measuring instrument for this study was evaluated through content and construct validity. The construct validity of the scale was chosen using inter-item correlations. These correlations should range from 0.15 to 0.50 (Clark & Watson, 1995:316). This study determined discriminant validity by computing the Heterotrait-Monotrait Ratio of correlation, as part of the validity analysis.

3.10.4 Descriptive statistical analysis

Descriptive measures serve as a fundamental element in the evaluation process forming part of the foundation for subsequent analysis. Descriptive analysis is defined as a method that describes the variables in a dataset. These variables specify the question responses, while the dataset represents all the respondents' answers (Burns *et al*., 2017:317). Iacobucci and Churchill (2010:59) explain that descriptive research allows the researcher to determine the frequency that occurs between two variables and the relationship that variables have towards each other.

The measures of location, also referred to as measures of central tendency, describe a location that exists within a dataset, where it identifies the central point of the distribution. Measures of location describe three statistical methods, namely the mean, the median and the mode (Malhotra, 2010:486). The mean is an arithmetic average that consists of a set of numbers that is determined by considering every member of the set of data. As such, means provide important information that could be plotted for quicker analysis that is ultimately more informative than the median (Burns & Bush, 2014:320). The median is described as the middle value that exists between the lowest and highest value. This implies that half of the responses are above and the other half of the responses are below the median value (Hair *et al*., 2008:154; Wiid & Diggines, 2009:243). Hyman and Sierra (2010:321) refer to the mode as the value that appears most frequently, which can summarise nominal and categorical data. As such, these values are allocated to objects for classification and identification purposes.

The measures of variability refer to a statistic that specifies the distribution dispersion. Measures of variability are calculated on ratio data, including the range, coefficient of variance and standard deviation (Malhotra, 2010:487). Burns and Bush (2014:321) explain that a range distinguishes between the distance of the lowest and highest value, where it recognises the interval in which the set of data occurs. The range can be used to stipulate how far apart the extremes are found. Variance measures the average squared distance from the mean, where the variance should only be used with numerical scores from interval or ordinal scales of measurement (Gravetter & Wallnau, 2010:92, 94). Hair *et al*. (2008:250) define standard deviation as "the average distance of the distribution values from the mean, where the difference between a specific response and the distribution mean is classified as a deviation". The standard deviation serves the same purpose as variance to understand how clustered the distribution occurrence is around the mean value (Malhora, 2015:333).

Measures of shape are mainly used for a more comprehensive understanding pertaining to the nature of distribution (Malhotra, 2010:488). Black (2009:77) points out that measures of shape,

such as skewness and kurtosis, are tools that can be used to explain the shape of a distribution of data. Skewness can be defined as the extent of deformation from the symmetrical bell curve or the normal distribution, which measures the lack of symmetry in the data distribution. Skewness differentiates between extreme values, while the standard of a symmetrical distribution indicates a skewness of zero (Jain, 2018). Malhotra (2010:388) emphasises that values in a symmetrical distribution are equally likely to plot on either side of the centre of the distribution. This implies that the positive and negative deviations from the mean will be equal. However, the positive and negative deviations in a skewed distribution from the mean will be unequal. Shurbi (2017) defines kurtosis as the framework of relative sharpness towards the peak of the probability distribution curve, where it identifies the way observations are clustered around the centre of the distributions. Malhotra (2010:488-489) adds that a positive distribution of kurtosis is more peaked than a normal distribution, whilst a negative value indicates that the distribution is flatter than a normal distribution in a study. As such, skewness and kurtosis should range between the recommended levels of -2 and 2, which indicates an acceptable range for being normally distributed (George & Mallery, 2010).

Descriptive statistical methods used in this study were measures of location, measures of variability and measures of shape (Malhotra, 2010:486).

3.10.5 Significance tests

Shuttleworth and Wilson (2008) emphasise that significant tests are vital in assessing data. Significant tests assist in determining whether the data supports or rejects the null hypothesis and if the alternative hypothesis could ultimately be accepted. A hypothesis can be defined as a temporarily accepted declaration regarding the marketing problem or opportunity, which identifies the area of research and specifies the direction that the research is taking (Wiid & Diggines, 2009: 49). In order to establish if the hypotheses that were formulated for the study will be rejected or accepted, the existence of a significant difference between the findings from the selected sample and what the findings would have been if the entire population was taken into account, should be determined (Bradley, 2010: 327). Three hypotheses (Section 1.4) were formulated for this study with a significance level at $\alpha = 0.01$ (McDonald, 2014:16-23). The significance tests computed in this study comprised a one-sample t-test, correlation analysis and regression analysis.

3.10.5.1 T-tests

Sarstedt and Mooi (2019:160) explain that the selection of suitable statistical tests is based on four crucial elements, namely assessing the testing environment, determining the nature of the samples that are being compared, evaluating the assumptions on normality to determine which

type of test to use and testing the region of rejection in terms of choosing the sample that should be used. Malhotra (2010:504) points out that a one-sample t-test can be used to do a comparison on one sample's mean against an expected mean.

According to Mooi and Sarstedt (2019:115), t-tests are classified as one of the most popular parametric tests for examining means. The one-sample t-test, independent sample t-test and a paired sample t-test can be used to evaluate dissimilarities between means. Malhotra (2010:504) points out that a one-sample t-test can be used to do a comparison on one sample's mean against an expected mean. Zikmund and Babin (2013:390,396) differentiate between independent-sample t-tests and paired sample t-tests. An independent-sample t-test differentiates between the means of two independent samples in the target population. Contrastingly, a paired-sample t-test refers to the comparisons between the scores of two interval variables that is drawn from related populations. Another component that is used along with t-tests when the sample size is larger than 30, is classified as z-tests. The z-tests also closely resembles the t-test and is used when the populations' standard deviation is known beforehand. However, the t-test is slightly more accurate than z-tests and is used in SPSS (Sarstedt & Mooi, 2019:168).

This study used a one-sample t-test on all the scale factors to analyse its significance.

3.10.5.2 Correlation analysis

Wiid and Diggines (2009:248) emphasise the importance of determining if there is a relationship between a set of dependent and independent variables. Correlation is used to assess the relationship between two or more interval variables. This implies that if there is a change in one variable, it is also connected to a change in another variable. Burns *et al*. (2017:383) further state that correlation indicates the strength of association between two variables according to their size, whilst the sign specifies the direction of the association. The results of a positive sign will indicate a positive direction, where a negative sign indicates a negative direction. However, before a correlation analysis can be used, it must first be classified as statistically significant from zero (Burns *et al*., 2017:382).

The correlation coefficient, known as the Pearson product-moment correlation coefficient (Allen, 2017:289) or the product moment correlation (Malhotra, 2010:562) and the Pearson correlation coefficient (Berndt & Petzer, 2011:286), refers to a parametric measure of association for two continuous random variables (Coussement *et al*., 2011:211) and is represented by the symbol 'r'. Nishishiba *et al*. (2014: 229) explain that a correlation coefficient is used as a statistical method to assess the linear relationship between two continuous variables. The Pearson correlation coefficient ranges from -1.00 and 1.00, where zero represents no relationship between two

variables (Hair *et al*., 2008:286). When a perfect correlation between two variables occurs, the correlation coefficient represents a value of exactly -1 or +1, whilst a coefficient with a value between zero and -1 indicates a negative relationship between the variables. If the correlation coefficient is between 0 and +1, a positive correlation between the variables occurs (Wiid & Diggines, 2009:249).

For the purpose of this study, Pearson's correlation coefficients were computed to determine the relationship between specific elements to evaluate if there is a relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and South African Generation Y members' attitude towards wrist-based fitness tracker usage.

3.10.5.3 Regression analysis

Regression analysis is identified as one of the most frequently used evaluation techniques in market research, where the relationship between dependent and independent variables is evaluated (Mooi *et al*., 2017:216). A statistical procedure analyses if there are any relationships between a metric dependent variable or independent variables. Regression analysis evaluates the nature and extent of associations between variables (Malhotra, 2010:568).

Clow and James (2014:416) emphasise that mathematical relationships do not prove cause and effect. This explains that if one variable highly correlates with another, the assumption cannot be made that the one variable causes the other to occur. Therefore, the results in a regression analysis indicate the amount of change in the dependant variable that is related with a one-unit change in the independent variable (Hair *et al*., 2013:337). Regression analysis is also used to strengthen prediction capabilities, which provides valuable insight regarding the nature of multiple relationships between the variables in the dataset (Burns & Bush, 2014:319). Malhotra (2015:372) points out that regression analysis consists of simple or bivariate regression, as well as multiple regression analysis.

Bivariate regression or simple regression is a method for obtaining a mathematical equation through a straight line. It is also a framework that utilises information between an independent variable and a dependent variable to ultimately make assumptions. In bivariate regression, there is only one independent variable that can be tested, therefore indicating that the researcher determines the correlation towards a dependent variable (Hair *et al*., 2013:322; Malhotra, 2015:372). This analysis indicates several similarities to determine the simple correlation between two variables, however since an equation must be obtained, a distinction between a dependant and independent variable must be reached (Malhotra, 2010: 568).

Zikmund and Babin (2010:390) define multiple regression analysis as “an association to which the effects of two or more independent variables on a single, interval-scaled dependent variable, are investigated simultaneously”. This insinuates that a multiple regression analysis refers to a single dependent variable that is explained by several independent variables. Hair *et al*. (2013:327) add that independent variables are entered into the equation, where a separate coefficient is calculated to describe its relationship with the dependent variable. The coefficients assist in evaluating the effect that each independent variable has on the dependent variables.

For the purpose of this study, regression analysis was performed to evaluate whether Generation Y members’ perceived usefulness, perceived ease of use, perceived social image and perceived cost statistically significantly influence their attitude towards wrist-based fitness tracker usage.

3.11 SYNOPSIS

This chapter described the research methodology utilised for the empirical part of this study. As such, an overview of the research approach, research design, the sampling strategy, data collection methods, the pre-testing of the questionnaire, administration of the questionnaire, preliminary data analysis and statistical methods were discussed.

Chapter 4 provides the findings of the empirical portion of the study. This includes a discussion for Section A – Section D, which includes the demographic information and descriptive evaluation. Moreover, recommendations of this study will be made based on the final chapter, Chapter 5, where the information gathered in Chapter 4, will be used as a framework.

CHAPTER 4
ANALYSIS AND INTERPRETATION OF EMPIRICAL FINDINGS

4.1 INTRODUCTION

This chapter analyses and interprets the empirical findings of this study. The results obtained from the pre-test of the questionnaire are reported in Section 4.2, whereby a discussion of the data gathering process in Section 4.3 followed. Section 4.4 presents a summary of the preliminary data analysis that involves the coding, data cleaning, as well as the tabulation of the variables. Section 4.5 incorporates a demographical analysis comprising the sample description of the participants, followed by an overview of participants' wrist-based fitness tracker background information. Furthermore, the outcome of the exploratory factor analysis is elaborated on in Section 4.6, where Section 4.7 delineates the reliability and validity of the measurement instrument used in this study. Section 4.8 provides an analysis of the descriptive statistics, followed by the results of the significance tests in Section 4.9, which comprises of the one sample t-test, correlation analysis and regression analysis.

The data was analysed using SPSS. The succeeding section reports on the findings that were obtained from the pre-test of the questionnaire.

4.2 PRE-TEST RESULTS

The questionnaire was pre-tested to determine the face and content validity of the questionnaire by using four academic staff members and two non-academic members, who were requested to partake in the de-briefing process to pre-test the questionnaire. Among the four academic staff members, two were English first language speakers with limited knowledge of wrist-based fitness trackers. The other two academic staff members were English second language speakers with knowledge pertaining to wrist-based fitness trackers. Furthermore, of the two non-academic members, one was an English first language speaker with knowledge pertaining to wrist-based fitness trackers, while the second non-academic member was an English second language speaker with limited knowledge of wrist-based fitness trackers. The results gathered from the pre-test were considered, and the wording of certain items where slightly adapt to make it more understandable in the multilingual environment that is characteristic of South Africa. Following the pre-testing of the questionnaire, comprising 23 Likert-scaled items for the attitude towards wrist-based fitness tracker usage scale, the final questionnaire with a cover letter (refer to Annexure

A), was distributed for the main survey. Table 4-1 presents an outline of the descriptions of the variables and constructs.

Table 4-1: Description of constructs and variables

Code	Variable	Construct
C1	Using a wrist-based fitness tracker is a good idea.	Construct 1- Attitude
C2	I have a generally favourable attitude towards using wrist-based fitness trackers.	
C3	I like the idea of using a wrist-based fitness tracker.	
C4	Overall, I think using a wrist-based fitness tracker is beneficial.	
C5	Wrist-based fitness trackers make tracking your activity and training more effective	Construct 2- Perceived usefulness
C6	Wrist-based fitness trackers help you organise your daily activity and training better.	
C7	Wrist-based fitness trackers help you organise your daily activity and training better.	
C8	Using a wrist-based fitness tracker is useful to your life in general.	
C9	Using a wrist-based fitness tracker helps to improve your physical performance in general.	
C10	Using a wrist-based fitness tracker is useful to your life in general.	
C11	Learning to use wrist-based fitness trackers is very simple.	Construct 3- Perceived ease of use
C12	It is extremely easy to be familiarised with the use of wrist-based fitness trackers.	
C13	Using wrist-based fitness trackers to measure your activity is easy.	
C14	Wrist-based fitness trackers can easily measure your activity.	
C15	Using a wrist-based fitness tracker does not require a lot of mental effort.	
C16	Wearing a wrist-based fitness tracker makes a good impression on your peers and friends.	Construct 4- Perceived social image
C17	Wearing a wrist-based fitness tracker improves one's social image amongst peers and friends.	
C18	Wearing a wrist-based fitness tracker gives you social approval.	
C19	Wearing a wrist-based fitness tracker helps you feel accepted amongst your peers and friends.	

Table 4-1: Description of constructs and variables (continued…)

Code	Variable	Construct
C20	Wrist-based fitness trackers are a waste of money.	Construct 5- Perceived cost
C21	Wrist-based fitness trackers are too expensive.	
C22	Wrist-based fitness trackers do not offer good value for money.	
C23	Wrist-based fitness trackers are just an expensive gimmick	

The subsequent section describes the data gathering process followed in the study.

4.3 DATA GATHERING PROCESS

In accordance with the sampling plan set out in Chapter 3, once permission was obtained from the main organisers at each of the three selected Parkrun events to distribute the questionnaire, 450 self-administered questionnaires were hand delivered to participants that form part of the South African Generation Y cohort with the assistance of two trained fieldworkers.

The mall-intercept approach was used to distribute the questionnaires to participants personally, where the researcher and fieldworkers did not interfere with the proceedings at each Parkrun event. Taking into consideration the specified sample size, 450 questionnaires were distributed between three parkrun events. Participants at each Parkrun event were informed that the contribution towards this study was on a strictly voluntary basis and the information was to be used for statistical purposes only. The completed questionnaires were collected by the researcher immediately after the participants had completed the questionnaire.

The succeeding section describes the preliminary data analysis process used in the study.

4.4 PRELIMINARY DATA ANALYSIS

A preliminary data analysis should be conducted before the data set is evaluated and incorporates the use of coding, data gathering as well as the tabulation of the data. As such, the succeeding three sections provide a summary of how the data was coded, cleaned and tabulated for further interpretation.

4.4.1 Coding

Zikmund and Babin (2013:363) explain coding as a process that assigns numerical scores, or any other character or symbol to previously edited data. The questionnaire utilised in this study consisted of three sections, namely Section A, Section B and Section C. Section A gathered

information regarding the participants' demographic information by means of eleven questions. Section B consisted of four questions that determined the participants' background information with regards to wrist-based fitness trackers. The last section, Section C, measured five constructs pertaining to attitude towards wrist-based fitness tracker usage, comprising 23 items. Table 4-2 illustrates the variable codes and assigned the values used in Section A, B and C of the final questionnaire.

Table 4-2: Coding information

Section A: Demographical information			
Question	**Code**	**Variable**	**Value assigned to responses**
Question 1	A1	Attendance of parkrun events	This is my first time (1); Occasionally (2); Once a month (3); Twice a month (4); Weekly (5)
Question 2	A2	Most important reason for attendance of parkrun events	Family time (1); A healthier lifestyle (2); Medical aid points (3); Insurance discount (4); Weight loss (5); Rehabilitation (6); Training (7); Other (8)
Question 3	A3	Province of parkrun	Free State (1); Gauteng (2)
Question 4	A4	Country of origin	South Africa (1); Other (2)
Question 5	A5	Province of origin	Eastern Cape (1); Free State (2); Gauteng (3); KwaZulu-Natal (4); Limpopo (5); Mpumalanga (6); Northern Cape (7); North West (8); Western Cape (9); Other (10)
Question 6	A6	Highest qualification	<Grade 12 (1); Grade 12 (2); Diploma (3); Degree (4); Post graduate (5); Other (6)
Question 7	A7	Gender	Male (1); Female (2)
Question 8	A8	Ethnic group	Black/African (1); Coloured (2); Indian/Asian (3); White (4); Other (5)
Question 9	A9	Home language	Afrikaans (1); English (2); IsiNdebele (3); IsiXhosa (4); IsiZulu (5); Sepedi (6); Sesotho (7); Setswana (8); SiSwati (9); Tshivenda (10); Xitsonga (11)
Question 10	A10	Age at last birthday	<18 (1); 18-24 (2); 25-33 (3); >33 (4)
Question 11	A11	Training on a weekly basis	Never (1); 1-2 days (2); 3-4 days (3); >5 days (4)

Table 4-2: Coding information (continued…)

Section B: Background information			
Question	**Code**	**Variable**	**Value assigned to responses**
Question 1	B1	Own a WBFT	Yes (1); No (2)
	B1a	If no, indicate why not	Expensive (1); Unreliable (2); Unfashionable (3); Complicated (4); Fad/ seasonal trend (5); Other (6)
	B1b	If no, consider buying a WBFT	Yes (1); No (2)
Question 2	B2	Favourite brand of WBFT	Apple (1); Fitbit (2); Garmin (3); Polar (4); Samsung (5); Suunto (6); Tomtom (7); Other (8)
Question 3	B3	Importance of Accuracy, Health tracking, Design and Functionality of WBFT	Not important (1); Slightly important (2); Important (3); Fairly important (4); Very important (5)
Question 4	B4	Spending on a WBFT	<R500 (1); R501− R1000 (2); R1001− R2500 (3); R2501− R 5000 (4); >R5000 (5)
Section C: Attitude towards wrist-based fitness tracker usage			
Item	**Code**	**Variable**	**Value assigned to responses**
Item 1 – 4	C1 − C4	Attitude	
Item 5 – 10	C5 − C10	Perceived usefulness	
Item 11 – 15	C11 – C15	Perceived ease of use	Strongly disagree (1); Disagree (2); Disagree somewhat (3); Agree somewhat (4); Agree (5); Strongly agree (6)
Item 16 – 19	C16 – C19	Perceived social image	
Item 20 – 23	C20 – C23	Perceived cost	

4.4.2 Data cleaning

The data was cleaned by removing questionnaires that fell outside the scope of the study, for instance participants that were not from South Africa and those who fell outside the intended age group of 18 to 33 years. Moreover, questionnaires that had missing values comprising more than 10 percent were also discarded. Considering the 450 questionnaires distributed, 407 questionnaires were returned, resulting in a 90.4 percent response rate. After the data cleaning process, only 326 questionnaires were usable for statistical analysis, which resulted in an actual response rate of 72.5 percent.

4.4.3 Tabulation

Hair *et al*. (2013:254) describe tabulation as a frequency count that calculates the number of responses within different categories. Table 4-3 provides the frequencies of the responses recorded from the total sample for Section C of the questionnaire, which presents the antecedents of attitude towards wrist-based fitness tracker usage amongst the South African Generation Y cohort (C1-C23).

Table 4-3: Frequency table of responses

Scale item	Strongly disagree	Disagree	Disagree somewhat	Agree somewhat	Agree	Strongly agree
	1	**2**	**3**	**4**	**5**	**6**
Construct 1 − Attitude						
C1	4	7	15	45	159	96
C2	7	17	10	65	152	75
C3	2	15	11	43	137	118
C4	4	10	15	56	133	108
Construct 2 – Perceived usefulness						
C5	2	7	18	52	136	111
C6	4	12	33	76	116	85
C7	6	14	22	79	113	92
C8	2	18	33	91	111	71
C9	5	17	29	65	120	90
C10	1	12	22	62	137	92
Construct 3 – Perceived ease of use						
C11	3	8	35	70	125	85
C12	1	13	28	84	122	78
C13	0	8	24	70	133	91
C14	0	8	15	56	139	108
C15	0	10	24	61	137	94
Construct 4 – Perceived social image						
C16	8	36	41	96	90	55
C17	13	40	53	80	85	55
C18	25	46	73	75	61	46
C19	41	60	53	60	75	37

Table 4-3: Frequency table of responses (continued…)

Construct 5 – Perceived cost						
C20	93	123	59	32	15	4
C21	35	58	66	74	56	37
C22	58	119	69	50	21	9
C23	70	125	62	41	19	9

Section 4.5 reports on the demographical analysis, detailing the sample of participants that formed part of this study as well as background information pertaining to participants' wrist-based fitness tracker usage.

4.5 DEMOGRAPHIC ANALYSIS

The following section provides a discussion of the sample pertaining to the demographical information and wrist-based fitness trackers background information. The demographical information and wrist-based fitness trackers background information is shown through pie charts and bar and line graphs.

4.5.1 Sample description of participants

As stated in Section 4.4.2, of the 450 questionnaires that were distributed, 407 questionnaires were returned. However, from the 407 questionnaires that were returned, only 326 questionnaires were usable for statistical analysis after completing the data cleaning process. As such, a response rate of 72.5 percent was obtained. Considering that the sample consisted of participants that are categorised within the defined target population, no graph is illustrated for country of origin.

A discussion regarding the demographical information of the sample includes participants' attendance of parkrun events, most important reasons for attending parkrun events, the province of the parkrun attended, province of origin, participants' highest qualification, gender, as well as the ethnicity of the group pertaining to wrist-based fitness trackers.

Figure 4-1 presents an outline of the distribution of the participants between the three parkrun events.

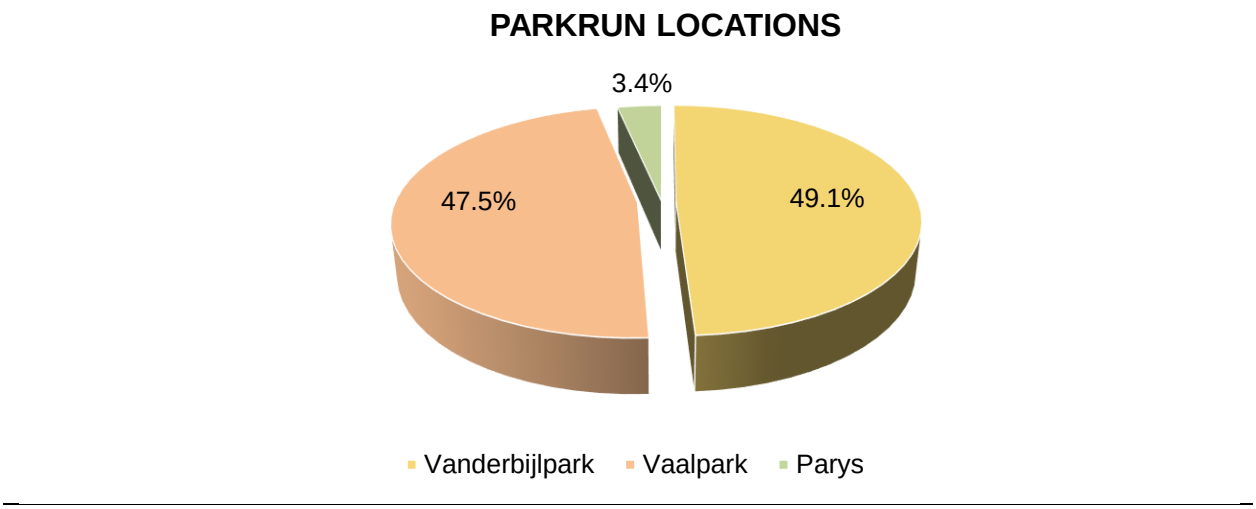


Figure 4-1: Location of parkrun events

This study gathered data from participants who attended three specific parkrun events, namely Vanderbijlpark, Vaalpark and Parys. Figure 4-1 provides the categorisation information of the total sample (N) of 326 parkrun participants. As shown in Figure 4-1, the majority of the data were gathered from participants (49.1%) who attended the parkrun event in Vanderbijlpark, followed by those who attended the parkrun in Vaalpark (47.5%), whilst only 3.4 percent of the data were gathered from participants who attended the parkrun in Parys.

