A Study on the Perception and Acceptance of Wrist-Worn Wearable Fitness Tracker and Development of Intervention Models for Enhancing the Acceptance and Prolonged Use of the Devices, Ensuring a Healthy Ageing

A thesis

submitted in partial fulfilment of the requirement for the award of Degree of

DOCTOR OF PHILOSOPHY

by

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January 2022

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January 2022

DECLARATION

January 2022

It is certified that the work contained in a thesis titled '**A Study on the Perception and Acceptance of Wrist- Worn Wearable Fitness Tracker and Development of Intervention Models for Enhancing the Acceptance and Prolonged Use of the Devices, Ensuring a Healthy Ageing**' has been carried out by me, a doctoral student in the Department of Design, Indian Institute of Technology Guwahati under the guidance of Professor Debkumar Chakrabarti for the award of Doctor of Philosophy and that this work has not been submitted elsewhere for a degree.

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The thesis presented herein titled '**A Study on the Perception and Acceptance of Wrist- Worn Wearable Fitness Tracker and Development of Intervention Models for Enhancing the Acceptance and Prolonged Use of the Devices, ensuring a Healthy Ageing**' by Ms. Swati Sarkar, was undertaken under my supervision and is a bonafide work. The volume of the work presented herein for the Degree of Philosophy of Indian Institute of Technology Guwahati was not submitted by her earlier for any other degree or diploma. She has fulfilled all the requirements mentioned in the rules and regulations for submitting the Doctor of Philosophy degree thesis at the Indian Institute of Technology Guwahati.

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ACKNOWLEDGEMENT

It is not so easy as it seems to convey the gratitude we preserve for the people whose contribution to our journey is invaluable. Nevertheless, I would try to express my sincere gratitude through this note.

I thank IIT Guwahati for providing such a serene and lovely place to pursue an essential phase of the Ph.D. journey.

I express my sincere gratitude and thank Prof. Amarendra Kumar Das Sir for providing me with the opportunity to work as a Ph.D. Scholar and the valuable skills that I could learn from him.

I convey my sincere gratitude to my Supervisor, Prof. Debkumar Chakrabarti, for providing me with this phase where I could learn so much from him; enlisting is quite impossible. I thank him for having faith in me and showing me the path of discovering the philosophy behind Research.

The support, guidance, and insights that I have received from my Doctoral Committee have enhanced my understanding and knowledge in multiple domains. I express my sincere gratitude and thank Prof. Debkumar Chakrabarti (Supervisor), Prof. Pradeep Kumar Das (External Member), Dr. Manoj Majhi Sir (Internal Member), and Dr. Urmi Salve Ma'am (Chairperson) for their valuable guidance in my Ph.D. journey.

I sincerely thank all my Study Participants for their time, patience, and insights, which made this study reach its destination.

I express my sincere gratitude and thank Prof. Pradeep Yammiyavar Sir, Dr. D. Uday Kumar Sir, Dr. Sougata Karmakar Sir, Dr. Swati Pal Ma'am, Prof. M. Guru Prem Prasad Sir, Prof. S. Senthilvelan Sir, Dr. Devanand Pathak Sir, Dr. Hitesh Sir, Dr. Amitabh Sir and Abhishek Singh Sir for their guidance, knowledge and best wishes.

I thank Mr. Abhijit, Mr. Dipu, and Mr. Santanu from Design Department. I thank the experts from Design Workshop for sharing their skills and

knowledge. I thank the fraternity of the design department for providing an environment of liveliness and their contribution towards such a beautiful place.

I convey my love to my Parents. I am grateful to them for believing in me, their blessings, and making me capable of making this day possible. I convey my love to my elder sisters for their love and belief in me and all the support and love to my nieces for their innocence, happiness, and love. I express my love to my significant other for his love, support, courage, and walking with me on this path.

I thank Nilakshi, Prarthana, Saurav, Neha, Dhriti, Birjit, Saswati, Bighnakalyan, Shiv, Pranav, Madhuri, Arunachalam, Ganesh Sir, Pallavi, Shilpi, Soumya, and Chinmaya.

I am overwhelmed and thank the Almighty for blessing me the strength that made it possible to approach the unknown with grace and courage.