Participants had to indicate how frequently they attend parkrun events. The majority of the participants (31.7%) indicated that they only attend parkrun events occasionally, where 24 percent of participants attended the parkrun on a weekly basis. Furthermore, 21.5 percent of participants indicated that they attended the parkrun for their first time, whilst 13.8 percent of participants attended parkrun events twice a month. The minority of the participants (8.9%) attended parkrun events once a month. One participant did not complete the question, which accounts for the 0.3 percent of the total sample. These results are indicated in Figure 4-2.

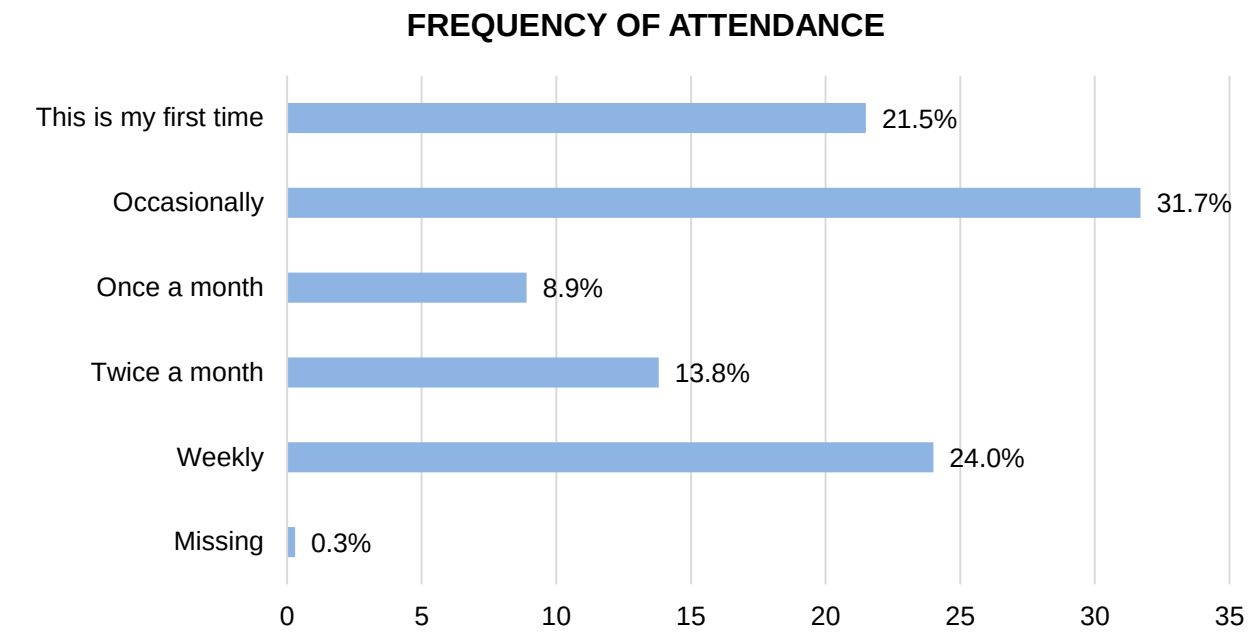


Figure 4-2: Participants frequency of attending parkrun events

The succeeding figure illustrates participants' most important reasons for attending parkrun events.

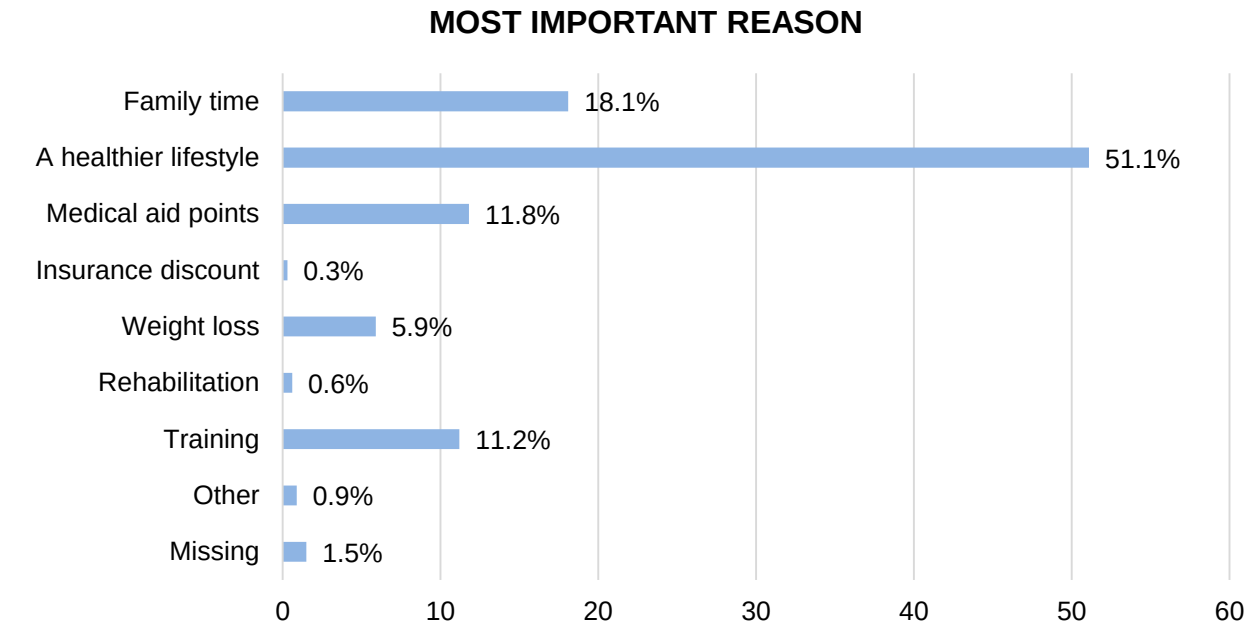


Figure 4-3: Participants' most important reasons for attending parkrun events

Figure 4-3 provides an outline of the most important reasons why participants attended parkrun events. The largest portion of the sample, 51.1 percent, attended parkrun events with the aim of living a healthier lifestyle, where 18.1 percent indicated that they attended parkrun events to spend more time with family members. Moreover, 11.8 percent of participants attended parkrun events because their medical aids rewarded them with points when they attend and 11.2 percent attended parkrun events as part of a training regime. Furthermore, of the remaining respondents, 5.9 percent of participants attended parkrun events to lose weight, where 0.6 percent attended parkrun events for rehabilitation purposes and only 0.3 percent attended parkrun events to obtain discount on some form of insurance. Participants that reported different reasons for attending parkrun events consisted of 0.9 percent of the sample, which included attending for fun thereof, community service, as well as motivation to partake in the parkrun event from friends and family. The 1.5 percent represented missing data, where five participants failed to answer the abovementioned question.

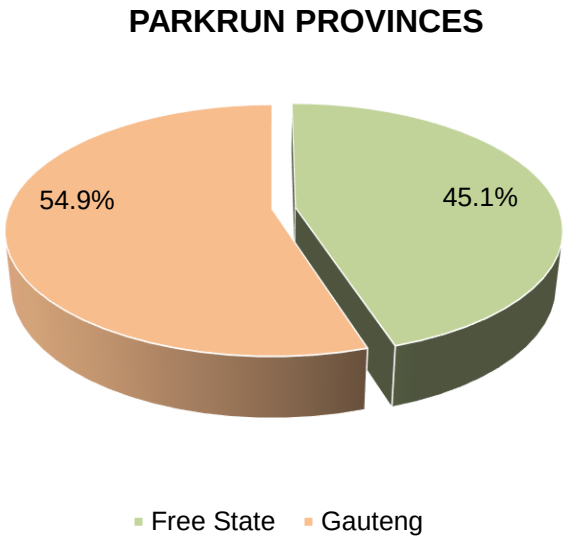


Figure 4-4: Province of parkrun

At the time of data collection, participants were requested to indicate the province of the parkrun that they attended. Figure 4-4 indicates that the majority of the participants, 54.9 percent, attended the parkrun events hosted in the Free State and 45.1 percent attended the parkrun event hosted in Gauteng.

Participants' had to indicate their province of origin. It is apparent from the table that the majority of the participants originated from the Gauteng province with 48 percent. In addition, 34.2 percent of the sample is represented by the Free State, where the Limpopo province was represented by

4.6 percent and Mpumalanga by 3.7 percent. Participants that originated from the North West province comprised 3.1 percent, followed by the Eastern Cape with 2.5 percent. The KwaZulu-Natal province was represented by 1.5 percent of the participants, where the Northern Cape and Western Cape were both represented by 1.2 percent of the sample respectively. One participant failed to complete the question, which accounts for the 0.3 percent of the sample. These results are illustrated in Figure 4-5.

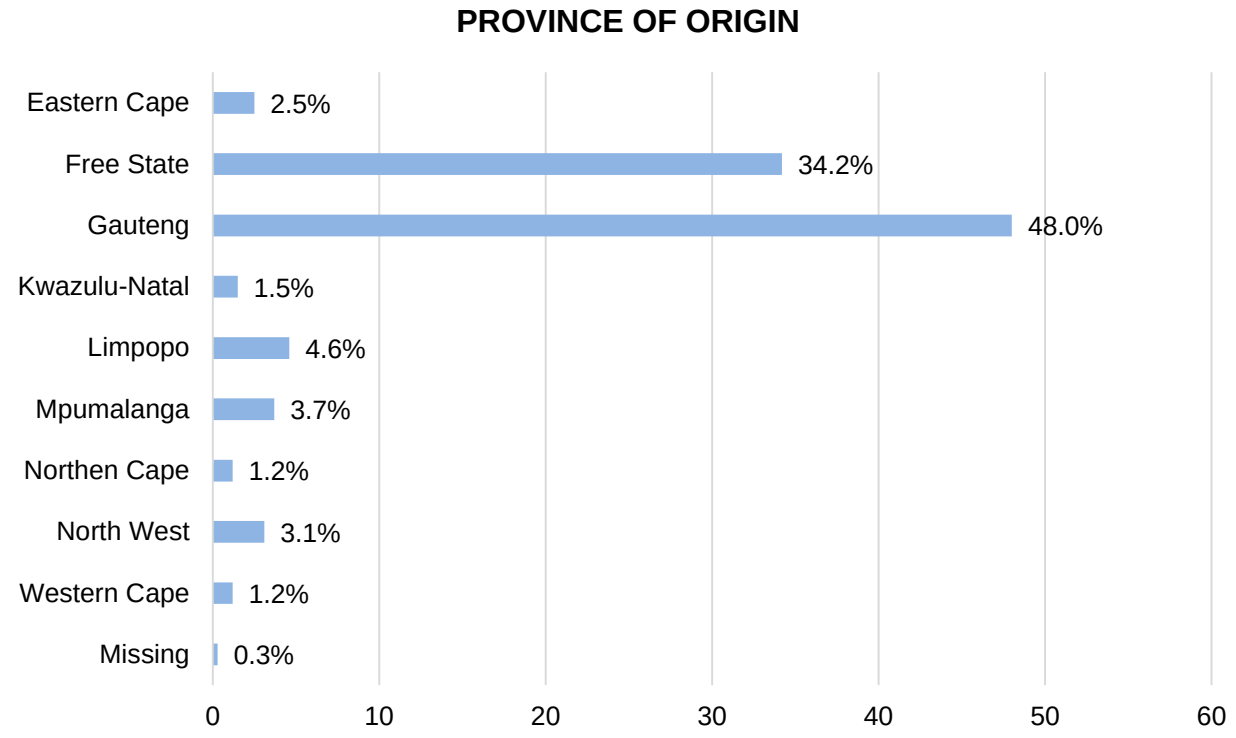


Figure 4-5: Participants province of origin

The following figure displays participants' highest qualification.

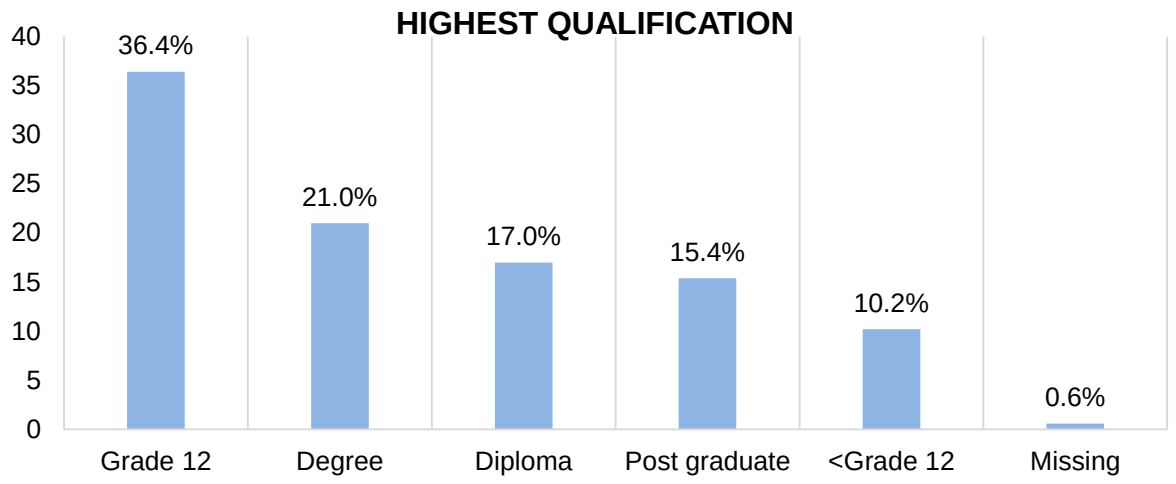


Figure 4-6: Participants highest qualifications

Figure 4-6 outlines participants' highest qualifications. As shown in Figure 4-6, the largest portion of the sample (36.4%) consisted of participants that obtained Grade 12, while the second largest portion of the study (21.0%) consists of participants that obtained a University degree. Furthermore, 17 percent of participants obtained a diploma, while 15.4 percent of participants had obtained a post-graduate qualification and 10.2 percent of participants did not have a matric certificate. The 0.6 percent represents missing data, where two participants failed to respond to the question. Based on these findings, device manufacturers should design devices that target Generation Y participants that obtained Grade 12, given that these participants consisted of the largest portion of the sample.

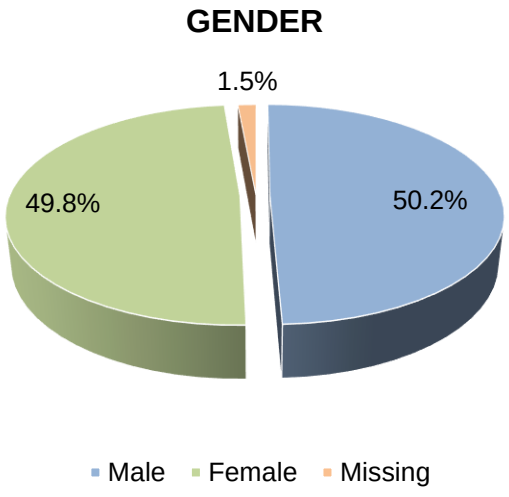


Figure 4-7: Gender profile of the participants

Figure 4-7 outlines the participants' gender profile. There were slightly more male participants (50.2%) than there where female participants (49.8%). Five participants failed to respond to the question, which accounts for the 1.5 percent missing data of the sample.

Participants had to indicate to which ethnic group they belong. The majority of the participants were of a White ethnicity, with 61.6 percent, where 30.2 percent were of a Black/African ethnicity, 5.3 percent were of a Coloured ethnicity and 2.2 percent were of either Indian or Asian ethnicity. The remaining 0.6 percent of participants comprised European African participants, individuals who most probably came from previously immigrating families, who were not born in South Africa. The 2.5 percent represents missing data, where eight participants failed to answer the question. These results are shown in Figure 4-8.

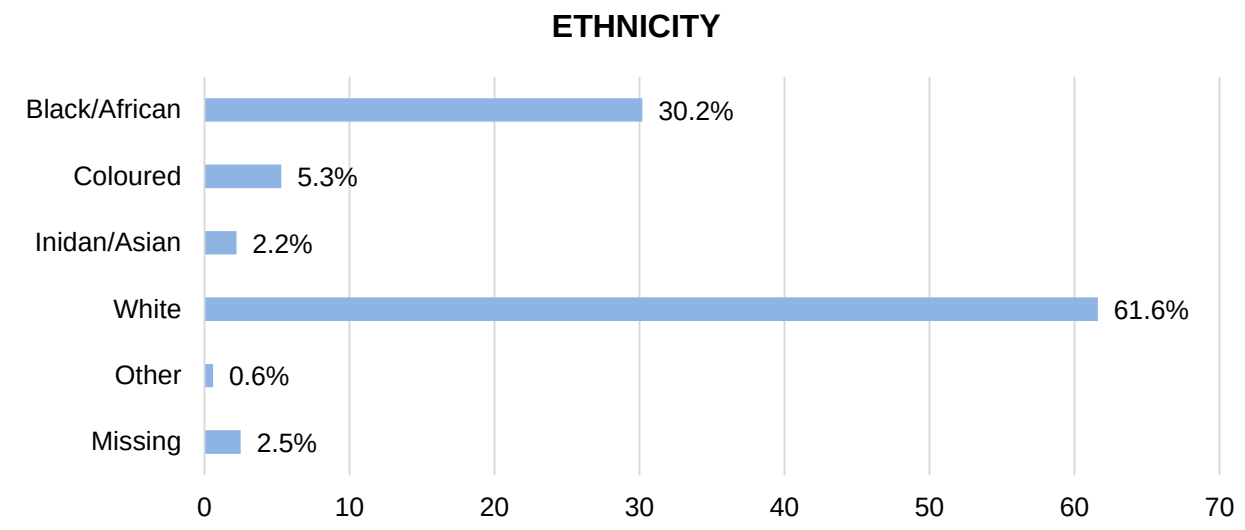


Figure 4-8: Participants' ethnic group

An outline on the participants' home language, which forms part of the demographic information in this study, is provided in Figure 4-9.

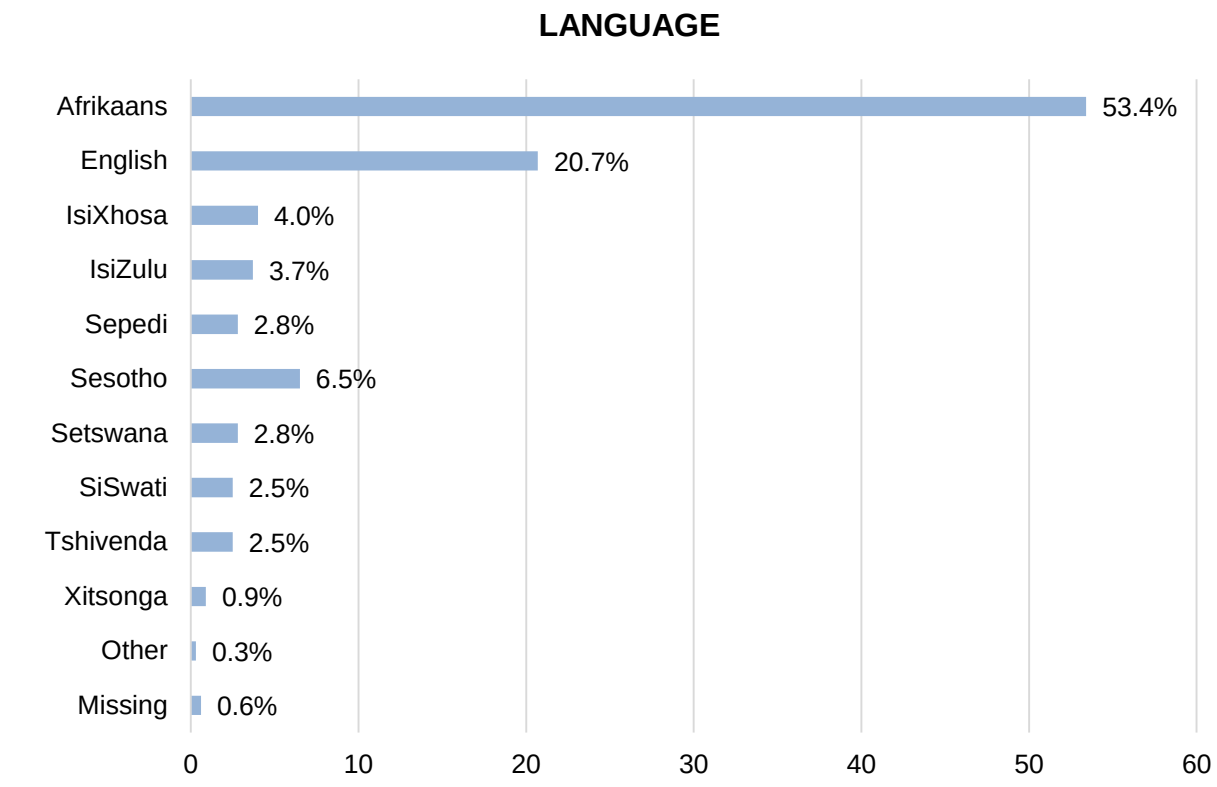


Figure 4-9: Participants' home language

The participants in this study were mostly Afrikaans speaking (53.4%), followed by English speaking participants (20.7%). Furthermore, the participants indicated that their home language included Sesotho (6.5%), IsiXhosa (4%) and IsiZulu (3.7%). Sepedi and Setswana were the home language of an equal number of participants (2.8%), where SiSwati and Tshivenda were also represented by equal amounts of participants (2.5%). Thereafter, 0.9 percent of participants reported that their home language was Xitsonga, whilst 0.3 percent indicated that their home language was German, French and Polish, which does not fall within South Africa's 11 language groups. These individuals are most likely those who came from previously immigrated families who were born in and classed as South Africans. However, none of the participants reported that isiNdebele is their home language. Two participants failed to respond to the question, which accounts for the 0.6 percent of the sample.

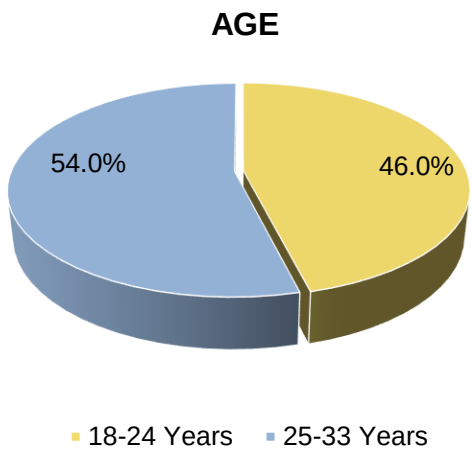


Figure 4-10: Participants' current age

Figure 4-10 indicates an overview pertaining to participants' age distribution, where the majority of participants were between the ages of 25 to 33 years, representing 54 percent of the total sample, followed by participants between the ages of 18 to 24 years, representing 46 percent of the total sample.

Participants had to indicate in Figure 4-11 how often they have trained on a weekly basis. The majority of the participants, with 35.4percent, trained three to four days per week, whereas 34.2 percent of the participants trained one to two days per week. Participants who indicated that they trained more than five days per week represents 16.3 percent of the sample, where 14.2 percent of participants trained three to four days a week. This indicates that the participants were serious about their health and fitness. The 0.3 percent represents missing data, where one participant failed to respond to the question. The succeeding figure demonstrates how often participants train on a weekly basis.

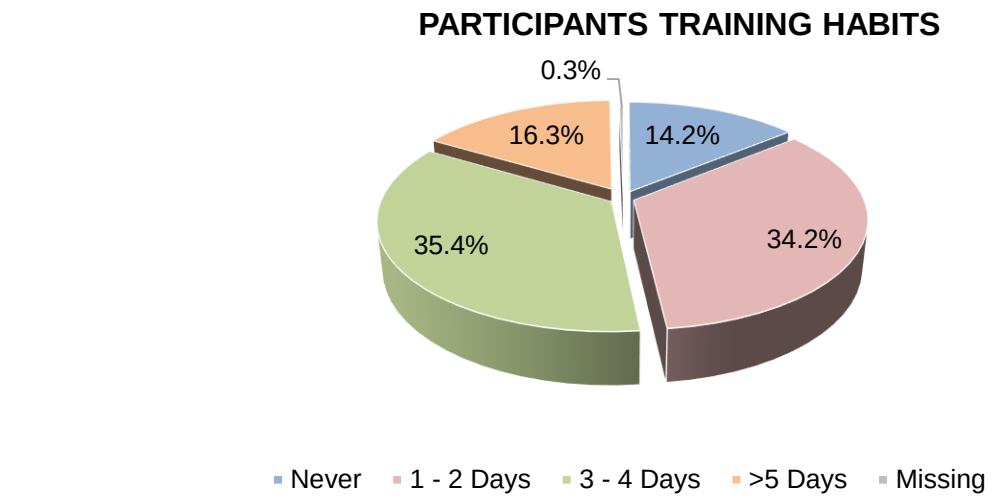


Figure 4-11: How often participants train on a weekly basis

The succeeding section highlights the background information of participants pertaining to wrist-based fitness trackers.

4.5.2 Wrist-based fitness tracker background information

Section B of the questionnaire comprised six questions aimed at gathering participants' background information pertaining to wrist-based fitness trackers. These questions related to whether participants owned a wrist-based fitness tracker, to indicated possible reasons for not owning a wrist-based fitness tracker and whether they would consider purchasing a wrist-based fitness tracker in the future. Moreover, questions were included that required participants to indicate their favourite wrist-based fitness tracker brand, as well as rate the wrist-based fitness tracker features based on the degree of importance of each feature. Participants were also requested to specify the amount of money that they were willing to spend on a wrist-based fitness tracker. The results of Section B are reported on by means of figures 4-12 to 4-17.

Participants had to indicate their ownership of a wrist-based fitness tracker. South Africa is expected to be the next major market pertaining to wrist-based fitness trackers (Writer, 2018). In addition, South Africa's wearable device market had a user penetration rate of 6.0 percent in 2019, where the penetration rate is expected to grow to 6.2 percent by 2023 (Statista, 2019b). It is evident that wrist-based fitness trackers are increasing in popularity and consumer interest. This is illustrated in Figure 4-12, which indicates that 47.2 percent of participants already owned a wrist-based fitness tracker, where 52.8 percent reported no ownership. The findings propose

an investigation pertaining to why certain participants did not own a wrist-based fitness tracker and whether they would consider purchasing a device.

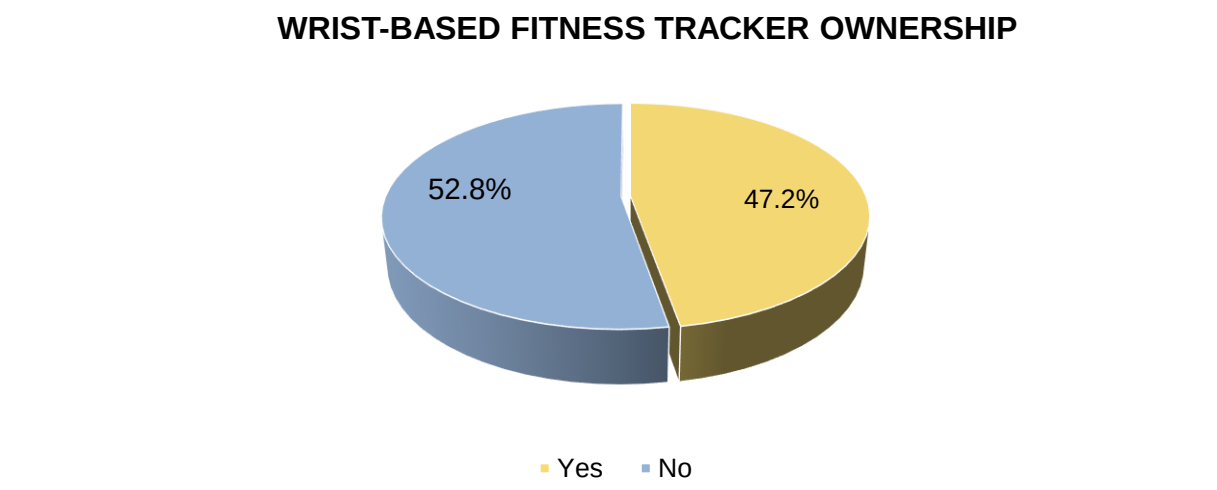


Figure 4-12: Participants' ownership of a wrist-based fitness tracker

The succeeding figure displays the reasons why participants do not own a wrist-based fitness tracker.

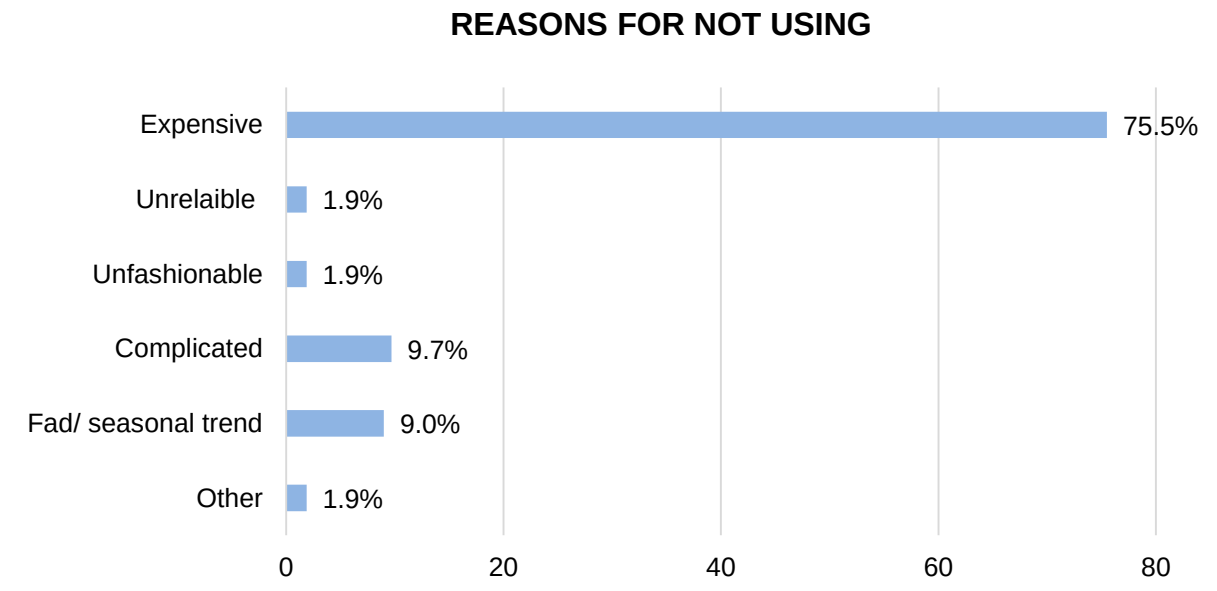


Figure 4-13: Reasons why participants do not own a wrist-based fitness tracker

It should be taken into consideration that the total sample is N=172. Figure 4-13 indicates that 75.5 percent of the participants (172 or 52.8%) that did not own a wrist-based fitness tracker, indicating that these devices are too expensive, where 9.7 percent reported that wrist-based fitness trackers are too complicated to use. Thereafter, 9.0 percent of participants reported that these devices are a fad or seasonal trend. Further, 1.9 percent of participants reported that wrist-based fitness trackers are unreliable, whereas 1.9 percent of participants reported that these devices are unfashionable. The remaining 1.9 percent of participants reported other reasons for not owning a wrist-based fitness tracker, which includes participants tracking their daily steps on their smartphone, participants not being physically active and participants who do not see the necessity of using such devices.

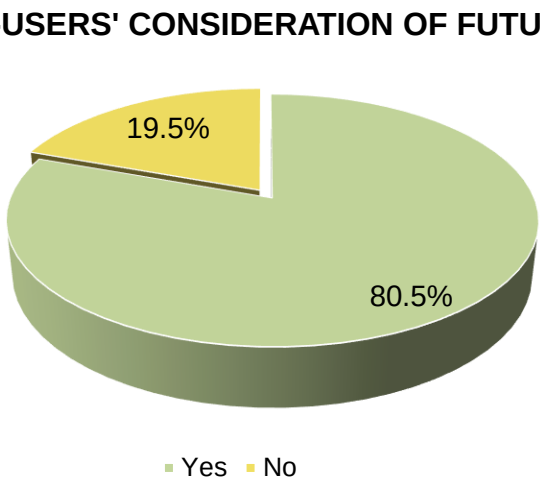


Figure 4-14: Participants that consider buying a wrist-based fitness tracker

As with Figure 4-13, the total sample for Figure 4-14 is N=172. Figure 4-14 demonstrates that 80.5 percent of the participants that did not own a wrist-based fitness tracker would consider purchasing a wrist-based fitness tracker, where only 19.5 percent or 63 participants reported that they did not consider buying a wrist-based fitness tracker. The abovementioned findings serve as a clear indicator that the majority of Generation Y members at these parkrun events have positive attitude towards writ-based fitness tracker usage. It is also likely, with encouragement from relevant marketing entities, that they will use such a device in the near future.

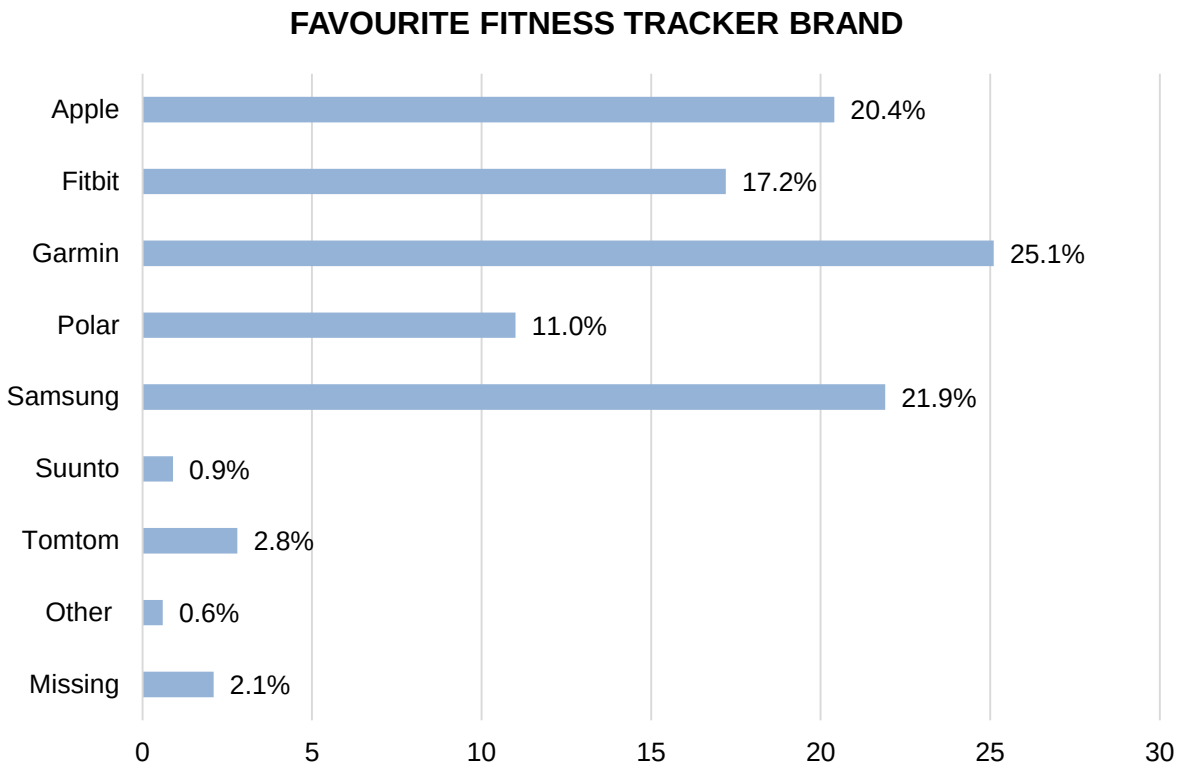


Figure 4-15: Participants favourite fitness tracker brand

As exemplified in Figure 4-15, the majority of the participants (25.1%) reported that Garmin was their favourite wrist-based fitness tracker brand, followed by Samsung (21.9%) and Apple (20.4%). Furthermore, 11.0 percent of participants reported that Polar was their favourite fitness tracker brand, while 2.8 percent indicated that they preferred TomTom. Participants who indicated Suunto as their favourite fitness tracker brand comprised 0.9 percent of the sample, while 0.6 percent of participants reported other types of fitness tracker brands such as Fossil, Huawei and GoLife. However, seven participants failed to respond to the question, which accounted for the 2.1 percent of the sample.

Participants had to specify the importance of wrist-based fitness tracker features. Figure 4-16 presents these results for accuracy, health tracking, design and functionality rated from not important to very important. For accuracy, 49.4 percent of participants indicated that it was a very important feature of wrist-based fitness trackers, followed by 22.4 percent that indicated the accuracy of devices is fairly important and 19 percent of participants indicated that the accuracy of wrist-based fitness trackers is important. Moreover, 3.1 percent reported that the accuracy of devices is slightly important, while 3.7 percent of participants indicated that the accuracy of wrist-

based fitness trackers is not important. The 2.5 percent represents missing data, where eight participants did not answer the question.

For the health tracking feature, 48.5 percent of participants reported that health tracking in a wrist-based fitness tracker is very important, while 27 percent of participants reported that health tracking is fairly important, followed by the 15 percent of participants that perceive health tracking in a wrist-based fitness tracker as important. Health tracking in wrist-based fitness trackers is perceived as slightly important by 5.8 percent of the total sample, where 1.8 percent of the participants indicated that health tracking in wrist-based fitness trackers is not important. Six participants failed to respond to the question, which accounts for the 1.8 percent missing data of the sample.

For the design feature of wrist-based fitness trackers, the majority of the participants, with 31.3 percent, reported it as very important, where 26.1 percent indicated that the design of devices is fairly important, followed 16.3 percent of participants that perceive design as important. The design in wrist-based fitness trackers was perceived as slightly important by 15.3 percent of the total sample, where 8.6 percent of participants reported that the design of wrist-based fitness trackers is unimportant. The 2.5 percent represents missing data, where eight participants failed to answer the question.

For the functionality feature of wrist-based fitness trackers, 60.4 percent of the participants reported this feature as very important, followed by 19 percent of participants that indicated the functionality of wrist-based fitness trackers as fairly important, whilst 13.8 percent of participants indicated that the functionality of wrist-based fitness trackers is important. Thereafter, 2.8 percent of participants perceived the functionality of wrist-based fitness trackers as slightly important, where the minority of participants, with1.8 percent indicating that the functionality of wrist-based fitness trackers is not important. However, seven participants failed to answer the question, which accounts for the 2.1 percent of missing data of the sample.

Given the four important features of fitness-tracking devices (accuracy, health tracking, design and functionality) the majority of participants reported the highest overall percentages that classify all four features as very important. This implies that the availability of specific features and benefits within wrist-based fitness trackers will ultimately have an impact on the usage tendencies and purchasing decisions of participants.

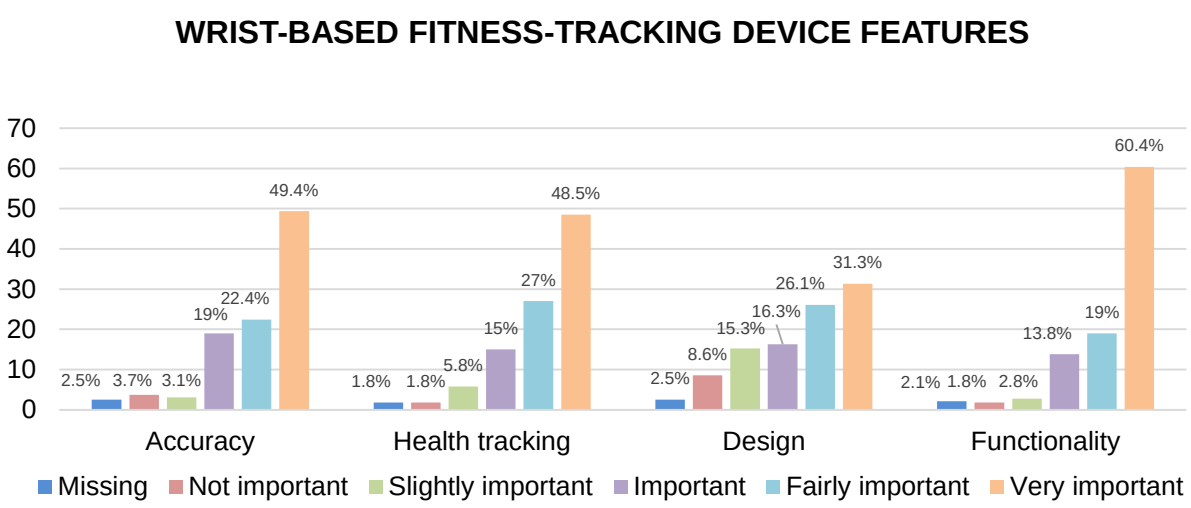


Figure 4-16: The importance of wrist-based fitness tracking device features: accuracy, health tracking, design and functionality

The following section displays the amount of money that participants were willing to spend on a wrist-based fitness tracker.

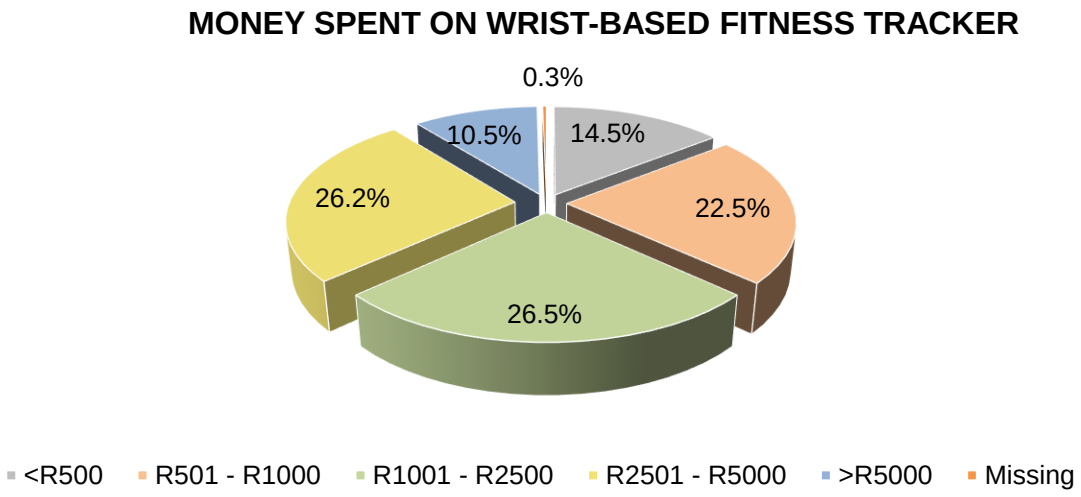


Figure 4-17: Amount of money that participants were willing to spend on a wrist-based fitness tracker

As exemplified in Figure 4-17, the majority of the participants, totalling 26.5 percent, indicated that they would spend between R1001-R2500 on a wrist-based fitness tracker, whilst 26.2 percent of participants are willing to spend between R2501 and R5000 on these devices. Moreover, 22.5

percent of participants reported that they would spend between R501-R1000 on a wrist-based fitness tracker, where 14.5 percent of participants reported that they would spend less than R500 on a device. Participants who indicated that they would spend more than R5000 on a wrist-based fitness tracker, comprised 10.5 percent of the sample. The 0.3 percent represents missing data, where one participant did not answer the question.

4.6 EXPLORATORY FACTOR ANALYSIS

Exploratory principal components analysis was performed on the data set of this study. This method was used to evaluate whether the 23 items used in Section C of the questionnaire, delivered the proposed constructs and to determine whether the variables loaded on the predetermined constructs. The Kaiser-Meyer-Olkin (KMO) and the Bartlett's test of sphericity was used to evaluate sample adequacy. Pallant (2013:190) states that a factor analysis can be considered sufficient if the Kaiser-Meyer-Olkin index has a value greater than 0.6 followed by a significant Barlett's test of Sphericity value. Both tests returned satisfactory values [KMO=0.931, chi-square Barlett's test=5146.176 (df=253), p=0.000<0.05], thereby affirming the data's appropriateness for principal component analysis.

Principle component analysis, using varimax rotation was executed on the 23 scaled items. Five factors were extracted, which accounted for 72.24 percent of the total variance. However, one item, item C10, cross-loaded on another factor in addition to having a low factor loading value. Accordingly, item C10 was removed and excluded from further data analysis. The removal of this item did not change the primary nature and meaning of the construct. After the deletion of item C10, the total variance increased to 72.65 percent, where both the Kaiser-Meyer-Olkin (KMO) and the Bartlett's test of Sphericity returned satisfactory values [KMO=0.926, chi-square Barlett's test=4821.984 (df=231), p=0.000<0.05]. The results of the exploratory principal component analysis are presented in Table 4-4.

Table 4-4: Exploratory factor analysis results

	Factors					
Item	**1**	**2**	**3**	**4**	**5**	**Communalities**
C1				0.743		0.776
C2				0.697		0.718
C3				0.797		0.824
C4				0.634		0.746

Table 4-4: Exploratory factor analysis results (continued…)

	Factors					
Item	**1**	**2**	**3**	**4**	**5**	**Communalities**
C5			0.603			0.649
C6			0.645			0.675
C7			0.787			0.772
C8			0.575			0.698
C9			0.638			0.619
C11		0.766				0.722
C12		0.774				0.721
C13		0.774				0.758
C14		0.626				0.648
C15		0.767				0.667
C16	0.815					0.754
C17	0.881					0.827
C18	0.911					0.843
C19	0.892					0.819
C20					0.757	0.720
C21					0.723	0.636
C22					0.749	0.675
C23					0.810	0.718

Table 4-4 illustrated that all five factors aligned in accordance with the specified scale and that 22 items remain after item C10 was removed, thereby explaining the 72.65 percent of total variance.

The succeeding section explains the reliability and validity analysis of the measurement instrument used in this study.

4.7 RELIABILITY AND VALIDITY OF THE SCALE

Burns and Bush (2014:214) state that validity explains the truthfulness of responses towards a measure, whilst reliability, as described by Hair *et al*. (2013:165), refers to the degree to which a scale can transcribe similar measurement results in various trails. As such, reliability can be considered as a measure of consistency. This section provides an outline of the Cronbach alpha and the average inter-item correlations of the 22-item scale used in Section C to ensure the reliability and validity thereof. Table 4-5 exemplifies an outline of the reliability and validity measures used in this study.

Table 4-5: Reliability and validity analysis of the main study

	Number of items	Cronbach alpha
Scale C: Attitude towards wrist-based fitness tracker usage	22	0.835
Construct 1 − Attitude	4	0.895
Construct 2 − Perceived usefulness	5	0.874
Construct 3 − Perceived ease of use	5	0.878
Construct 4 – Perceived social image	4	0.921
Construct 5 − Perceived cost	4	0.803

As indicated in Table 4-5, the Cronbach alpha value of 0.835 was calculated for the 22-item antecedents of wrist-based fitness tracker usage scale. The Cronbach alpha values for the individual constructs within the scale ranged between 0.803 and 0.921, which fall above the recommended level of 0.60 (Malhotra, 2010:319), therefore indicating the reliability of the scale used in this study. Accordingly, the inter-item correlation for the overall scale was considered to examine the internal consistency reliability and construct validity. An inter-item correlation value of 0.213 was calculated for the attitude towards wrist-based fitness tracker usage scale, which falls within the recommended range of 0.15 to 0.50 (Clark & Watson, 1995:316), thereby indicating construct validity. All factor loadings surpassed the 0.50 level, which indicates convergent validity of the data (Hair *et al*., 2010:709).

The heterotrait-monotrait ratio of correlation method (HTMT) was used to measure the discriminant validity (Henseler *et al*., 2015:121), where discriminant validity is evident when the

ratios of the HTMT are below 0.85 (Phillips & Furness, 1997:14). However, some authors indicate that a ratio below 0.90 is acceptable (Gold *et al*., 2001:202).

Table 4-6: Discriminant validity for the antecedents of attitude towards wrist-based fitness tracker usage

Item	Attitude	Perceived cost	Perceived ease of use	Perceived usefulness	Perceived social image
Attitude					
Perceived cost	0.547				
Perceived ease of use	0.732	0.442			
Perceived usefulness	0.883	0.520	0.745		
Perceived social image	0.276	0.290	0.284	0.456	

From Table 4-6, it is evident that all the HTMT values are below 0.90, which ultimately indicate discriminant validity (Gold *et al*., 2001:202). The descriptive statistics are evaluated in the following section.

4.8 DESCRIPTIVE STATISTICS

Descriptive statistics analysis can be classified as a method that describes the variables in a dataset (Burns *et al*., 2017:317). Dawn and Churchill (2010:59) explain that descriptive research aims to determine the relationship between one or more variables. The scaled responses were captured on a six-point Likert-type scale that ranged from 1=strongly disagree to 6=strongly agree; higher mean values represent a greater degree of agreement amongst the sampled Generation Y members. The number of questionnaires completed by participants is represented by the Valid N in Table 4-7, which illustrates the descriptive statistics.

Table 4-7: Descriptive statistics summary

Item	Valid N	Mean	Standard deviation	Skewness	Kurtosis
Overall scale	326	4.263	0.568	-0.807	1.024
Attitude	326	4.901	0.936	-1.406	2.517

Table 4-7: Descriptive statistics summary (continued…)

Item	Valid N	Mean	Standard deviation	Skewness	Kurtosis
Perceived usefulness	326	4.715	0.907	-0.963	0.964
Perceived ease of use	326	4.820	0.842	-0.817	0.546
Perceived social image	326	3.887	1.298	-0.257	-0.858
Perceived cost	326	2.739	1.042	0.537	0.269

Table 4-7 indicates that the research instrument generated a mean value above 3.5 (mean=4.263). This implies that Generation Y participants have positive perceptions of wrist-based fitness tracker usage. Means above 3.5 were computed for four of the five constructs in the attitude towards wrist-based fitness tracker usage scale, except for perceived cost with mean = 3.887. Considering that this is a negative construct, a lower mean value is preferred to a larger mean value. Construct one (attitude) recorded the highest mean value (mean=4.901), which suggests that Generation Y participants have a favourable attitude towards wrist-based fitness tracker usage. The second highest mean value was recorded for the PEOU construct where a mean value of 4.820 was recorded, which implies that Generation Y participants perceive wrist-based fitness trackers as relatively easy to use. The perceived usefulness construct was ranked third, with a mean value of 4.735, which indicates that Generation Y participants perceive wrist-based fitness trackers as useful to their lives in general. Thereafter, the perceived social image construct recorded a mean value of 3.887, which proposes that Generation Y participants perceive that a wrist-based fitness tracker improves their social image. The lowest mean value was recorded for the perceived cost construct, with a mean value of 2.739, which, as stated, is preferred. This indicates that Generation Y participants do not perceive wrist-based fitness trackers as a waste of money, or as devices that are too expensive to purchase. Furthermore, participants do not perceive wrist-based fitness trackers as devices that do not offer good value for money and the participants do not perceive wrist-based fitness trackers as an expensive gimmick. This suggests that Generation Y members are willing to spend money on these devices and that the cost of these devices will not impede the adoption of these devices in general.

The skewness and kurtosis are classified as tools that describe the shape of a distribution of data (Black, 2009:77). In addition, the majority of the values fell within the recommended range of -2 to +2, with the exception of two values that slightly exceed the range, but still indicates a normally distributed data set.

The following section performed significance tests to test the hypotheses formulated in this study.

4.9 SIGNIFICANCE TESTS

In order to achieve the empirical objectives and test the hypotheses that were set out in Chapter 1 (refer to Section 1.3.3), various significance tests were performed, including a one sample t-test, correlation analysis, as well as regression analysis. The significance level for each test was set at the conventional 1 percent level, that is α=0.01 and the decision rule is as follows:

- If p-value ≥ α, conclude H_o
- If p-value < α, conclude H_a

4.9.1 One sample t-test

A two-tailed one sample t-test was conducted in order to determine whether Generation Y members' have statistically significant positive attitude towards wrist-based fitness tracker usage and whether they have significant positive perceived usefulness, perceived ease of use, perceived social image and perceived cost of wrist-based fitness tracker usage.

The expected mean was set at X>3.5. The hypotheses were formulated as follows:

H_o1: Generation Y members do not have a positive attitude towards wrist-based fitness tracker usage, perceiving such devices as being useful, easy to use, having a positive social image, but as being costly.

H_a1: Generation Y members do have a positive attitude towards wrist-based fitness tracker usage, perceiving such devices as being useful, easy to use, having a positive social image, but as being costly.

Table 4-8: Antecedents of attitude towards wrist-based fitness tracker usage

Construct	Mean	Standard deviation	Standard error	t-value	P-value
Attitude	4.901	0.936	0.052	27.026	0.000*
Perceived usefulness	4.715	0.907	0.050	23.649	0.000*
Perceived ease of use	4.819	0.842	0.047	28.282	0.000*

Table 4-8: Antecedents of attitude towards wrist-based fitness tracker usage (continued…)

Construct	Mean	Standard deviation	Standard error	t-value	P-value
Perceived social image	3.887	1.298	0.072	5.378	0.000*
Perceived cost	2.739	1.042	0.058	-13.199	0.000*

*Significant at the 0.01 level (two-tailed)

As shown in Table 4-8, a significant p-value and the highest mean score (mean=4.901) was calculated for the attitude construct. Therefore, H_o1 is rejected and H_a1 is concluded. As such, Generation Y participants appear to have a statistically significant positive attitude toward wrist-based fitness tracker usage (p=0.000<0.01). Similarly, a significant p-value was calculated on all the remaining constructs, which includes PU (p=0.000<0.01), PEOU (p=0.000<0.01), perceived social image (p=0.000<0.01) and perceived cost (p=0.000<0.01). The second highest mean was recorded for PEOU (mean=4.819), where PU was the third highest mean recorded (mean=4.735). Moreover, perceived social image recorded a mean of 3.887, followed by perceived cost that recorded the lowest mean (mean=2.739). In accordance, perceived cost returned a significant p-value, which indicates that the perceived cost of wrist-based fitness tracker usage is statistically significant to Generation Y participants. Furthermore, the mean value computed for this construct (mean=2.739) indicates that Generation Y participants do not perceive these devices as a waste of money, or as devices that are too expensive to purchase. Furthermore, participants do not perceive wrist-based fitness trackers as devices that do not offer good value for money and participants do not perceive wrist-based fitness trackers as an expensive gimmick. It is evident that Generation Y participants have statistically significant positive perceived usefulness, perceived ease of use, perceived social image and perceived cost of wrist-based fitness trackers.

4.9.2 Correlation analysis

Correlation analysis was executed to address the sixth empirical objective as conducted in Chapter 1. The Pearson product-moment correlation coefficient was used to evaluate whether there is a statistically significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness tracker usage.

The hypothesis was formulated as follows:

Ho2: There is no statistically significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness trackers usage.

Ha2: There is a statistically significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness trackers usage.

Table 4-9 indicate the results of the correlation analysis

Table 4-9: Correlation matrix

	1	2	3	4	5
Attitude	1				
Perceived usefulness	0.780**	1			
Perceived ease of use	0.648**	0.649**	1		
Perceived social image	0.246**	0.409**	0.252**	1	
Perceived cost	-0.454**	-0.430**	-0.366**	-0.258**	1

**Significant at the 0.01 level (two-tailed)

As shown in Table 4-9, the correlation values between all constructs (attitude, PU, PEOU, perceived social image and perceived cost) range between $1 \geq r \geq -1$, which indicates that all constructs are significant and within the expected direction. A significant negative relationship between perceived cost and perceived social image ($r=-0.258$, $p=0.000<0.01$), perceived ease of use ($r=-0.366$, $p=0.000<0.01$), perceived usefulness ($r=-0.430$, $p=0.000<0.01$) and attitude towards wrist-based fitness tracker usage ($r=-0.454$, $p=0.000<0.01$) was recorded. Considering that perceived cost is a negative construct, Generation Y members are willing to spend money on these devices and that the cost of these devices will not impede the adoption of these devices in general. Furthermore, the findings of the correlation analysis are indicative of nomological validity, which proposes that the relationships between all constructs are deemed significant. As such, the null hypothesis H_o2 is rejected and H_a2, the alternative, is concluded. The more positive attitudes that Generation Y participants have towards wrist-based fitness trackers, the greater their perceptions towards these devices will be.

Since a positive significant relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and attitude towards wrist-based fitness tracker usage

was determined, regression analysis was conducted to determine whether Generation Y participants' PU, PEOU, perceived social image and perceived cost influence their attitude towards wrist-based fitness tracker usage.

4.9.3 Regression analysis

Regression analysis was executed to address the seventh empirical objective of this study formulated in Chapter 1 (refer to Section 1.3.3). Regression analysis was implemented to determine the influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on Generation Y members' attitude towards wrist-based fitness tracker usage. If found statistically significant, the results would imply future usage intent, as suggested by the proposed model (Figure 2-1, Section 2.7)

The following hypotheses were formulated:

H_o3: Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost do not influence their attitude towards wrist-based fitness tracker usage.

H_a3: Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost do influence their attitude towards wrist-based fitness tracker usage.

Table 4-10 illustrates the results obtained from the regression analysis

Table 4-1: Influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on attitude toward wrist-based fitness tracker usage

	Standardised Beta	t-value	Significance level
Attitude			
Perceived usefulness	0.618	13.316	0.000*
Perceived ease of use	0.223	5.178	0.000*
Perceived social image	-0.097	-2.714	0.007*
Perceived cost	-0.132	-3.635	0.000*

As shown in Table 4-10, Generation Y participants' perceived usefulness has a significant positive influence on Generation Y participants' attitude toward wrist-based fitness tracker usage (B=0.618, p=0.000<0.01), where perceived ease of use also has a significant positive influence on the Generation Y participants' attitudes (B=0.223, p=0.000<0.01). This is in line with previous wearable technology research that used the TAM (Chuah *et al*., 2016; Kim & Shin, 2015; Kim & Sundar, 2014; Lunney *et al*., 2016; Park & Chen, 2007). Moreover, Generation Y participants' perceived social image has a significantly negative influence on Generation Y participants' attitude towards wrist-based fitness tracker usage (B=-0.097, p=0.000<0.01). Perceived cost also has a statistically significant negative influence on Generation Y participants' attitude towards wrist-based fitness tracker usage (B=-0.132, p=0.000<0.01). PU, PEOU, perceived social image and perceived cost explained 65.9 percent of the total variance in Generation Y participants' attitude towards wrist-based fitness tracker usage. Therefore, the null hypothesis, H_o3, is rejected and the alternative hypothesis H_a3, concluded. As such, Generation Y members' perceived usefulness, perceived ease of use, perceived social image and perceived cost do influence Generation Y participants' attitude towards wrist-based fitness tracker usage, and according to the underlying theory of the TAM, implies Generation Y participants' future usage intent pertaining to such devices.

The results obtained from the regression analysis, are shown in Figure 4-18.

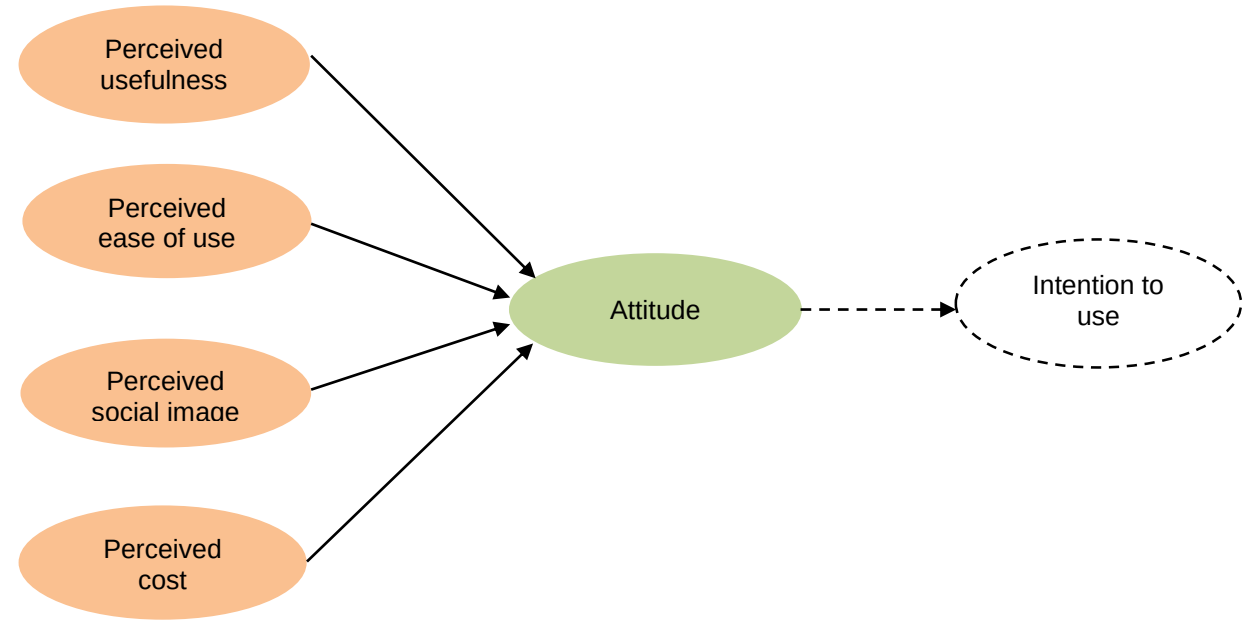


Figure 4-18: Model of antecedents of attitude towards wrist-based fitness tracker usage amongst the South African Generation Y cohort

The results illustrated in Figure 4-18 propose that perceived usefulness, perceived ease of use, perceived social image and perceived cost significantly influence Generation Y members' attitude towards wrist-based fitness tracker usage, which have an implied effect on Generation Y participants' intentions to use wrist-based fitness trackers in the near future. These findings are in accordance with the TAM, as proven by similar research studies (Wu & Wang, 2005:722; Yang *et al*., 2016:258; Lin & Bhattacherjee, 2010:166; Kim & Shin, 2015:534).

4.10 SYNOPSIS

The main objective of this chapter was to report and interpret the empirical findings of this study. In Section 4.2, the pre-test analysis was described, followed by a discussion of the data gathering process in Section 4.3. The preliminary data analysis process of the main study was discussed in Section 4.4, which incorporated coding (Section 4.4.1), data cleaning (Section 4.4.2), tabulation and frequency distribution of the data (Section 4.4.3).

Section 4.5 provided a discussion of the sample pertaining to the demographical information and wrist-based fitness trackers background information. Exploratory factor analysis was analysed in Section 4.6, while the reliability and validity, as well as the discriminant validity of the scale was evaluated in Section 4.7. Descriptive statistics, which included the mean, standard deviation, skewness and kurtosis were discussed in Section 4.8. Furthermore, Section 4.9 outlined the significance tests conducted in this study. A one sample t-test was conducted to determine whether Generation Y participants have statistically significant positive attitude towards wrist-based fitness trackers and whether they have significant positive PU, PEOU, perceived social image and perceived cost of wrist-based fitness tracker usage (Section 4.9.1). Thereafter, a correlation analysis followed to determine whether there is a statistically significant relationship between PU, PEOU, perceived social image, perceived cost and Generation Y members' attitude towards wrist-based fitness tracker usage (Section 4.9.2). Regression analysis was used to determine the influence of PU, PEOU, perceived social image and perceived cost on Generation Y participants' attitude towards wrist-based fitness tracker usage (Section 4.9.3). The results of these tests provided the imperative evidence to support the hypotheses of this study.

The succeeding chapter of this study, Chapter 5, provides a summary of this research study. Moreover, an analysis of the main findings of the study, recommendations, limitations and future research opportunities and an overall conclusion of this study are included.

CHAPTER 5
CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The development of technology has enabled users to access resources easily and conveniently, which emphasises the fact that consumers are currently living in an era of advanced technology. The wearable technology market is classified as a major megatrend that is reshaping the way users live (Kalantari, 2017:277), given that consumers can obtain useful and health-related data that tracks their activities in real-time and monitor their health and fitness-related metrics.

The shipment of global wearable devices is constantly growing (Statista, 2019a), where wrist-worn devices consist of the majority of the wearable device market (Framingham, 2019). Moreover, the South African wearable device market is constantly increasing its user penetration rate, which ultimately indicates growth and increased acceptance of these devices. The findings obtained from this study fills the existing gap that explains Generation Y consumers' wearable technology adoption and trends. Known as the youth of today, Generation Y members were raised in a world of technology that consists of different aspects that now encourage and drive their daily lifestyles. As such, individuals that form part of this cohort are more likely to adopt wearable devices.

There is an opportunity for wrist-based fitness tracker manufacturers such as Apple, Fitbit, Garmin, Polar, Samsung, Suunto and Tomtom to produce devices according to consumers' preferences that comprise improved productivity, accuracy, trust and timely access to activity-related metrics that are also more affordable to the general Generation Y consumer market. The successful implantation of these functionalities could have a significant influence on professional athletes, healthcare professionals, marketing practitioners, wrist-based fitness tracker manufacturers, as well as health-conscious consumers. Based on this presumption, this study's primary objective was to determine the antecedents that influence Generation Y members' attitude towards wrist-based fitness tracker usage within the South African context.

Chapter 5 provides an outline of the study (Section 5.2), followed by the main findings of the study (Section 5.3), as well as recommendations based on the findings of this study (Section 5.4). This chapter highlights the limitations of this study, followed by suggestions for future research

opportunities (Section 5.5). The concluding remarks are used to conclude the chapter (Section 5.6)

5.2 OVERVIEW OF THE STUDY

In order to provide the appropriate recommendations for the study, it is paramount to incorporate the insights gathered from the previous four chapters.

Chapter 1 provided a brief introduction regarding wrist-based fitness trackers, which comprised an overview of the wearable device industry, types and characteristics of wrist-based fitness trackers, a general discussion pertaining to the Generation Y cohort, whereafter a discussion of the factors that highlighted the importance of wrist-based fitness trackers in Section 1.1. Thereafter, the problem statement comprised the reason for conducting this research and the motivation for including the Generation Y cohort as a sample. Section 1.3 delineated the objectives for this study, which consisted of one primary objective, five theoretical objectives and seven empirical objectives. Based on the empirical objectives, specific hypotheses were formulated for this study in Section 1.4 and the proposed research design and methodology used were analysed in Section 1.5. Moreover, Section 1.6 discussed the ethical considerations pertaining to this study, while Section 1.7 provided an overview regarding the classification of the study's chapters.

Chapter 2 elaborated on the literature review, as conducted by the theoretical objectives. Section 2.2 comprised a general overview of wearable technology, followed by a discussion of consumers' perceptions of and attitude towards new technologies in Section 2.2.1. The development of the digital environment was analysed in Section 2.2.2, where an overview of the mobility of technological devices was outlined in Section 2.2.3. Moreover, the general wearable fitness tracker market was outlined in Section 2.2.4, where Section 2.3 provided a discussion pertaining to wrist-based fitness trackers, which included the benefits of using such devices in Section 2.3.1, as well as a brief discussion regarding the categories and types of wrist-based fitness trackers available in 2019 in Section 2.3.2. Section 2.4 discussed the target market of this study, followed by a discussion pertaining to the Generation Y cohort and technology in Section 2.4.1. Section 2.5 identified several technology adoption theories and models, which included a discussion on the technology acceptance model (TAM).

Section 2.6 outlined the antecedents of attitude towards wrist-based fitness tracker usage possible factors that influence wrist-based fitness tracker adoption amongst the Generation Y cohort, where the TAM was discussed and extended to include two additional factors. Therefore,

a detailed discussion pertaining to their attitude towards wrist-based fitness tracker usage (Section 2.6.1), perceived usefulness (Section 2.6.2), perceived ease of use, (Section 2.6.3), perceived social image (Section 2.6.4) and perceived cost (Section 2.6.5), was provided. The resulting proposed model pertaining to the antecedents of wrist-based fitness tracker usage among South African Generation Y members was presented in Section 2.7, where the findings imply users' eventual behavioural intention to use wrist-based fitness trackers.

A comprehensive description pertaining to the research design and methodology was explained in Chapter 3. The marketing research process was discussed in Section 3.2, whereby a quantitative research approach was used in Section 3.3, followed by a descriptive research design in Section 3.4. The target population was defined as all South African Generation Y members ranging between the ages of 18 and 33 years of age, who participated at registered Parkrun events during 2019, in the Free State and Gauteng provinces in Section 3.5.1. The sampling frame comprised the 221 registered South African Parkrun events as of 2019. A non-probability convenient sample of three Parkrun events, located in the Free State and Gauteng provinces were selected, of which two Parkrun events were situated in the Free State and one Parkrun event in Gauteng. Thereafter, 450 questionnaires were distributed across the three parkrun events based on a single cross-sectional, non-probability convenience sample in Section 3.5.3 and Section 3.5.4 respectively.

The questionnaire was submitted to the (EMS-REC) for ethics clearance (Ethics Clearance Number: 00097-19-A4). The questionnaire was pre-tested in Section 3.7 prior to the administration of the main survey in Section 3.8. The preliminary data analysis was described in Section 3.9, whilst the statistical procedures were presented in Section 3.10.

Chapter 4 delineates the findings of the empirical portion of this study. The outcome of the findings presented in Chapter 4 were in accordance with the empirical objectives composed for this research study.

5.3 MAIN FINDINGS OF THE STUDY

This section provides a discussion pertaining to the main findings of this study in accordance with the formulated empirical objectives in Chapter 1 (Section 1.3.3):

- Determine South African Generation Y members' attitude towards wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived usefulness of wrist-based fitness tracker usage.

- Determine South African Generation Y members' perceived ease of use regarding wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived social image regarding wrist-based fitness tracker usage.
- Determine South African Generation Y members' perceived cost of wrist-based fitness tracker usage.
- Determine the relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and South African Generation Y members' attitude towards wrist-based fitness tracker usage.
- Determine the influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on South African Generation Y members' attitude towards wrist-based fitness tracker usage.

Descriptive statistics and a two-tailed one sample t-test was performed to address the first five empirical objectives. According to the results of the descriptive statistics, the highest mean was recorded for attitude (mean=4.901), which implies that Generation Y members have a favourable attitude towards wrist-based fitness tracker usage. A two-tailed one sample t-test, where the expected mean was set at mean>3.5, was used to analyse whether Generation Y members have a statistically significant positive attitude towards wrist-based fitness tracker usage. As shown in Table 4.8, Generation Y members appear to have a statistically significant positive attitude towards wrist-based fitness tracker usage ($p=0.000<0.01$), with a recorded mean value of 4.901. These findings are in agreement with previous research done by Kim and Shin (2015:535) on smartwatches, whereby a positive attitude leads to a greater intention to use these devices. This proven significant positive attitude provides evidence for device manufacturers and brand managers to appeal to this segment.

In accordance with the descriptive statistics, the second highest mean was recorded for PEOU (mean=4.819), which suggests that Generation Y participants perceived wrist-based fitness trackers as devices that are easy to use. The third highest mean was recorded for PU (mean=4.735), which indicates that Generation Y participants perceive wrist-based fitness trackers as devices that are useful to their lives in general. For perceived social image, a mean value of 3.887 was recorded, which implies that Generation Y members perceive that a wrist-based fitness tracker improves their social image. Moreover, perceived cost recorded the lowest mean (mean=2.739). Although perceived cost towards wrist-based fitness tracker usage was positive, a low score was obtained, which ultimately suggests that Generation Y members are

willing to spend money on wrist-based fitness trackers, where the cost of the device will not restrain the adoption of these devices in general. Again, a two-tailed, one-sample t-test, where the expected mean was set at mean>3.5 was used to determine whether Generation Y members have statistically significant positive PU, PEOU, perceived social image and perceived cost of wrist-based fitness tracker usage. The results returned a significant p-value (P=0.000<0.01) for all four variables. The results of the statically positive PU, PEOU and perceived social image are in line with previous research (Chuah *et al*., 2016:280; Lunney *et al*., 2016:117; Ajjan & Hartshorne, 2008:77-78). However, previous research found a negative relationship between consumers' perceived cost and their intentions to use technological devices (Kim & Shin, 2015:534). This indicates that if the cost of wrist-based fitness trackers is high, consumers are inclined to have a negative attitude towards these devices, which ultimately has a negative influence on their usage intention of such devices. Therefore, H_o1, H_o2, H_o3 are rejected and the alternatives, H_a1, H_a2, H_a3, are concluded. As such, it is evident that Generation Y members have statistically significant positive PU, PEOU, perceived social image and perceived cost of wrist-based fitness tracker usage.

The sixth empirical objective was to determine whether there is a relationship between perceived usefulness, perceived ease of use, perceived social image, perceived cost and South African Generation Y members' attitude towards wrist-based fitness tracker usage. As illustrated in Table 4.9, the Pearson product-moment coefficient was used for the correlation analysis, whereby a statistically significant positive relationship exists between Generation Y members' attitude toward wrist-based fitness tracker usage, perceived usefulness, perceived ease of use, perceived social image and perceived cost.

The seventh empirical objective of this study was to determine the influence of perceived usefulness, perceived ease of use, perceived social image and perceived cost on South African Generation Y members' attitude towards wrist-based fitness tracker usage. A regression analysis was conducted, because a relationship was formed between Generation Y members' attitude towards wrist-based fitness tracker usage and their PU, PEOU, perceived social image and perceived cost towards wrist-based fitness tracker usage. Generation members' PU and PEOU had a significant positive influence on their attitude towards wrist-based fitness tracker usage. A statistically significant negative influence was computed between Generation Y participants' perceived social image and perceived cost and their attitude toward wrist-based fitness tracker usage respectively. Given the statistically significant influence on Generation Y members' attitude towards wrist-based fitness tracker usage and their PU, PEOU, perceived social image and perceived cost towards wrist-based fitness tracker usage, it can be implied that they will use such

devices in the near future; hence, intention to use is inferred. Based on the empirical objectives formulated from this study, the model presented in Figure 5-1 indicates the antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage among South African Generation Y consumers.

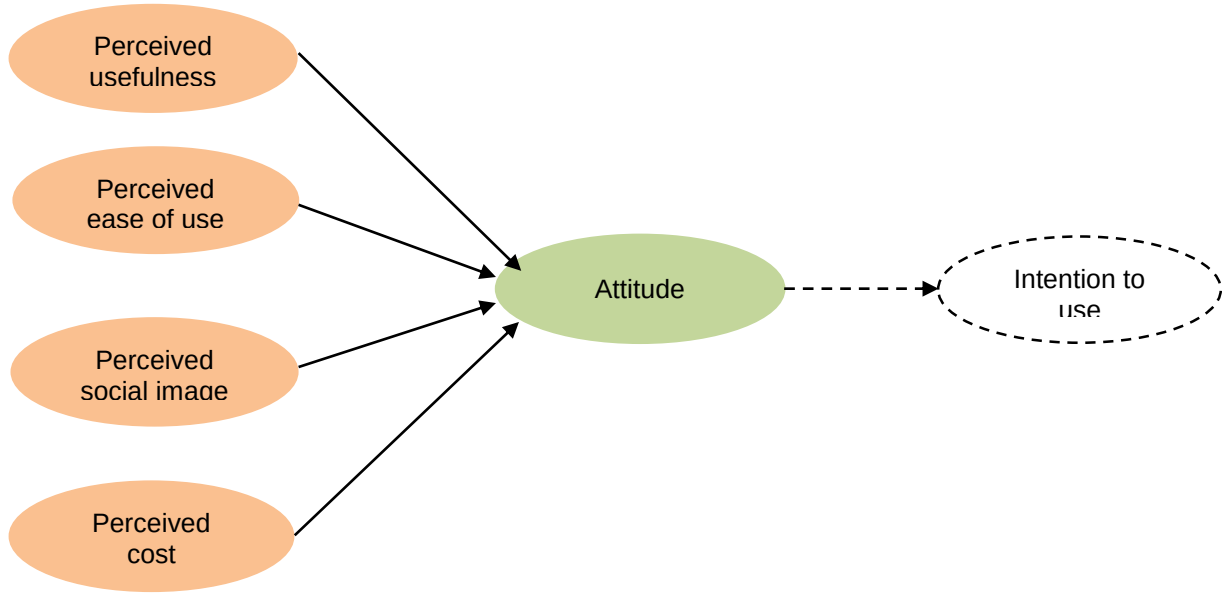


Figure 5-1: Antecedents of Generation Y members' attitude towards wrist-based fitness tracker usage

Users' technology acceptance is strengthened by means of the TAM. Accordingly, the TAM suggests that technology adoption is determined by behavioural intention, which is influenced by users' attitude towards technology (Davis, 1989). Moreover, both PU and PEOU are suggested to determine users' attitude towards using technology (Kim & Sundar, 2014:466). As illustrated in Figure 5-1, this study extended this theory to include Generation Y members' PU, PEOU, perceived social image and perceived cost, whereby a statistically significant influence on their attitude towards wrist-based fitness tracker usage was found, which ultimately has an implied effect on members' intention to use wrist-based fitness trackers in the future. Because Generation Y members are exposed to increased amounts of social media, users have higher expectations regarding the functionality and performance of wrist-based fitness trackers. It is, therefore, paramount that marketing practitioners promote wrist-based fitness trackers that resonate accurately with the user.

The succeeding section elaborates on the recommendations formulated, based on the main findings of this study.

5.4 RECOMMENDATIONS

The recommendations are based on the literature review, along with the empirical findings obtained from the South African Generation Y members pertaining to their attitude towards wrist-based fitness tracker usage.

5.4.1 Parkrun events in collaboration with wrist-based fitness device brands should incentivise consumers to achieve greater parkrun event attendance across South Africa

Organisers of parkrun events are advised to find a way to incorporate effective strategies that would encourage and motivate participants to attend parkrun events more frequently. Parkrun events across South Africa award participants with a colourful club t-shirt, which represents the achievement of personal milestones for participants, such as completing 50, 100, 250 and 500 parkrun events. Furthermore, other participants are encouraged to participate in parkrun events to build up fitness points to obtain insurance discounts. These incentives motivate participants to attend parkrun events more often, to reach these personal milestones. However, the findings obtained from this study reported that the majority of the participants in the Free State and Gauteng province attend parkrun events on an occasional basis. Therefore, the possibility exists to encourage participants to attend parkrun events on a weekly basis.

Parkrun events could collaborate with specific wrist-based fitness tracker brands, such as Apple, Fitbit, Garmin, Polar, Samsung, Suunto or Tomtom. Accordingly, marketing practitioners of wrist-based fitness trackers should encourage parkrun attendance by providing parkrunners with discounts on these devices when they complete a certain number of parkrun events. This strategy could enable participants to have an increased positive attitude towards their attendance of parkrun events, which could lead to more participants purchasing wrist-based fitness trackers. Another strategy that could increase parkrun attendance is to sponsor parkrunners with a free wrist-based fitness tracker when they complete the five-kilometre event in less than 20 minutes, or after a certain amount of events attended. This strategy could encourage participants to attend parkrun events more frequently to reach their fitness goals, while they can also become a user of a wrist-based fitness tracker. Furthermore, parkrun organisers can collaborate with wrist-based fitness tracker retailers to sponsor two devices that can be won twice a year in a lucky draw to registered parkrun participants. Participants could fill in a coupon with their personal details every time they participate in the parkrun event; the more participants attend parkrun events, the greater their chances of winning the wrist-based fitness tracker will be.

5.4.2 Medical aid schemes should incentivise wrist-based fitness tracker users with premium discounts

Wearable devices have the capability of effectively guiding users towards healthier habits which enables them to improve their current lifestyles. As such, users feel encouraged when wearing a fitness device that monitors their daily activity, training results and motivates them to be more physically active (Patel *et al*., 2015:459). It is, therefore, paramount to provide individuals with effective incentives that would lead to an increased adoption of these devices in the South African consumer market.

Discovery Vitality and Momentum Multiply are two medical aid schemes in South Africa that are currently providing users with specialty reward programmes that encourage users to earn health points by being more physically active, eating healthy and doing regular health assessments (Writer, 2019). Moreover, the Momentum Multiply Health programme provides consumers with a great deal of discount when they purchase specific products in accordance with their various partners within several categories, such as education, entertainment, fitness and travel (Multiply & Momentum, 2019). Discovery Vitality enables users to spend their vitality reward points on incentives of their choice ranging from holiday tickets, gifts and gadgets, online shopping vouchers, groceries, smoothies, snacks, coffee, popcorn and charity donations (Discovery, 2019). Other medical aid schemes should follow their example and provide competitive rewards for their consumers, whereby more affordable health-care should be incorporated for their consumers, such as a free doctor's consultation per year when using a wrist-based fitness tracker. Major opportunities exist for medical aid schemes to encourage wrist-based fitness tracker users with premium discounts based on their physical performances each month. This strategy could enable wrist-based fitness tracker users to exercise on a more regular basis, whilst participants might achieve a feeling of accomplishment, whilst being rewarded afterward. Furthermore, individuals that do not own a wrist-based fitness tracker might consider purchasing a wrist-based fitness tracker, to not only lead a healthier lifestyle, but to receive additional benefits from the medical aid scheme, which, subsequently, could lead to more individuals using such devices in South Africa.

5.4.3 Wrist-based fitness tracking device manufacturers should offer and promote more affordable devices to Generation Y members

According to Lashkari (2018), wrist-based fitness trackers enable users to track how active they are in their daily routines. Goldstein (2018) adds that without the use of wrist-based fitness devices, most users would not be aware of their daily activity levels or what they can do to improve

their performance. Wrist-based fitness trackers are mainly focused on being compatible with its users, yet, some consumers perceive the costs of these devices as a burden that leads to an adoption barrier, regardless of the perceived usefulness, enjoyment and attitude towards these devices (Shin, 2009b:193). The majority of the participants that did not own a wrist-based fitness tracker indicated that these devices are too expensive. The possibility exists that participants would purchase a wrist-based fitness tracker, given that 80.5 percent reported that they would consider purchasing a device in the future. As such, several marketing strategies should be implemented to increase participants' purchasing intentions towards wrist-based fitness trackers.

Marketing practitioners should provide consumers with different types of wrist-based fitness trackers at different price points, ranging from entry level to top-range, which will give consumers the opportunity to choose devices that consist of basic functionality, such as monitoring users' daily step counts and measuring the number of calories they consumed. These devices are less expensive than devices with more advanced functionalities. This method will provide consumers with the opportunity to experience and use a wrist-based fitness tracker and ultimately develop favourable feelings towards using such devices, whilst the possibility exists that users might develop the need to purchase a wrist-based fitness tracker with more advanced features in the future.

Marketing practitioners can also incorporate price promotions that are valid for a limited timeframe, which enables consumers to benefit not only from reduced prices on wrist-based fitness trackers, but also being introduced to different types of devices, while the opportunity exists to become loyal users of a certain wrist-based fitness tracker brand. Another strategy that marketing practitioners can incorporate is to enable consumers to use a wrist-based fitness tracker on a trial period. This strategy will allow consumers to have first-hand experience with the device that might influence consumers to have a favourable attitude towards using wrist-based fitness trackers. Ultimately, this trial period can influence consumers to recognise and experience several benefits pertaining to the device, which might outweigh the high costs of these devices. Additionally, consumers can purchase a wrist-based fitness tracker on credit by paying a monthly fixed cost. This marketing strategy will encourage individuals to increase their spending when choosing a specific device. Consumers can experience the freedom to purchase a wrist-based fitness tracker, without enduring immediate financial pressure.

5.4.4 Wrist-based fitness tracking device manufacturers should incorporate strategies to increase awareness of existing brand names towards Generation Y members

Given the various favourite fitness tracker brands that participants from the Gauteng and Free State province parkruns could choose from, the majority (25.1%) reported that Garmin was their favourite fitness tracker, followed by Samsung (21.9%) and thereafter Apple (20.4%). Garmin continuously provides users with new and innovative products that place their focus and commitment on performance. Moreover, Garmin ensures that they remain the frontrunner in the wearable fitness device market by providing devices that are fashion-orientated, as well as watches that are compatible with the outdoors, which ultimately fulfils consumers' lifestyle and fitness-related needs. It is evident that Garmin has managed to build a product line that makes it extremely difficult for other brand names to compete with. Considering that Fitbit was the leader in the wrist-based fitness tracker market, failure to respond to a changing marketplace led Fitbit to lose market share. Additionally, consumers' interests in wrist-based fitness trackers divided into two different categories, namely devices that are costly with advanced features and devices that are less expensive and consist of basic features. As such, Fitbit watches were caught between these two categories, whereby the Fitbit device is costly, but not as expensive as the main leader in the marketplace and is also considered as a device that is too expensive to afford if consumers only consider basic functionality (Duprey, 2018). However, Google recently acquired Fitbit and with its innovation and change of ownership, it might introduce competing models to improve their market share once again (Heater, 2019). Smartwatches, such as Samsung and Apple, are considered favourable devices, given that these devices enable users to receive different notifications from a smart device that enables users to receive text messages, incoming calls, emails and calendar appointments, whilst looking stylish. These smartwatches also have the capability to do basic fitness and activity tracking, which results in users having favourable attitude towards smartwatches (Walsh, 2019).

Based on the findings obtained from this study, only 11 percent of participants reported that Polar is their favourite fitness tracker brand. This ultimately creates a major concern for Polar, given that they are the pioneers of wearable sports technology, whereby they started their first patent in 1977. Moreover, Polar launched the world's first wireless heart rate monitor in 1982 and its first wearable activity tracker in 2007 (Polar, 2017). Polar device manufacturers should incorporate various strategies that will allow this brand to be more competitive within the wrist-based fitness market. Moreover, wrist-based fitness tracker device manufacturers should refrain from building fitness watches that incorporate all fitness tracking features in one device, but should rather

manufacture a device that is applicable to specific niche markets. These niche markets can include exclusive wrist-based fitness trackers for runners, swimmers, cyclers, or individuals that specifically participate in triathlons. Device manufacturers can also design watch faces that are slimmer, more comfortable and compatible with users' wrist sizes, given that some fitness trackers still have relatively large watch interfaces, which creates an uncomfortable experience for its users.

5.4.5 Device manufacturers should develop wrist-based fitness trackers that are easier to use and/or have video tutorials available that explain how each model works to simplify usage for consumers

PEOU refers to the extent to which a consumer believes that using a technological device would be effortless (Kulviwat *et al*., 2007:1063). The negative effects of perceived ease of use exist, given that certain individuals believe that there are specific skills required to use wrist-based fitness trackers. From the findings gathered from this study, several participants indicated that they do not own a wrist-based fitness tracker because these devices are too complicated to use. As such, various strategies should be implemented to ensure a level of easy operational usage for all wrist-based fitness tracker users across device brands and models. Consumers that find it difficult to understand how to access certain features and capabilities on these devices can watch YouTube tutorials that will assist them with step-by-step instructions to ultimately understand and experience a favourable feeling towards wrist-based fitness trackers. This way consumers will not perceive wrist-based fitness trackers as difficult to use, but a step-by-step guide will explain how it works. Furthermore, device manufacturers and application developers should shorten the process of synchronising a wrist-based fitness tracker to the application on users' mobile devices or computers. As a result, users will feel that their health and fitness metrics are uploaded in a fast and effective manner, eliminating complicated and time-consuming processes.

5.4.6 Device manufacturers should monitor the Generation Y cohorts' wrist-based fitness tracker adoption behaviour and implement strategies to effectively target this market segment

The South African Generation Y cohort postulates high expectations from brands and new technological devices. As such, the Generation Y cohort is capable of using various forms of technology and mastering effective ways of communicating through technology. It is evident that this transparent generation is the most active and informed generation, because they are constantly exposed to several wearable gadgets.

The findings based on this study indicate that the Generation Y cohort is a viable consumer market for wrist-based fitness trackers. As such, device manufacturers should focus their marketing efforts on this cohort and continuously monitor their behaviour. The successful promotion of wrist-based fitness trackers can be done by utilising several social media platforms such as Facebook, Twitter, Instagram, YouTube, LinkedIn, Pinterest), mobile advertising, as well as in-store promotions offered by retailers.

5.4.7 Marketers should focus on the benefits of wrist-based fitness trackers to increase Generation Y members training habits

Technology innovations should be compatible with consumer's specific needs, personal preferences and lifestyle choices. Additionally, consumers make purchasing decisions based on the perception that the technology will provide specific benefits, which are compatible with their daily lifestyles. From the findings of this study, it is evident that the majority of the participants', a total of 35.4 percent, train three to four days per week, while 14.2 percent of participants do not train at all. Therefore, a great opportunity exists to improve participants' weekly training habits. Livingstone (2019) mentions that the use of a wrist-based fitness tracker can ultimately increase users' physical performance, such as running or walking more often, while they become less sedentary. Accordingly, marketers should emphasise additional elements and benefits of wrist-based fitness trackers in such a captivating way that participants develop favourable attitude towards these devices. This can lead to an increased number of participants that would adopt and use wrist-based fitness trackers. Participants can become more productive and physically active, given that wrist-based fitness trackers focus on enhancing users' fitness and health performance. As a result, wrist-based fitness trackers can motivate participants through the incorporation of visual progress of their daily training habits, allowing them to set their own weekly training goals and encouraging users to reach these goals in a predetermined timeframe. Consequently, marketers should place emphasis on appealing benefits that could increase participants' weekly training habits, resulting in a more physically active and healthy lifestyle.

5.5 LIMITATIONS AND FUTURE RESEARCH OPPORTUNITIES

This study determined the antecedents that influence Generation Y members' attitude towards wrist-based fitness tracker usage in the South African context. This study, similar to other studies, had certain limitations, whereby several future research opportunities are presented. Consequently, the interpretation of the results should be done with caution. A single cross-sectional research approach was used in this study. Therefore, the findings obtained from this study lack the accuracy of a longitudinal study.

Participants from only three parkrun events, situated in two provinces, namely the Free State and Gauteng province, formed the sample (Section 3.4.2). Therefore, the opportunity exists to launch a wider scale research study at parkrun events across all nine provinces. Thereby, a more accurate representation of attitude towards wrist-based fitness tracker usage among the South African Generation Y cohort could be obtained.

This study focused exclusively on parkrunners, where all participants formed part of the Generation Y cohort, aged between 18 and 33 years of age, known as the individuals most likely to use a wrist-based fitness tracker. This provides an opportunity for researchers to conduct research on individuals that do not participate in parkrun events that form part of the South African Generation Y cohort, to evaluate whether a gap exists in the market to appeal to non-parkrunners.

Limited factors that influence members' attitude towards wrist-based fitness tracker usage includes only focusing on the attitude towards wrist-based fitness tracker usage amongst the selected sample, providing PU an opportunity to conduct further research on the actual influence that wrist-based fitness trackers have on consumers' purchasing behaviour. Therefore, marketing practitioners can integrate various strategies that are based directly on specific consumer preferences of wrist-based fitness trackers.

For the purpose of this study, a sample size of 450 participants was acceptable (Section 3.4.4). A larger-scale study that involves more parkrun events should be conducted, to determine users' personal preferences pertaining to wrist-based fitness trackers.

5.6 CONCLUDING REMARKS

Wrist-based fitness trackers have the capability to motivate users to live healthier lifestyles, such as following a healthy diet or exercising on a regular basis. It is, therefore, evident that the availability of specific benefits that wrist-based fitness trackers have to offer will ultimately have an impact on the adoption tendencies of consumers.

The adoption rate of wrist-based fitness trackers in South Africa can further be increased, considering that a large number of South African consumers form part of the Generation Y cohort. These individuals associate themselves with high social statuses and trends, which increases the possible opportunities for development in South Africa. As such, a major market opportunity exists in South Africa to fulfil the gap in the Generation Y cohort by combining previous research and findings pertaining to this cohort. The results obtained from this study allow wrist-based fitness tracker advertisers to incorporate positively framed advertising messages while creating awareness for manufacturers and marketers to produce more affordable devices and to

incorporate pricing strategies that reduce the prices of wrist-based fitness trackers for a specific time period.

This study evaluated the attitude towards wrist-based fitness tracker usage amongst members of the South African Generation Y cohort. Understanding these factors and taking into consideration the findings and recommendations made for the purpose of this study, wrist-based fitness trackers can have a substantial influence on professional athletes, healthcare professionals, marketing practitioners, as well as health-conscious consumers. As a result, wrist-based fitness trackers have the opportunity to keep a strong competitive advantage in the wearable device industry within South Africa.

BIBLIOGRAPHY

Aaker, D.A., Kumar, V., George, S.D. & Robert, P.L. 2011. Marketing research. 10th ed. Hoboken, NJ: Wiley.

Aarts, H., Paulussen, T. & Schaalma, H. 1997. Physical exercise habit: On the conceptualisation and formation of habitual health behaviours. *Health education research*, 12(3):363-374.

Abbot, L. 2019. 11 Millennium traits you should know about before you hire them. https://business.linkedin.com/talent-solutions/blog/2013/12/8-millennials-traits-you-should-know-about-before-you-hire-them Date of access: 25 August 2019.

Actuarial Society. 2018. Generations in the workplace. https://www.actuarialsociety.org.za/wp-content/uploads/2018/11/DIVERSITY-AND-INCLUSION-MULTI-GENERATIONAL-Nene-Molefi.pdf Date of access: 12 September 2019.

Adapa, A., Hall, R.H., Smith, S.N., Nah, F.H. & Siau, K. 2018. Factors influencing the adoption of smart wearable devices. *International Journal of Human-Computer Interaction*, 34(5): 399-409.

Adika, D. & Sweary, R. 2019. How does technology adoption impact business? https://www.walkme.com/glossary/technology-adoption/ Date of access: 21 August 2019.

Africa Check. 2018. Are some 70% of women, 39% of men in South Africa overweight? https://africacheck.org/spot-check/are-some-70-of-women-39-of-men-in-south-africa-overweight/ Date of access: 22 August 2019.

Agarwal, S. & Teas, R.K. 2001. Perceived value: Mediating role of perceived risk. *Journal of Marketing theory and Practice*, 9(4):1-14.

Aitken, N. 2019. Most used features of smartwatches. https://whatphone.com.au/guide/most-used-features-of-smartwatches Date of access:13 September 2019.

Ajjan, H. & Hartshorne, R. 2008. Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *The internet and higher education*, 11(2):71-80.

Ajzen, I. & Fishbein, M. 1980. Understanding attitudes and predicting social behaviour. Upper Saddle River, NJ: Prentice-Hall.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2):179-211.

Al-Eidan, R.M., Al-Khalifa, H. & Al-Salman, A.M. 2018. A review of wrist-worn wearable: Sensors, models, and challenges. *Journal of Sensors*, p. 1-20.

Allen, M. 2017. The SAGE Encyclopaedia of communication research methods. United States of America: Sage.

Allison, C. 2018. Semi-precious: The best smart jewellery. https://www.wareable.com/fashion/semi-precious-the-best-smart-jewelry-582 Date of access: 3 February 2019.

Babin, B. & Zikmund, W. 2016. Exploring marketing research. 11th ed. Boston USA: Cengage Learning, p.342.

Bajpai, N. 2011. Business research methods. India: Dorling Kindersley.

Bajpai, N. 2015. Marketing research: An Indian perspective. India: Pearson Education.

Barazani, D. 2019. How to recruit a sample. https://www.ibpsychmatters.com/sampling-methods Date of access: 19 November 2019.

Barnes, S., Bauer, H., Neumann, M. & Huber, F. 2007. Segmenting cyberspace: A customer typology for the internet. *European Journal of Marketing*, 41(1):71-93.

Beal, V. 2019. Wearable technology. https://www.webopedia.com/TERM/W/wearable_technology.html Date of access: 14 November 2019.

Belen del Rio, A., Vazquez, R. & Iglesias, V. 2001. The role of the brand name in obtaining differential advantages. *Journal of Product & Brand Management*, *10*(7):452-465.

Bell, D. 2019. Best fitness tracker 2019: track steps, activity, sleep and cardio. https://www.t3.com/features/best-fitness-tracker Date of access: 9 September 2019.

Benbunan-Fich, R. 2017. Usability of wearables without affordances. *Twenty-third Americas Conference on Information Systems,* p. 1-10.

Berglund, M.E., Duvall, J. & Dunne, L.E. 2016. A survey of the historical scope and current trends of wearable technology applications. *International Symposium on Wearable Computers,* p.40-43.

Bernarte, R. 2019. Methods of research. https://www.academia.edu/9419738/The_Sample_and_Sampling_Techniques Date of access: 4 April 2019.

Berndt, A. & Petzer, D. 2011. Marketing research. Cape Town: Pearson.

Berri, G.C. 2013. Marketing research. 5th ed. New Delphi: McGraw Hill Education.

Berrios, R. & Lucca, N. 2006. Qualitative methodology in counselling research: Recent contributions and challenges for a new century. *Journal of Counselling and Development*, 84(1):174-186.

Bevan-Dye, A. 2016. Profiling the Generation Y cohort. Vanderbijlpark: North-West University, Vaal Triangle Campus.

Bevan-Dye, A.L., Dhurup, M. & Surujal, J. 2009. Black generation Y students' perceptions of national sport celebrity endorsers as role models. *African journal for physical, health education, recreation and dance*, 15(4):172-188.

Beverly, J. 2016. First run: Under Armour's smart shoes. https://www.runnersworld.com/gear/a20859984/first-run-under-armours-smart-shoes/ Date of access: 11 September 2019.

Bhakuni, U. 2018. Types of statistical analysis - video and lesson transcript. https://study.com/academy/lesson/types-of-statistical-analysis.html Date of access: 21 April 2019.

Bhasin, H. 2019. What is exploratory research? Types of exploratory research. https://www.marketing91.com/exploratory-research/ Date of access: 29 August 2019.

Bhat, A. 2019a. Exploratory research: Definition, methods, types and examples. https://www.questionpro.com/blog/exploratory-research/ Date of access: 11 July 2019.

Bhat, A. 2019b. Non-probability sampling: Definition, methods and examples. https://www.questionpro.com/blog/non-probability-sampling/ Date of access: 14 April 2019.

Black, K. 2009. Business statistics: Contemporary decision making. 6th ed. Hoboken: John Wiley & Sons, Inc.

Bolton, R.N., Parasuraman, A., Hoefnagels, A., Migchels, N., Kabadayi, S., Gruber, T., Komarova Loureiro, Y. & Solnet, D. 2013. Understanding Generation Y and their use of social media: A review and research agenda. *Journal of service management*, *24*(3):245-267.

Bothun, D. & Liberman, M. 2016. The wearable life 2.0 connected living in a wearable world. https://www.pwc.com/ee/et/publications/pub/pwc-cis-wearables.pdf Date of access: 9 September 2019.

Boughton, L. 2016. 5 Wearable technologies you should consider for your qualitative market research. https://www.howtogeek.com/207108/wearables-101-what-they-are-and-why-youll-be-seeing-a-lot-of-them/ Date of access: 11 September 2019.

Brabazon, T., Redhead, S., & McRae, L. 2015. Moving on up: Physical cultural studies in third tier cities. http://traffic.libsyn.com/tarabrabazon/Moving_on_up_-_physical_cultural_studies_in_third_tier_cities.mp3 Date of access: 20 August 2019.

Brace, I. 2018. Questionnaire design: How to plan, structure and write survey material for effective market research. 4th ed. United States: Kogan Page Limited.

Bradley, N. 2010. Marketing research: Tools & techniques. 2nd ed. New York, NY: Oxford University Press.

Bradley, N. 2013. Marketing research: Tools and techniques. 3rd ed. United Kingdom: Oxford University Press.

Brain & Spine. 2018. 3 Reasons to track sleep on your smart watch or fitness tracker. https://health.clevelandclinic.org/3-reasons-to-track-your-sleep-on-an-app-or-wearable-device/ Date of access: 23 August 2019.

Brosdahl, D.J. & Carpenter, J.M. 2011. Shopping orientations of US males: A generational cohort comparison. *Journal of Retailing and Consumer Services*, *18*(6):548-554.

Brown, J.S. & Duguid, P. 2000.The social life of information. Boston: Harvard Business School, p.13.

Brown, T.A. 2015. Confirmatory factor analysis for applied research. 2nd ed. New York: Guilford Publications.

Brown, T.J., Suter, T.A. & Churchill, G.A. 2014. Basic marketing research: Customer insights and managerial action. 8th ed. America: Cengage Learning.

Bulatovych, D. & Tagiev, R. 2019. Latest technologies for fitness app development. https://yalantis.com/blog/what-activity-tracking-technology-is-used-in-fitness-app-development/ Date of access: 6 September 2019.

Burns, A. C. & Bush, R.F. 2010. Marketing research. Global edition. New Jersey: Prentice Hall.

Burns, A.C. & Bush, R.F. 2014. Marketing research. 7th ed. Essex, England: Pearson Education.

Burns, A.C. & Veeck, A. & Bush, R.F. 2017. Marketing research. 8th ed. Boston: Pearson Education.

Cabral, J. 2008. Is Generation Y addicted to social media? *Strategic communications*, 18:125.

Callaway, J. & Falkous, C. 2018. Wearable technology in life insurance. https://www.rgare.com/knowledge-center/media/research/wearable-technology-in-life-insurance Date of access: 5 September 2019.

Cameron, L. 2019. Wearables: The next big thing as smartphones mature. https://www.computer.org/publications/tech-news/research/wearables-next-big-thing-smartphones Date of access: 19 November 2019.

Cant, M. Gerber-Nel, C., Nel, D. & Kotze, T. 2008. Marketing research. 2nd ed. Pretoria: Van Schaik.

Canteneur, P. 2016. Generation Y: Technology shapes attitude to work. https://atelier.bnpparibas/en/life-work/article/generation-y-technology-shapes-attitudes-work Date of access: 25 August 2019.

Cardinal, D. 2019. How sleep and fitness trackers work, and whether they’re worth it. https://www.extremetech.com/electronics/287613-how-sleep-and-fitness-trackers-work-and-whether-theyre-worth-it Date of access: 23 August 2019.

Carp, A. 2015. Wearable electronics. Electrical and computer engineering design handbook. Sites.tufts.edu.https://sites.tufts.edu/eeseniordesignhandbook/2015/wearable-electronics/ Date of access: 8 July 2019.

Case, M. A., Burwick, H. A., Volpp, K. G., & Patel, M. S. 2015. Accuracy of smartphone applications and wearable devices for tracking physical activity data. *Journal of the American Medical Association*, 313(6):625-626.

CCS Insight, 2019. Fitness bands and basic smartwatches fuel sales of wearable devices. https://www.ccsinsight.com/press/company-news/2702-fitness-bands-and-basic-smartwatches-fuel-sales-of-wearable-devices/ Date of access: 19 October 2019.

Cha, A.E. 2015. Health and data: Can digital fitness monitors revolutionise our lives? https://www.theguardian.com/society/2015/may/19/digital-fitness-technology-data-heath-medicine Date of access: 19 August 2019.

Chan, C. 2018. Can you change the band on the Fitbit Alta HR? https://www.imore.com/can-you-change-band--fitbit-alta-hr Date of access: 12 September 2019.

Chang, A. 2017a. Fitness tracker buying guide. https://www.tomsguide.com/us/fitness-tracker-buying-guide,review-2549.html Date of access: 6 September 2019.

Chang, C.T. 2017b. Health-care product advertising: The influences of message framing and perceived product characteristics. *Psychology & Marketing*, 24(2):143-169.

Chanhoto, A. I. & Arp, S. 2017. Exploring the factors that support adoption and sustained use of health and fitness wearables. *Journal of Marketing Management*, 33(1-2):32-60.

Chaput, J.P., Klingenberg, L., Rosenkilde, M., Gilbert, J.A., Tremblay, A., Sjodin, A. 2010. Physical activity plays an important role in the body weight regulation. *Journal of obesity*, p.1-11.

Chen, P.Y. & Hitt, L.M. 2002. Measuring switching costs and the determinants of customer retention in internet-enabled businesses: A study of the online brokerage industry. *Information Systems Research*, 14(3):255-274

Chi, C. 2019. What is an early adopter? https://blog.hubspot.com/marketing/early-adopters Date of access: 22 August 2019.

Chisnall, P. 1992. Marketing research. 4th ed. England: McGRAW- HILL, London.

Choi, J. & Kim, S. 2016. Is the smartwatch an IT product or a fashion product? A study on factors affecting the intention to use smartwatches. *Computers in Human Behavior*, 63:777-786.

Chuah, S.H.W., Rauschnabel, P.A., Krey, N., Nguyen, B., Ramayah, T. & Lade, S. 2016. Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior,* 65:276-284.

Clark, L.A. & Watson, D. 1995. Constructing validity: Basic issues in objective scale development. *Psychology assessment*, 7(3):309-319.

Clause, C. 2018. Content validity: Definition, index and examples. https://study.com/academy/lesson/content-validity-definition-index-examples.html Date of access: 22 June 2019.

Clow, K.E. & James, K.E. 2014. Essential of marketing research: Putting research into practice. Thousand Oaks, California: Sage Publications.

Computer Hope. 2019. Fitness tracker. https://www.computerhope.com/jargon/f/fitness-tracker.htm Date of access: 12 September 2019.

Corder, K., Brage, S. & Ekelund, U. 2007. Accelerometers and pedometers: Methodology and clinical application. *Current Opinion in Clinical Nutrition and Metabolic Care,*10(5):597-603.

Courtney, N.A. 2017. The 10 most giftable trackers and wearables. https://www.nbcnews.com/better/health/10-most-giftable-trackers-wearables-ncna823321 Date of access: 19 October 2019.

Coussement, K., Demoulin, N. & Charry, K. 2011. Marketing research with SAS enterprise guide. England: Gower.

Cox, T. 2019. How different Generations use social media. https://themanifest.com/social-media/how-different-generations-use-social-media Date of access: 25 August 2019.

Creswell, J. W. & Clark, V. L. 2007. Designing and conducting mixed methods research. Thousand Oaks, CA: Sage Publications.

Creswell, J.W. 2013. Research design: Qualitative, quantitative, and mixed methods approaches. 4th ed. Thousand Oaks: Sage Publications.

Cuofano, G. 2019. What is a technology adoption curve? The five stages of a technology adoption life cycle. https://fourweekmba.com/technology-adoption-curve/ Date of access: 21 August 2019.

Daniel, J. 2012. Sampling essentials. Thousand Oaks, Calif: Sage, p.147.

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3):319-340.

Davis, F. D., Warshaw, P. R. & Bagozzi, R. P. 1992. Development and test of a theory of technological learning and usage. http://dx.doi.org/10.1177/001872679204500702 Date of access: 28 May 2018.

Davis, Z. 2018. Definition of a fitness tracker. https://www.pcmag.com/encyclopedia/term/67469/fitness-tracker Date of access: 21 August 2019.

Dawn, L. & Churchill, G. 2010. Marketing research methodological foundations. 10th ed. Canada: Cengage Learning.

de Arriba-Pérez, F., Caeiro-Rodríguez, M. & Santos-Gago, J. 2016. Collection and processing of data from wrist wearable devices in heterogeneous and multiple-user scenarios. *Sensors*, *16*(9):1538.

De Clerck, J.P. & De Wit, R. 2016. Mobile and mobility – the transformational impact of ubiquitous connectivity. https://www.i-scoop.eu/digital-transformation/mobile-mobility/ Date of access: 20 August 2019.

Dean, D. 2019. The 8 best wearable tech of 2019. https://www.lifewire.com/best-wearable-tech-4170046 Date of access: 11 September 2019.

DeFranzo, S. 2014. Benefit from 3 types of survey research. https://www.snapsurveys.com/blog/benefit-3-types-survey-research/ Date of access: 12 July 2019.

DeMarco, A. 2019. The best smartwatches for woman in 2019. https://www.forbes.com/sites/anthonydemarco/2019/07/19/the-best-smartwatches-for-women-in-2019/#1b4a0bb75cc1 Date of access: 3 February 2019.

Denscombe, M. 2014. The good research guide. For small-scale social research projects. 5th ed. New York: McGraw-Hill Education.

Desjardins, J. 2018. The rising speed of technological adoption. https://www.visualcapitalist.com/rising-speed-technological-adoption/ Date of access: 21 August 2019.

Discovery. 2019. Vitality active rewards. https://www.discovery.co.za/vitality/active-rewards Date of access: 6 November 2019.

Domb, M. 2018. Wearable devices and their implementation in various domains. https://www.intechopen.com/online-first/wearable-devices-and-their-implementation-in-various-domains Date of access: 23 August 2019.

Dornyei, Z. & Taguchi, T. 2010. Questionnaires in second language research. 2nd ed. New York: Lawrence Erlbaum Associates.

Story, J. 2019. Why are there generational cohorts? https://blogs.stthom.edu/cameron/why-are-theregenerationalcohorts/#targetText=%E2%80%9CDid%20you%20really%20think%20that,have%20similar%20characteristics%20and%20behaviors. Date of access: 25 August 2019.

Driver, M. 2018. Smartwatch VS fitness tracker: What's best? https://www.teamknowhow.com/discover/discover/smartwatch-vs-fitness-tracker Date of access: 13 September 2019.

Dudovskiy, J. 2019. Data collection methods - research-methodology. https://research-methodology.net/research-methods/data-collection/ Date of access: 17 April 2019.

Duffy, J. 2019. The best heart rate monitors for 2019. https://www.pcmag.com/roundup/352257/the-best-heart-rate-monitors Date of access: 15 November 2019.

Dulin, L. 2008. Leadership preferences of a generation Y cohort: A mixed-methods investigation. *Journal of leadership studies*, *2*(1):43-59.

Duprey, R. 2018. Things go from bad to worse for Fitbit. https://www.fool.com/investing/2018/03/14/things-go-from-bad-to-worse-for-fitbit.aspx Date of access: 7 November 2019.

Dvorak, J.L. 2008. Moving wearables into the mainstream: Taming the borg. New York: Springer.

Dwivedi, Y., Rana, N., Jeyaraj, A., Clement, M. & Williams, M. 2017. Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, p.1-16.

Eagly, A.H. & Chaiken, S. 2007. Wat is an attitude? The advantages of an inclusive definition of attitude. *Social Cognition,* 25(1):582-602.

Edison, S.W. & Geissler, G.L. 2003. Measuring attitudes towards general technology: Antecedents, hypotheses and scale development. *Journal of targeting, Measurement and Analysis for Marketing*, *12*(2):137-156.

Edmead, M. 2016. Digital transformation: Why it's important for your organisation. https://www.cio.com/article/3063620/digital-transformation-why-its-important-to-your-organization.html Date of access: 20 August 2019.

Ekinci, Y. 2015. Designing research questionnaires for business and management students. Los Angeles: SAGE Publications Ltd.

Keating, L. 2019. Runner Click. Garmin forerunner 235. https://runnerclick.com/garmin-forerunner-235-review/ Date of access: 26 August 2019.

Etikan, I., Musa, S.A. & Alkassim, R.S. 2016. Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1):1-4.

Evenson, K.R., Goto, M.M. & Furberg, R.D. 2015. Systematic review of the validity and reliability of consumer-wearable activity trackers. *International Journal of Behavioral Nutrition and Physical Activity*, 12(1):159.

Facts, F. 2018. Fitness & activity tracker. https://www.statista.com/topics/4393/fitness-and-activity-tracker/ Date of access: 1 July 2018.

Featherman, M.S. & Pavlou, P.A. 2003. Predicting e-services adoption: A perceived risk facets perspective. *International Journal of Human-Computer Studies*, 59:451-474.

Feinberg, M.F., Kinnear, C.T. & Taylor, R.J. 2013. Modern marketing research concepts, methods, and cases. 2nd ed. South-Western, Cengage Learning.

Fishbein, M. & Ajzen, I. 1975. Belief, attitudes, intention and behavior: An introduction to theory and research. Philippines: Addison-Wesley.

Foley, B. 2018. The methods of probability sampling and when to use each. https://www.surveygizmo.com/resources/blog/probability-sampling/ Date of access: 14 April 2019.

Fox, T. 2019. Advantages and disadvantages of using a fitness tracker. https://www.dumblittleman.com/do-fitness-trackers-work/ Date of access: 12 August 2019.

Framingham, M. 2018. IDC forecasts slower growth for wearables in 2018 before ramping up again through 2022. The premier global market intelligence company. https://www.idc.com/getdoc.jsp?containerId=prUS44276818 Date of access: 11 February 2019.

Framingham, M. 2019. Ongoing demand fuels a strong growth trajectory for wearable devices in q1 2019 with wrist-worn and ear-worn leading the market, according to IDC. https://www.idc.com/getdoc.jsp?containerId=prUS45115019 Date of access: 7 September 2019.

Friedman, M. 1985. The changing language of a consumer society: Brand name usage in popular American novels in the postwar era. *Journal of Consumer Research*, 11(4):927-938.

Fripp, G. 2016. Consumer adoption categories. https://www.google.com/search?q=late+majority&ei=k1FeXanOG4vRwALmxK2YAw&start=20&sa=N&ved=0ahUKEwjp44CCh5bkAhWLKFAKHWZiCzM4ChDy0wMIiAE&biw=1366&bih=614 Date of access: 21 August 2019.

Garmin, 2019. Garmin. https://buy.garmin.com/en-ZA/ZA/wearables/wearables/c10001-c10002-p1.html Date of access: 15 November 2019.

Garris, A. 2018. Five reasons why you should buy a fitness tracker. http://www.hyperactivz.com/5-reasons-buy-fitness-tracker/ Date of access: 17 August 2019.

Gefen, D. 2002. Reflections on the dimensions of trust and trustworthiness among online consumers. *Database for Advances in Information Systems*, 33(3):38-53.

George, D. & Mallery, M. 2010. SPSS for windows step by step: A simple guide and reference, 17.0 update. 10th ed. Boston: Pearson.

GFK. 2019. Unpacking South African Millennials. https://www.gfk.com/en-za/insights/news/unpacking-south-african-millennials/ Date of access: 25 August 2019.

Gilliland, N. 2019. Twelve examples of digital technology in retail stores. https://econsultancy.com/examples-digital-technology-in-retail-stores/ Date of access: 19 August 2019.

Godfrey, A., Hetherington, V., Shum, H., Bonato, P., Lovell, N.H. & Stuart, S. 2018. From A to Z: wearable technology explained. *Maturitas*, *113*:40-47.

Gold, A.H., Malhotra, A. & Segars, A.H. 2001. Knowledge management: an organizational capabilities perspective. *Journal of management information systems*, *18*(1):185-214.

Goldstein, R. 2018.The benefits of fitness and activity trackers in the workplace. https://www.forbes.com/sites/forbeslacouncil/2018/09/07/the-benefits-of-fitness-and-activity-trackers-in-the-workplace/#72d63bb769cf Date of access: 23 August 2019.

Goodman, P. 2019. Sixteen advantages of digital technology. https://turbofuture.com/computers/Advantages-of-Digital-Technology Date of access: 18 August 2019.

Gravetter, F.J. & Wallnau, L. 2010. Essentials of statistics for the behavioural sciences. 7th ed. Belmont: Wadsworth Cengage Learning.

Grbich, C. 2013. Qualitative data analysis. 2nd ed. Los Angeles: SAGE Publications.

Gunnel, M. 2016. Research Methodologies: A comparison of quantitative, qualitative and mixed methods. Tecolote Research. (Thesis-PhD). https://www.linkedin.com/pulse/research-methodologies-comparison-quantitative-mixed-methods-gunnell Date of access: 9 Augustus 2019.

Gürhan-Canli, Z. & Maheswaran, D. 1998. The effects of extensions on brand name dilution and enhancement. *Journal of marketing research*, 35(4):464-473.

Hagger, M.S., Chatzisarantis, N.L.D. & Biddle, S.J.H. 2002. A meta-analytic review of the theories of reasoned action and planned behaviour in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology*, 24:3-32.

Hair, J.F., Wolfinbarger, Ortinau, D.J. & Bush, R.P. 2008. Essentials of marketing research. New York: McGraw-Hill Higher Education.

Hair, J.F., Wolfingerger Celsi, M., Ortinau, D.J. & Bush, R.P. 2013. Essentials of marketing research. New York: McGraw-Hill Higher Education.

Hale, J. 2018. The 3 basic types of descriptive research methods. https://psychcentral.com/blog/the-3-basic-types-of-descriptive-research-methods/ Date of access: 13 July 2019.

Harwood, C., Hardy, L. & Swain, A. 2000. Achievement goals in sport: A critique of conceptual and measurement issues. *Journal of Sport and Exercise Psychology*, 22:235-255.

Health Fitness Revolution. 2019. Top 10 benefits of fitness trackers. https://www.healthfitnessrevolution.com/top-10-benefits-of-fitness-trackers/ Date of access: 22 August 2019.

Heater, B. 2019. Google is acquiring Fitbit for $2.1 billion. https://techcrunch.com/2019/11/01/google-is-acquiring-fitbit/ Date of access: 19 November 2019.

Henriksen, A., Haugen Mikalsen, M., Woldaregay, A., Muzny, M., Hartvigsen, G., Hopstock, L. & Grimsgaard, S. 2018. Using fitness trackers and smartwatches to measure physical activity in research: Analysis of consumer wrist-worn wearables. *Journal of Medical Internet Research*, 20(3):2.

Henseler, J., Ringle, C.M. & Sarstedt, M. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*(1):115-135.

Higley, M. 2018. Understanding the African Millennials. http://www.hrpulse.co.za/editors-pick/236166-understanding-the-african-millennial-advice-for-small-business-owners-to-cater-to-todays-consumers Date of access: 25 August 2019.

Hodgkins, K. 2019. The best fitness trackers for 2019. https://www.digitaltrends.com/wearables/best-fitness-trackers/ Date of access: 8 September 2019.

Hong-Youl, H. 2002. The effects of consumer risk perception on pre-purchase information in online auctions: Brand, Word-of-mouth, and customized information. *Journal of Computer-Mediated Communication*, 8(1).

Hoyt, A. 2019. How lifelogging works. https://electronics.howstuffworks.com/gadgets/fitness/lifelogging1.htm Date of access: 3 February 2020.

Hsu, C.L. & Lu, H.P. 2004. Why do people play on-line games? An extended TAM with social influences and flow experience. *Information and Management*, 41:853-868.

Huang, J.H., Lin, Y.R. & Chuang, S.T. 2007. Educating user behavior of mobile learning: A perspective of the extended technology acceptance model. *Emerald Group Publishing Limited*, 25(5):585-598.

Hyman, M.R. & Sierra, J.J. 2010. Marketing research kit for dummies. Indiana: Wiley Publishing, Inc.

Iacobucci, G.A. & Iacobucci, D. 2010. Marketing research: Methodological foundations. 10th ed. Mason, OH: Cengage Learning.

Ismail, T. & Masinge, K. 2012. Mobile banking: innovation for the poor. *African Journal of Science, Technology, Innovation and Development*, 4(3):98-127.

Jackson, S. 2016. Research methods and statistics. 5th ed. Boston, Cengage Learning, p.98.

Jain, D. 2018. Skewness and kurtosis: 2 Important statistics terms you need to know in data science. https://codeburst.io/2-important-statistics-terms-you-need-to-know-in-data-science-skewness-and-kurtosis-388fef94eeaa Date of access: 29 April 2019.

Jeanalogia. 2014. The digital transformation: A view to the future. https://www.jeanologia.com/digital-transformation-article/ Date of access: 20 August 2019.

Jefferys, A. 2018. Distinguishing between descriptive and causal studies. https://sciencing.com/distinguishing-between-descriptive-causal-studies-12752444.html Date of access: 12 July 2019.

Jeong, S.C., Kim, S.H., Park, J.Y. & Choi, B. 2017. Domain-specific innovativeness and new product adoption: A case of wearable devices. *Telematics and Informatics*, 34(5):399-412.

Jiang, P. 2004. The role of brand name in customization decisions: A search VS experience perspective. *Journal of Product & Brand Management*, 13(2):73-83.

John. 2018. What types of wearable technology are there. https://smartwatchlabs.com/what-types-of-wearable-technology-are-there/ Date of access: 11 September 2019.

Jooste, C. 2018. Start your exercise now to burn calories and get rewarded. https://www.mlmgateway.com/announcements/34657093-start-your-exercise-now-to-burn-calories-and-get-rewarded.php Date of access: 13 August 2019.

Kaewkannate, K. & Kim, S. 2016. A comparison of wearable fitness devices. *BMC public health*, *16*(1):433.

Kalantari, M. 2017. Consumers' adoption of wearable technologies: Literature review, synthesis, and future research agenda. *International Journal of Technology Marketing*, *12*(3):274-307.

Kaminski, J. 2011. Diffusion of innovation theory. *Canadian Journal of Nursing Informatics*, 6(2):1-6.

Karahanoglu, A. & Erbug, C. 2011. Perceived qualities of smart wearables: Determinants of user acceptance. In Proceedings of the 2011 Conference on designing pleasurable products and interfaces.

Kerner, M. S. & Grossman, A. H. 1998. Attitudinal, social and practical correlates to fitness behaviour: A test of the theory of planned behaviour. *Journal of Perceptual and Motor Skills*, 87:1139-1154.

Khillar, S. 2019. Difference between smart watch and fitness tracker. http://www.differencebetween.net/technology/difference-between-smartwatch-and-fitness-tracker/ Date of access: 13 September 2019.

Kim, E. 2016. People are getting tired of buying new devices — and this chart proves it. Business Insider. https://www.businessinsider.com/people-are-getting-tired-of-buying-new-devices-2016-1?IR=T Date of access: 3 July 2019.

Kim, K. J. & Shin, D.H. 2015. An acceptance model for smart watches. *Internet Research*, 25(4):527-541.

Kim, K.J. & Sundar, S.S. 2014. Does screen size matter for smartphones? Utilitarian and hedonic effects of screen size on smartphone adoption. *Cyberpsychology, Behavior, and Social Networking*, 17(7):466-473.

Kim, T. & Chiu, W. 2019. Consumer acceptance of sports wearable technology: The role of technology readiness. *International Journal of Sports Marketing and Sponsorship*, *20*(1):109-126.

Kim, Y.J., Oh, Y., Park, S., Cho, S. & Park, H. 2013. Stratified sampling design based on data mining. *Health Inform Res*, 19(3):186-195.

Klink, R. R. & Athaide, G. A. 2010. Consumer innovativeness and the use of new versus extended brand names for new products. *Journal of Product Innovation Management*, 27(23):23–32.

Koch, L. 2018. How many Millennials use wearables? https://www.emarketer.com/content/the-wearables-series-millennials-infographic Date of access: 12 September 2019.

Kulviwat, S., Bruner, G.C. & Nasco, S.A. 2007.Towards a unified theory of consumer acceptance technology. *Psychology and Marketing*, 24(12):1059-1084.

Kuo, Y.F. & Yen, S.N. 2009. Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior*, *25*(1):103-110.

Kurian, S. 2017. Meet the Millennials. https://home.kpmg/content/dam/kpmg/uk/pdf/2017/04/Meet-the-Millennials-Secured.pdf Date of access: 19 November 2019.

Kynäslahti, H. 2003. In search of elements of mobility in the context of education. *Mobile learning*, p.41-48.

Lalonde, D. 2018. The wearable revolution: Millennials are leading the wearable movement. https://abacusdata.ca/the-wearable-revolution-millennials-are-leading-the-wearable-movement/ Date of access: 12 September 2019.

Landreneau, K. J. & Creek, W. 2008. Sampling strategies. www.natco1.org/research/files/SamplingStrategies.pdf Date of access: 4 April 2019.

Lashkari, C. 2019. How do wearable fitness trackers measure steps? https://www.news-medical.net/health/How-do-wearable-fitness-trackers-measure-steps.aspx Date of access: 19 November 2019.

Lea, B. 2019. Best fitness trackers and smart watches for cyclists. https://www.bicycling.com/training/g20027619/best-fitness-trackers-for-cyclists/ Date of access: 23 August 2019.

Lee, M. 2009. Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications*, 8:130-141.

Lee, S.Y. & Lee, K. 2018. Factors that influence an individual's intention to adopt a wearable healthcare device: The case of a wearable fitness tracker. *Technological Forecasting and Social Change*, 129:154-163.

Leonhard, G. 2016. Technology vs. Humanity is one of the last moral maps we'll get as humanity enters the Jurassic park of big tech. https://www.techvshuman.com/read-preview/ Date of access: 15 August 2019.

Lidaka, K. 2018. Advantages and disadvantages of using a fitness tracker. https://treinio.com/blogs/news/advantages-and-disadvantages-of-using-a-fitness-tracker Date of access: 19 August 2019.

Lin, C. & Bhattacherjee, A. 2010. Extending technology usage models to interactive hedonic technologies: A theoretical model and empirical test. *Info Systems*, 20:163-181.

Lin, R. & Kreifeldt, J. G. 2001. Ergonomics in wearable computer design. *International Journal of Industrial Ergonomics*, 27(1):259-269.

Lindberg, S. 2018. How many steps do I need a day? https://www.healthline.com/health/how-many-steps-a-day#1 Date of access: 23 August 2019.

Linder, C. 2019. How does wireless charging work? https://www.popularmechanics.com/technology/gear/a28679177/how-wireless-charging-works/ Date of access: 21 October 2019.

Liu, S. 2019. Fitness and activity tracker – statistics and facts. https://www.statista.com/topics/4393/fitness-and-activity-tracker/ Date of access: 9 September 2019.

Livingstone, A. 2019. Are fitness activity trackers and watches worth the money? https://www.moneycrashers.com/fitness-activity-trackers-watches-worth-it/ Date of access: 13 August 2019.

Luarn, P. & Lin, H.H. 2005. Toward an understanding of the behavioral intention to use mobile banking. *Computer in Human Behavior*, 21(6):873-891.

Lunney, A., Cunningham, N. & Eastin, M. 2016. Wearable fitness technology: A structural investigation into acceptance and perceived fitness outcomes. *Computers in Human Behavior*, 65: 114-120.

Lynch, C. 2019. 10 Best fitness trackers in 2019. https://www.androidcentral.com/10-best-fitness-trackers-2019 Date of access: 23 August 2019.

Mack, E. 2014. Martian notifier may be a better introduction to wearables than android wear. https://newatlas.com/review-martian-notifier-smartwatch-wearables/32667/ Date of access: 6 September 2019.

Mahmood, M.A., Burn, J.M., Gemoets, L.A. & Jacquez, C. 2000. Variables effecting information technology end-user satisfaction: A meta-analysis of the empirical literature. *Journal of Human Computer Studies*, 52:751-771.

Malhotra, N.K. 2010. Marketing research: An applied orientation. 6th ed. Upper Saddle River, New Jersey: Pearson Education.

Malhotra, N.K. 2015. Essentials of marketing research: A hands-on orientation. Harlow: Pearson Education.

Mangelsdorf, L. 2019. Generation Y and technology. http://www.generationy.com/about-generation-y-in-the-workforce/generation-y-and-technology/ Date of access: 12 September 2019.

Mannheim, K. 1956. Essays on the Sociology of Culture. London: Routledge, p.1-264.

Markert, J. 2004. Demographics of age: Generational and cohort confusion. *Journal of current issues and research in advertising*, 26(2):11-25.

Markets, R. 2018. Global wearable fitness trackers market to 2023: Market size, share, development, growth and demand forecast. https://www.prnewswire.com/news-releases/global-wearable-fitness-trackers-market-to-2023-market-size-share-development-growth-and-demand-forecast-300645385.html Date of access: 27 May 2018.

Martins, C., Oliveira, T. & Popovič, A. 2014. Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application. *International Journal of Information Management*, 34(1):1-13.

Masinge, K. 2010. Factors influencing the adoption of mobile banking services at the bottom of the pyramid in South Africa. Pretoria: UP. (Thesis – MBA).

Masterson, K. 2019. Best blood pressure watches. https://www.33rdsquare.com/best-blood-pressure-watches/ Date of access: 13 September 2019.

Matchar, E. 2019. This smartwatch can help detect seizures in kids. https://www.smithsonianmag.com/innovation/smartwatch-can-help-detect-seizures-kids-180971352/ Date of access: 3 February 2019.

McDaniel, C. & Gates, R. 2010. Marketing research essentials. 7th ed. USA: John Wiley & Sons, Inc.

McDaniel, C.D. & Gates, R. 2001. Marketing research essentials. 3rd ed. Ohio: South-Western College.

McDaniel, C.D. & Gates, R. 2007. Marketing research. 7th ed. Hoboken, NJ: John Wiley.

McDonald, J.H. 2014. Biological statistics. 3rd ed. Baltimore: Sparky House Publishing.

McGarry, C. 2018. Who has the most accurate heart rate monitor? https://www.tomsguide.com/us/heart-rate-monitor,review-2885.html Date of access: 9 September 2019.

McGregor, R. 2015. How fitness trackers boost your health. https://clicks.co.za/health/article-view/do-fitness-trackers-actually-improve-your-health Date of access: 23 August 2019.

Metz, R. 2015. Like your glasses, your virtual-reality headset may need a prescription. https://www.technologyreview.com/s/542691/like-your-glasses-your-virtual-reality-headset-may-need-a-prescription/ Date of access: 12 August 2019.

Mikhalchuk, D. 2017. Wearables classification by teslasuit team. https://teslasuit.io/blog/wearables/detailed-wearables-classification-by-teslasuit-team/ Date of access: 6 September 2019.

Millar, R.B. 2011. Maximum likelihood estimation and inference: With examples in R, SAS and ADMB. Chichester: John Wiley & Sons, Ltd.

Monette, D., Sullivan, T. & De Jong, C. 2011. Applied social research: A tool for the human services. 8th ed. Belmont: Cengage learning.

Mooi, E. & Sarstedt, M. 2019. A concise guide to market research. Germany: Springer.

Mooi, E., Sarstedt, M. & Mooi-Reci, I. 2017. Market research: The process, data and methods using stata. Gateway East, Singapore: Springer.

Mooi, E., Sarstedt, M. & Mooi-Reci, I. 2018. Market research: The process, data and methods using stata. Gateway East, Singapore: Springer.

Moore, G. C. & Benbasat, I. 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3):192-222.

Moore, G.A. 1991. Crossing the chasm: Marketing and selling technology products to mainstream customers. New York: Harper Business.

Morris, M. & Dillon, A. 1997. The influence of user perception on software utilization: Application and evaluation of a theoretical model of technology acceptance. *IEEE Software*, 14(4):58-65.

Muller, C. 2019. Generation Y students' attitude towards and intention to use activity-tracking devices. Vanderbijlpark: Nwu (Thesis-PhD).

Muller, C., De Klerk, N. & Bevan-Dye, A.L. 2018. Relationship between social image, brand name, subjective norms and South African Generation Y students' attitude towards wearable activity tracking devices. *International Journal of Business and Management Studies*, 10(2):83-98.

Multiply & Momentum, 2019. Multiply and Momentum or other medical aid schemes. https://www.multiply.co.za/engaged/rewards/partner-rewards/!ut/p/z1/04_iUlDg4tKPAFJABpSA0fpReYllmemJJZn5eYk5-hH6kVFm8QGBFiZGHs4Gfv5GhpYGgRaWFn6GjmHGBpbG-l76UfgVFGQHKgIA_riVLA!!/ Date of access: 6 November 2019.

Murthy, S.R. & Mani, M. 2013. Discerning rejection of technology. *SAGE open*, 3(2):1-10.

Nasir, S. & Yurder, Y. 2015. Consumers' and physicians' perceptions about high tech wearable health products. *Social and Behavioral Sciences*, 195:1261-1267.

Nirvanium. 2019. 4 Different types of wearable tech. https://nirvanium.net/wearable-tech/ Date of access: 11 September 2019.

Nishishiba, M., Jones, M. & Kraner, M. 2014. Research methods and statistics for public and nonprofit administrators. United States of America: Sage Publications, Inc.

Norman, P. & Smith, L. 1995. The theory of planned behavior and exercise: An investigation into the role of prior behavior, behavioral intentions and attitude variability. *European Journal of Social Psychology,* 25:403-415.

Ohio University. 2019. How wearable technology is transforming athletics. https://onlinemasters.ohio.edu/blog/how-wearable-tech-is-transforming-a-coachs-decision-making/ Date of access: 5 March 2019.

Olivier, L. 2011. River sampling non-probability sampling in an online environment. Centre for information-based decision making and marketing research. http://lexo livier.blogspot.com/2011/11/river-sampling-non-probabilitysampling.html. Date of access: 16 April 2019.

Ooi, K.B. & Tan, G.W.H. 2016. Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card. *Expert Systems with Applications*, *59*:33-46.

Osborne, J.W. & Banjanovic, E.S. 2016. Exploratory factor analysis with SAS. Cary: SAS Institute, Inc.

Osborne, J.W. 2013.Best practises in data cleaning. Los Angeles: Sage Publications.

Otieno, K. 2016. Sampling plan: Important factors to consider. https://dairytechnologist.com/sampling-plan Date of access: 4 April 2019.

Ozag, D. & Duguma, B. 2004. The relationship between cognitive processes and perceived usefulness: an extension of TAM2. (In Proceedings of 23rd annual organizational systems research association conference. Pittsburgh, Pennsylvania).

Palermo, P. 2019. The best fitness trackers. https://www.reviews.com/fitness-tracker/ Date of access: 8 September 2019.

Palladino, V. 2019. Guidemaster: Fitness trackers to consider before buying a smartwatch. Ars Technica. https://arstechnica.com/gadgets/2019/07/guidemaster-best-fitness-trackers/ Date of access: 22 July 2019.

Pallant, J. 2013. SPSS survival manual. 5th ed. London: Open University Press.

Park, N., Roman, R., Lee, S. & Chung, J.E. 2009. User acceptance of a digital library system in developing countries: An application of the Technology Acceptance Model. *International Journal of Information Management*, 29:196-209.

Park, Y. & Chen, J.V. 2007. Acceptance and adoption of the innovative use of smartphone. *Industrial Management & Data Systems*, 107(9):1349-1365.

Parkrun. 2018a. Heron Banks parkrun. http://www.parkrun.co.za/heronbanks/ Date of access: 20 May 2018.

Parkrun. 2018b. Meyerton parkrun. http://www.parkrun.co.za/meyerton/ Date of access: 20 May 2018.

Parkrun. 2018c. Potchefstroom parkrun. http://www.parkrun.co.za/potchefstroom/ Date of access: 20 May 2018.

Parkrun. 2019a. About parkrun South Africa. https://www.parkrun.co.za/aboutus/ Date of access: 23 October 2019.

Parkrun. 2019b. Parys parkrun - weekly free 5km timed run. https://www.parkrun.co.za/parys/ Date of access: 23 October 2019.

Parkrun. 2019c. Heron Banks parkrun – weekly free 5km timed run. https://www.parkrun.co.za/heronbanks/ Date of access: 23 October 2019.

Parkrun. 2019d. Phoenix Park parkrun – weekly free 5km timed run. https://www.parkrun.co.za/phoenixpark/ Date of access: 23 October 2019.

Patel, M.S., Asch, D.A. & Volpp, K.G. 2015. Wearable devices as facilitators, not drivers, of health behavior change. *Jama*, *313*(5):459-460.

Pavlou, P. 2001. Integrating trust in electronic commerce with the technology acceptance model: Model development and validation. *Proceedings of the Seventh Americas Conference on Information Systems*, p.159.

Pavlou, P.A. 2003. Consumer intentions to adopt electronic commerce – incorporating trust and risk in the technology acceptance model. *International Journal of Electronic Commerce*, 7(3):101–134.

Peckham, J. 2019. The 10 best cheap fitness trackers: The top affordable sport bands to keep you fit. https://www.techradar.com/news/best-cheap-activity-trackers Date of access: 11 September 2019.

Phillips, R.A. & Furness, R.W. 1997. Predicting the sex of parasitic jaegers by discriminant analysis. *Colonial Waterbords*, p.14-23.

Pituch, K.A. & Stevens, J.P. 2016. Applied multivariate statistics for the social sciences: Analyses with SAS and IBM's SPSS. 6th ed. New York: Routledge.

Poddubnyi, M. 2019. Most stylish fitness tracker 2019: Top 10 fashionable fitness tracker. https://top10bestbuy.com/most-stylish-fitness-tracker/ Date of access: 11 September 2019.

Polar, 2017. 40 Years of incredible firsts. https://www.polar.com/blog/40-years-of-incredible-firsts-polar-history/ Date of access: 7 November 2019.

Poor, A. 2019. How to choose a fitness tracker. https://www.theverge.com/2019/9/9/20856999/fitness-tracker-how-to-choose-features-price-sensors-workout-health Date of access: 3 February 2020.

PostBeyond. 2019. Social media for every Generation. https://www.postbeyond.com/social-media-generations/ Date of access: 25 August 2019.

Pratap, A. 2018. Research design and its types: Exploratory, descriptive and causal. https://notesmatic.com/2018/07/research-design-and-its-types-exploratory-descriptive-and-causal/ Date of access: 12 July 2019.

Prescient & Strategic Intelligence. 2018. Wearable fitness trackers market to reach $48.2 billion by 2023. https://www.psmarketresearch.com/press-release/wearable-fitness-trackers-market Date of access: 9 September 2019.

Raskovic, D., Martin, T. & Jovanov, E. 2004. Medical monitoring applications for wearable computing. *The Computer Journal*, 47(4):495-504.

Rauschnabel, P. A., & Ro, Y. 2016. Augmented reality smart glasses: An investigation of technology acceptance drivers. *International Journal of Technology Marketing*, 11(2):123-148.

Rear, J. 2019. The best fitness trackers. https://www.telegraph.co.uk/recommended/leisure/best-fitness-trackers-watches/ Date of access: 28 August 2019.

Reddy, N. & Acharyulu, G. 2008. Marketing research. New Delhi: Anurag Jain for Excel Books, p.195.

Reddy, S. 2018. Why mobility is the key enabler of digital transformation. https://apifriends.com/api-management/mobility-enabling-digital-transformation/ Date of access: 15 November 2019.

Reid, R., Insogna, J., Carver, T., Comptour, A., Bewski, N., Sciortino, C. & Andersen, R. 2017. Validity and reliability of Fitbit activity monitors compared to ActiGraph with female adults in a free-living environment. *Journal of Science and Medicine in Sport*, 20(6):578-582.

Reliance Digital. 2019. Fitness Bands – All about their tracking features. https://www.reliancedigital.in/solutionbox/fitness-bands-all-about-their-tracking-features/ Date of access: 13 September 2019.

Rense, S. 2019. The 15 coolest new gadgets to come out this year. https://www.esquire.com/lifestyle/g25891194/cool-new-tech-gadgets-2019/ Date of access: 21 October 2019.

Reyes-Mercado, P.R. 2018. Adoption of fitness wearables. Insight from partial least squares and qualitative comparative analysis. *Journal of Systems and Information Technology*, 20(1):103-127.

Reynolds, N. & Diamantopoulos, A. 1993. Pre-testing in questionnaire design: A review of the literature and suggestions for further research. *International Journal of Market Research*, 35(2):1-11.

Roberts, A. 2019. The best fitness trackers. https://thewirecutter.com/reviews/the-best-fitness-trackers/ Date of access: 8 September 2019.

Roberts, A. & Skjong, I. 2019. The best fitness trackers. https://thewirecutter.com/reviews/the-best-fitness-trackers/ Date of access: 3 February 2020.

Robinson, M.T. 2018. The Generations. https://www.careerplanner.com/Career-Articles/Generations.cfm Date of access: 25 August 2019.

Rogers, E.M. 1983. Diffusion of innovations. 3rd ed. New York: A Division of MacMillan Publishing,

Rossi, P.H., Wright, J.D. & Anderson, A.B. 2013. Handbook of survey research. 2nd ed. New York: Academic Press.

Rouse, M. 2019. Internet of things (IoT). https://internetofthingsagenda.techtarget.com/definition/Internet-of-Things-IoT Date of access: 19 August 2019.

Rubas, D. 2004. Technology adoption: Who is likely to adopt and how does the timing affect the benefits? Texas A and M University (Thesis-PhD).

Rubin, J. & Chisnell, D. 2008. Handbook of usability testing. 2nd ed. Wiley Publishing Inc: Indiana.

Rucker, M. 2018. Mixed methods approach when conducting research. https://unstick.me/mixed-methods/ Date of access: 19 November 2019.

Ruggeri, A. 2017. What everyone gets wrong about 'millennial snowflakes'. https://www.bbc.com/worklife/article/20171003-millennials-are-the-generation-thats-fun-to-hate Date of access: 25 August 2019.

Ryan, L. 2017. Sharing workout results with your friends pushes you to even exercise harder. https://www.thecut.com/2017/04/sharing-exercise-results-with-friends-pushes-you-harder.html Date of access: 23 August 2019.

Saaksjarvi, M. 2003. Consumer adoption of technological innovations. *European Journal of Innovation Management*, *6*(2):90-100.

Sacco, A.L. 2013. Why smartwatches, glasses and other wearable tech are no gimmick. https://www.cio.com/article/2453326/why-smartwatches-glasses-and-other-wearable-tech-are-no-gimmick.html Date of access: 5 September 2019.

Sam Mobile. 2019. Best 5 fitness bands to help you achieve your fitness goals. https://www.sammobile.com/2019/04/18/best-5-fitness-bands/ Date of access: 15 November 2019.

Samsung. 2019. Gear fit 2 GPS sports brand. https://www.samsung.com/global/galaxy/gear-fit2/ Date of access: 13 September 2019.

Sanchez, R.A. & Hueros, A.D. 2010. Motivational factors that influence the acceptance of Modle using TAM. *Computers in Human Behavior*, 26:1632-1640.

Sanchez-Franco, M. J. & Roldan, J. L. 2005. Web acceptance and usage model: A comparison between goal-directed and experiential web users. *Journal of Internet Research*, 15(1):21-48.

Sarokin, D. 2019. Types of digital communication. https://www.techwalla.com/articles/types-of-digital-communication Date of access: 19 August 2019.

Sarstedt, M & Mooi, E. 2019. A concise guide to market research. 3rd ed. Germany: Springer.

Sarstedt, M. & Mooi, E. 2014. A concise guide to market research: The process, data, and methods using IBM SPSS Statistics. 2nd ed. Berlin: Springer Berlin.

Sawh, M. & Alger, K. 2019. 25 Expert tips to get more from your fitness tech this year. https://www.wareable.com/wearable-tech/fitness-tech-tips-for-beginners-6866 Date of access: 23 August 2019.

Sawh, M. 2019. Best Garmin watch faces 2019: Our top picks to download. https://www.wareable.com/garmin/best-garmin-watch-faces-to-download-7227 Date of access: 26 August 2019.

Scarano, G. 2019. 10 Of the best fitness trackers for monitoring heart rate. https://mashable.com/roundup/best-fitness-trackers-smart-watch-heart-rate/ Date of access: 23 August 2019.

Schoon, I. & Eccles, J.S. 2014. Gender differences in aspirations and attainment: A life course perspective. United Kingdom: Cambridge University Press.

Schüll, N.D. 2016. Data for life: Wearable technology and the design of self-care. *BioSocieties*, *11*(3):317-333.

Schwarz, T. 2008. Brace yourself here comes Generation Y. *Critical Care Nurse*, 28(5):80-85.

Seale, Q. 2016. 10 Best calorie counter watches. https://www.keepinspiring.me/10-best-calorie-counter-watches/ Date of access: 29 August 2019.

Sekaran, U. & Bougie, R. 2016. Research methods for business: A skill building approach. United Kingdom: John Wiley & Sons.

Shimp, T.A., & Bearden, W.O. 1982. Warranty and other extrinsic cue effects on consumers' risk perceptions. *Journal of Consumer Research*, 38-46.

Shin, D.H. 2009a. Determinants of customer acceptance of multi-service network: An implication for IP-based technologies. *Information & Management*, 46(1):16-22.

Shin, D.H. 2007. User acceptance of mobile internet: Implication for convergence technologies. *Interacting with Computers*, 19(4):472-483.

Shin, D.H. 2009b. Understanding user acceptance of DMB in South Korea using the modified technology acceptance model. *International Journal of Human-Computer Interaction*, 25(3):173-198.

Shin, D.H. 2012. What makes consumers use VoIP over mobile phones? Free riding or consumerization of new service. *Telecommunications Policy*, 36(4):311-323.

Shiu, E., Hair, J., Bush, R. & Ortinau, D. 2009. Marketing research. London: McGraw-Hill Education.

Shukla, P. 2008. Essentials of marketing research. Ventus Publishing. http://bookbbon.com/en/business-ebooks/marketing-ebooks/essentials-of-marketing-research-part-ii. Date of access: 18 April 2019.

Shurbi, S. 2017. Differences between skewness and kurtosis. Key differences. https://keydifferences.com/differences-between-skewness-and-kurtosis.html Date of access: 29 April 2019.

Shuttleworth, M. & Wilson, L. 2008. Significance test. https://explorable.com/significance-test Date of access: 23 April 2019.

Shuttleworth, M. 2016. Face validity. https://explorable.com/face-validity Date of access: 22 July 2019.

Shuttleworth, M. 2019. Descriptive research design - observing a phenomenon. https://explorable.com/descriptive-research-design Date of access: 13 July 2019.

Silbert, S. 2019. All the things you can track with wearables. https://www.lifewire.com/what-wearables-can-track-4121040 Date of access: 12 September 2019.

Silver, L., Stevens, R., Wrenn, B. & Loudon, D. 2013. The essentials of marketing research. 3rd ed. New York: Routledge.

Simms, H. 2014. Encouraging people to wear wearable technology. https://thenextweb.com/dd/2014/12/07/encouraging-people-wear-wearable-technology/ Date of access: 16 August 2019.

Sincero, S.M. 2018. Pilot survey. https://explorable.com/pilot-survey Date of access: 29 August 2019.

Smallwood, C. 2015. The complete guide to using google in libraries: Instruction, administration and staff productivity. 2nd ed. London: Rowman and Littlefield publishers.

So, A. 2019. The 11 best fitness trackers and watches for everyone. https://www.wired.com/gallery/best-fitness-tracker/ Date of access: 19 October 2019.

Solomon, M. 2018. Consumer behaviour: Buying, having, and being. 12th ed. Boston: Pearson Education Limited.

Spann, S. 2016. Wearable fitness devices: Personal health data privacy in Washington State. *Seattle UL Rev*, *39*:1411-1432.

Staff, E. 2017. Seven health benefits of wearing fitness trackers. https://www.medicalopedia.org/5495/7-health-benefits-of-wearing-fitness-trackers/ Date of access: 23 August 2019.

Statista, 2018. Percentage of the global population that used a mobile app or fitness tracking device to track their health as of 2016, by age. https://www.statista.com/statistics/742448/global-fitness-tracking-and-technology-by-age/ Date of access: 23 November 2019.

Statista. 2019a. Wearables. https://www.statista.com/outlook/319/100/wearables/worldwide Date of access: 11 February 2019.

Statista. 2019b. Wearables. https://www.statista.com/outlook/319/112/wearables/south-africa Date of access: 21 August 2019.

Statista. 2019c. Wearable device sales revenue worldwide from 2016 to 2022 (in billion U.S. dollars). https://www.statista.com/statistics/610447/wearable-device-revenue-worldwide/ Date of access: 9 September 2019.

Statistics South Africa. 2017. Statistical P0302: 2017 mid-year population estimates. https://www.statssa.gov.za/publications/P0302/P03022017.pdf Date of access: 16 June 2018.

Stats SA. 2019. Mid-year population estimates. http://www.statssa.gov.za/publications/P0302/P03022019.pdf Date of access: 20 November 2019.

Stein, S. 2014. Wearable tech access 2014: Many, many small steps. https://www.cnet.com/news/wearable-tech-at-ces-2014-many-many-small-steps/#ixzz2sIIfyOQM Date of access: 12 August 2019.

Stojanov, Z. 2017. The six main ways technology impacts your daily life. https://tech.co/news/6-main-ways-technology-impacts-daily-life-2017-02 Date of access: 15 August 2019.

Struwig, F.W. & Stead, G.B. 2010. Planning, designing and reporting research. Cape Town: Pearson.

Sullivan, A.N. & Lachman, M.E. 2017. Behavior change with fitness technology in sedentary adults: A review of the evidence for increasing physical activity. *Frontiers in public health*, *4*:289.

Sweeney, J.C. & Soutar, G.N. 2001. Consumer perceived value: The development of a multiple item scale. *Journal of retailing*, 77(2):203-220.

Tagiev, R. 2019. Nine latest activity technology used in fitness app development. https://yalantis.com/blog/what-activity-tracking-technology-is-used-in-fitness-app-development/ Date of access: 13 August 2019.

Taylor, N., Hagen, L., Dincelli, E. & Unsworth, K. 2017. Wearable devices: Information privacy, policy and user behaviour. *Proceedings of the Association for Information Science and Technology*, 54(1):603-605.

Taylor, S. & Todd, P.A. 1995. Decomposition and crossover effects in the theory of planned behavior: a study of consumer adoption intentions. *International Journal of Research in Marketing*, 12(2):137-155.

Techopedia, 2019. Wearable device. https://www.techopedia.com/definition/31206/wearable-device Date of access: 19 October 2019.

Thompson, R. 2018. The 'ennial tribes: Understanding Generation Y and Generation Z South Africans. https://www.bizcommunity.com/Article/196/19/176153.html Date of access: 25 August 2019.

Thompson, S. 2012. Sampling. 3rd ed. Hoboken, New Jersey: John Wiley & Sons, Inc, p.11.

Toft, B.M., Schuitema, G. & Thogersen, J. 2014. Responsible technology acceptance: Model development and application to consumer acceptance of smart grid technology. *Applied Energy*, 134:392-400.

Tomasetti, B. 2018. The 5 step marketing research process. https://www.smartbugmedia.com/blog/the-5-step-marketing-research-process Date of access: 10 July 2019.

Tornatzky, L.G. & Klein, K.J. 1982. Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on engineering management*, (1):28-45.

Trochim, W.M., Donnelly, J.P. & Arora, K. 2015. Research methods. Boston: Cengage Learning.

Tunca, S. & Fueller, J. 2009. Impression formation in a world full of fake products. *Advances in Consumer Research*, 36:287-292.

Tustin, D., Lighthelm, A.A., Martins, J.H. & Van Wyk, H. 2005. Marketing research in practice. Pretoria: Unisa Press, p.337.

Ubrani, J., Llamas, R. & Shirer, M. 2018. Global wearables market gross 7.7% in 4Q17 and 10.3% in 2017 as Apple seizes the leader position, says IDC. https://www.idc.com/getdoc.jsp?containerId=prUS43598218 Date of access: 19 September 2019.

Van Niekerk, L. 2017. What wearable tech to get in 2017. https://itouch.co.za/news/best-wearable-tech-2017.php Date of access: 14 November 2019.

Vandrico, 2018. Devices worn on the wrist. https://vandrico.com/wearables/device-categories/location/wrist Date of access: 3 July 2018.

Vazharov, S. 2019. The 100 coolest tech gadgets of 2019. https://www.bestproducts.com/tech/g864/cool-tech-products-you-need/?slide=58 Date of access: 21 October 2019.

Venkatesh, V. 1999. Creation of favourable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, 23:239-260.

Venkatesh, V. and Davis, F.D. 1996. A model of the antecedents of perceived ease of use: development and test. *Decision sciences*, *27*(3):451-481.

Venkatesh, V., Morris, M. G., Davos, G.B. & Davis, F.D. 2003. User acceptance of information technology: Toward a unified view. *MIS quarterly*, 27(3):425-478.

Walsh, H. 2019. Should I buy a fitness tracker or a smartwatch? https://www.which.co.uk/reviews/fitness-trackers/article/should-i-buy-a-fitness-tracker-or-a-smartwatch Date of access: 7 November 2019.

Wang, D., Xiang, Z. & Fesenmaier, D.R. 2014. Adapting to the mobile world: A model of smartphone use. *Annals of Tourism Research*, 48:11-26.

Wani, T.A. & Ali, S.W. 2015. Innovation diffusion theory. *Journal of general management research*, *3*(2):101-118.

Waterman, H. 2012. Action research and health. Researching health: Qualitative, quantitative and mixed methods. 2nd ed. London: Sage Publications Ltd, p.148-168.

Wearables sales revenue worldwide category. 2018. Wearables sales revenue worldwide 2015-2021. https://www.statista.com/statistics/641865/wearables-sales-by-category-worldwide/ Date of access: 27 May 2018.

Westenberg, J. 2019. Best fitness trackers June 2019. https://www.androidauthority.com/best-fitness-trackers-707649/ Date of access: 12 September 2019.

Wiedmer, T. 2015. Generations do differ: Best practices in leading traditionalists, boomers, and generations X, Y, and Z. *Delta Kappa Gamma Bulletin*, *82*(1):51-58.

Wiid, J. & Diggines, C. 2009. Marketing research. Cape Town: Juta.

Wiid, J. & Diggines, C. 2013. Marketing research. 2nd ed. Cape town: Juta.

Wilson, S. 2019. Wearables market to be worth $25 billion by 2019. https://www.ccsinsight.com/press/company-news/2332-wearables-market-to-be-worth-25-billion-by-2019-reveals-ccs-insight/ Date of access: 9 September 2019.

Wired. 2019. The best fitness trackers for any budget in 2019. https://www.wired.co.uk/article/best-fitness-trackers Date of access: 28 August 2019.

Wong, S. 2015. What is the difference between pilot study and pretesting a questionnaire? https://www.researchgate.net/post/What_is_the_difference_between_Pilot_study_and_Pretesting_a_questionnaire Date of access: 21 April 2019.

Wood, S. 2013. Generation Z as consumers: Trends and innovation. *Institute for Emerging Issues*, p.1-3.

Woodford, C. 2019. Analog or digital. https://www.explainthatstuff.com/analog-and-digital.html Date of access: 19 August 2019.

Woods, S. 2017. Top 5 custom watch faces for Garmin users to enjoy. http://navworld.co.za/top-5-custom-watch-faces-garmin-users-enjoy/ Date of access: 26 August 2019.

World Health Organisation. 2018. Physical activity.http://www.who.int/en/news-room/fact-sheets/detail/physical-activity Date of access: 27 May 2018.

World Population Review. 2019. South African population 2019. http://worldpopulationreview.com/countries/south-africa-population/ Date of access: 25 August 2019.

Wrenn, B., Stevens, R.E. & Loudon, D.L. 2007. Marketing research: text and cases. 2nd ed. Binghamton, NY: Best Business Books.

Writer, S. 2018. South Africa expected to be the next big market for smartwatches and fitness trackers. https://businesstech.co.za/news/mobile/243043/south-africa-expected-to-be-the-next-big-market-for-smartwatches-and-fitness-trackers/ Date of access: 1 November 2019.

Writer, S. 2019. The 5 biggest medical aid schemes in South Africa-what they offer, and how much they cost in 2019. https://businesstech.co.za/news/finance/287446/the-5-biggest-medical-aid-schemes-in-sa-what-they-offer-and-how-much-they-cost-in-2019/ Date of access: 6 November 2019.

Wu, J.H. & Wang, S.C. 2005. What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information and Management*, 42(5):719-729.

Wu, M.Y., Chou, H.P., Weng, Y.C. & Huang, Y.H. 2008. A study of web 2.0 website usage behavior using TAM 2. (In Asia-Pacific Services Computing Conference, 2008. APSCC'08. IEEE, 1477-1482).

Yang, B. 2005. Factor analysis methods. Research in organizations: Foundations and methods of inquiry. San Francisco: Berrett-Koehler Publishers, Inc, p.181-200.

Yang, C. & Hsu, Y. 2010. A review of accelerometer-based wearable motion detectors for physical activity monitoring. Sensors, 10(8):7772-7788.

Yang, H., Yu, J., Zo, H. & Choi, M. 2016. User acceptance of wearable devices: An extended perspective of perceived value. *Telematics and Informatics*, 33:256-269.

YellowPages. 2018. Nine key features to look for when you buy a fitness tracker. https://www.yellowpages.ca/tips/how-to-buy-a-fitness-tracker/ Date of access: 28 May 2018.

Yong, A.G. & Pearce, S. 2013. A beginner's guide to factor analysis. Tutorials in quantitative methods for psychology, 9(2):79-94.

Yuan, S., W., Kanthawala, S. & Peng, W. 2015. Keep using my health apps: Discover users' perception of health and fitness apps with the UTAUT2 model. *The official Journal of the American Telemedicine Association*, 21(9):735-741.

Zaluzny, P. 2018. The future of fitness trackers. Choice. https://www.choice.com.au/health-and-body/diet-and-fitness/sportswear-and-shoes/articles/the-future-of-fitness-trackers Date of access: 24 June 2018.

Zikmund, W.G. & Babin, B.J. 2010. Essentials of marketing research. Mason: Cengage Learning.

Zikmund, W.G. & Babin, B.J. 2013. Essentials of marketing research. 5th ed. Australia: South-Western Cengage Learning.

ANNEXURE A

QUESTIONNAIRE

Antecedents of wrist-based fitness tracker usage amongst members of the South African Generation Y cohort

Dear participant,

I am currently working towards my dissertation under the supervision of Dr Chantel Muller and Prof Natasha de Klerk as part of the requirements for completing my MCom in Marketing Management at the North-West University.

The purpose of this research study is to determine antecedents of wrist-based fitness device usage amongst members of the South African Generation Y (individuals born between 1986 and 2005). The study is important in order to understand the purchase and adoption behaviour of members of the Generation Y since you are more likely than members of previous generations to purchase a fitness device.

Participation in this study is completely voluntary. The questionnaire should take approximately 15 minutes to complete. Confidentiality of all information enclosed in this questionnaire is guaranteed and no personal questions linking you to this specific questionnaire are included (e.g. name, address, contact details).

Statement of consent:
I have read the above description of this research study. I have been informed that it is a low risk study and I am aware of the purpose of the study. I voluntarily agree to take part in this study and by continuing and completing this questionnaire I consent to the information being used in aggregate form.

Thank you for your assistance - it is truly appreciated.

Amiskha Hattingh
Amiskhahattingh1@gmail.com
School of Management Sciences, Faculty of Economic and Management Sciences

Dr Chantel Muller
23488042@nwu.ac.za
0798847943 / 016 9103346
School of Management Sciences, Faculty of Economic and Management Sciences

Prof Natasha de Klerk
Natasha.deKlerk@nwu.ac.za
016 9103364
School of Management Sciences, Faculty of Economic and Management Sciences

SECTION A: Demographical information

Please mark the appropriate box with a cross (X) or write down your answer.

A1	**How often do you attend parkrun events?**	This is my first time	Occasionally	Once a month	Twice a month	Weekly

A2	**What is the most important reason that you attend parkrun events? (select one)**	Family time	A healthier lifestyle	Medical aid points	
	Insurance discount	Weight loss	Rehabilitation	Training	
	Other (please specify):				

A3	**Province of parkrun:**	Free State	Gauteng

A4	**Country of origin:**	South Africa	Other (Please specify):

A5	**Province of origin:**	Eastern Cape	Free State	Gauteng	KwaZulu-Natal	
	Limpopo	Mpumalanga	Northern Cape	North West	Western Cape	
	Other (please specify):					

A6	**Highest qualification:**	<Grade 12	Grade 12	Diploma	Degree	Post graduate
	Other (please specify):					

A7	**Gender:**	Male	Female

A8	**Ethnic group:**	Black/African	Coloured	Indian/Asian	White
	Other (please specify):				

A9	**Please indicate your home language:**			Afrikaans	English	IsiNdebele	IsiXhosa
	IsiZulu	Sepedi	Sesotho	Setswana	SiSwati	Tshivenda	Xitsonga
	Other (please specify):						

A10	**Age at your last birthday:**	<18	18 – 24	25 – 33	>33

A11	**How often do you train on a weekly basis?**	Never	1 – 2 days	3 – 4 days	>5 days

SECTION B: Background information

A wrist-based fitness tracking device refers to any device worn exclusively on the users' wrist capable of tracking physical activity and fitness-related metrics and may or may not have a display (steps taken, running distance, heart rate, sleep patterns, swimming laps, fitness tracking, speed, etc.) E.g.: Fitness watch, bracelets, changeable wristbands.

Please mark the appropriate box with a cross (X) or write down your answer.

B1	**Do you currently own a wrist-based fitness tracker?**					Yes	No
	B1a	**If NO, please indicate why not (select only one):**					
		Expensive	Unreliable	Unfashionable	Complicated	Fad/ seasonal trend	
		Other (please specify):					
	B1b	**If NO, would you consider buying one?**				Yes	No

B2	**Please indicate your FAVOURITE fitness tracker brand (select one):**						
	Apple	Fitbit	Garmin	Polar	Samsung	Suunto	Tomtom
	Other (please specify):						

B3	**Rate how important each of the fitness-tracking device features are to you. Mark with a cross (X):**					
		Not important	Slightly important	Important	Fairly important	Very important
	Accuracy					
	Health tracking					
	Design					
	Functionality					

B4	**Approximately how much would you spend on a wrist-based fitness tracker?**				
	<R500	R501 – R1000	R1001 – R2500	R2501 – R5000	>R5000

SECTION C: Attitude towards wrist-based fitness tracker usage

Please indicate the extent to which you disagree/agree with each of the following statements by placing a cross (X) in the appropriate box; 1 being strongly disagree and 6 strongly agree.

	Perceptions of wrist-based fitness trackers:	Strongly disagree	Disagree	Disagree somewhat	Agree somewhat	Agree	Strongly agree
C1	Using a wrist-based fitness tracker is a good idea.	1	2	3	4	5	6
C2	I have a generally favourable attitude towards using wrist-based fitness-trackers.	1	2	3	4	5	6
C3	I like the idea of using a wrist-based fitness tracker.	1	2	3	4	5	6
C4	Overall, I think using a wrist-based fitness tracker is beneficial.	1	2	3	4	5	6
C5	Wrist-based fitness trackers make tracking your activity and training more effective.	1	2	3	4	5	6
C6	Wrist-based fitness trackers help you organise your daily activity and training better.	1	2	3	4	5	6
C7	Wrist-based fitness trackers could increase your productivity.	1	2	3	4	5	6
C8	Using a wrist-based fitness tracker is useful to your life general.	1	2	3	4	5	6
C9	Using a wrist-based fitness tracker helps to improve your physical performance in general.	1	2	3	4	5	6
C10	Using a wrist-based fitness tracker provides useful activity-related information.	1	2	3	4	5	6
C11	Learning to use wrist-based fitness trackers is very simple.	1	2	3	4	5	6
C12	It is extremely easy to be familiarised with the use of wrist-based fitness trackers.	1	2	3	4	5	6
C13	Using wrist-based fitness trackers to measure your activity is easy.	1	2	3	4	5	6
C14	Wrist-based fitness trackers can easily measure your activity.	1	2	3	4	5	6
C15	Using a wrist-based fitness tracker does not require a lot of mental effort.	1	2	3	4	5	6

Perceptions of wrist-based fitness trackers:		Strongly disagree	Disagree	Disagree somewhat	Agree somewhat	Agree	Strongly agree
C16	Wearing a wrist-based fitness tracker makes a good impression on your peers and friends.	1	2	3	4	5	6
C17	Wearing a wrist-based fitness tracker improves one's social image amongst peers and friends.	1	2	3	4	5	6
C18	Wearing a wrist-based fitness tracker gives you social approval.	1	2	3	4	5	6
C19	Wearing a wrist-based fitness tracker helps you feel accepted amongst your peers and friends.	1	2	3	4	5	6
C20	Wrist-based fitness trackers are a waste of money.	1	2	3	4	5	6
C21	Wrist-based fitness trackers are too expensive.	1	2	3	4	5	6
C22	Wrist-based fitness trackers do not offer good value for money.	1	2	3	4	5	6
C23	Wrist-based fitness trackers are just an expensive gimmick.	1	2	3	4	5	6

Thank you!