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Behavioural Intention 62

BMI

Body Mass Index 15

BPL

Below Poverty Line 35

CBR

Community-Based Rehabilitation 35

CFA

Confirmatory Factor Analysis 69

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Continuance Intention 63

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Chronic Obstructive Pulmonary Disease 14

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Composite Reliability 70

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Longitudinal ageing Survey of India 7

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Maximum Shared Variance 70

NIHH

National Institute for the Hearing Handicapped 35

NIMH

National Institute Of Mental Health 35

NIMHANS

National Institute of Mental Health and Neurosciences 34

NIVH

National Institute for the Visually Handicapped 35

OSH

Occupational Safety and Health 5

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Abstract

There is a significant societal change in the world with the growth in the ageing population. Older adults are likely to accumulate some health sternness with age, often leading to the functional disability with time. Assistive devices are an excellent resource in such cases, but independence is compromised to some extent. However, prevention is better than cure; if disabilities in older age can be prevented, assuring freedom, one can enhance the essence of living irrespective of any generation. With proper maintenance of physical fitness and psychological well-being, it is possible to eradicate the sufferings associated with older age. Also, adequate health care before even hitting the older age ensures healthy ageing.

Physical activity has been considered an essential health factor. Monitoring and promoting physical activity in day-to-day life can tremendously improve health outcomes. There is a significant positive effect on physical and cognitive health in people irrespective of age. Studies have revealed that despite the age stereotypes, the benefits of exercise are brilliant even in very old age. Nowadays, young people are pretty conscious about health and fitness, but older adults often do not indulge in physical activity; a more considerable fraction of the more ageing adult population involves them in sedentary lifestyles with the negative stereotype of ageing. However, wearable fitness trackers play a significant role in motivating people to indulge in a healthy lifestyle. With the increase in health awareness among people, the use of fitness devices has significantly increased. Wearable Fitness Technology is an innovative technology that has already established its benchmark in the world market. There are various categories of people intending to avail of this facility. These devices positively motivate users to indulge in fitness regimes and derive health benefits. Also, these devices can provide basic information

regarding the vital physiological changes in the body, which might require professional attention. These devices are already motivating the younger users to indulge in fitness regimes and hence derive health benefits; the ageing population is the most challenging group to be encouraged into the fitness regime. Although wearable fitness trackers' sales are significant, it faces challenges in their sustainable usage. Reports say users tend to abandon wearable devices in less than six months. The market survey of these wearables reveals a gradual increase in their sales. However, the sustainable engagement and adherence to these products diminish with time. With the advancement in Wearable Technology, researchers have received opportunities with a new wave of research. However, most research has focused on establishing these devices' reliability and accuracy; very little research focuses on providing adoption and acceptance interventions.

The existing technology acceptance models have been studied and analysed to understand the underlying cause of lack of adherence and unsustainability in their usage. It has been observed that there lie some gaps and missing links in the existing models while studying people's perception towards the Wearable Fitness Trackers. In order to fill those voids, respective models have been developed which incorporates the micro-determinants that can assist in the development of a modified version of such devices to ensure sustainable engagement towards these devices. This study also includes the design development of the conceptualised model of Wearable Fitness Trackers that may include the exclusiveness within the scope of inclusiveness to ensure the customer engagement that too on a wide range of people.

Chapter 1

Health and fitness are very significant areas of interest concerning Healthy Ageing. With the growth in the older population, there is an expressed need for better healthcare facilities. This chapter contains an overview of the Ageing process and its associated areas. Exploring various studies could lead to finding the research gap and the motivation. Furthermore, it holds the study design conceptualised to structure the proper methodology for the research.

Chapter 1. **Introduction**

1.1. Background

Ailments due to age are natural and can be delayed by adopting preventive measures. Wellness depends on prevention and curative clinical approaches. In the process of wellness, monitoring health and fitness has become very easy, irrespective of the place and time. One such innovation can be named 'Wearable technology' (Lunney, et al., 2016). With the increase and evolution in smartphone technology, complementary information technology has increased gradually (Shamim, et al., 2018). There has been a rapid development of wearable devices to track physical activity in real-time. The popularity and the proliferation of such devices show a significant chance of presenting an opportunity in integrating these wearable technologies into Physical Activity interventions (Ridgers, et al., 2016). Such technologies have emerged as a new trend and have become very popular in tracking day-to-day activities (Kaewkannate & Kim, 2016).

In a survey, thirty-one per cent of the consumers identified themselves as the self-trackers monitoring their health via health apps, smartwatches, wearable fitness trackers, or health websites. However, twenty-five per cent of the non-users had shown interest in using the self-trackers, and twenty per cent lived with the people who were using the wearable self-trackers (Lunney, et al., 2016) (Loechner, 2015). In the workplace, employee acceptance and adherence to wearable technology are the key concerns of adopting the Technology (Jacobs, et al., 2019). In a particular study, out of 952 respondents, 50 per cent

have shown favourable acceptance of wearable devices in tracking OSH (Occupational Safety and Health) related risk factors. However, unfortunately, the rate of barriers gives a tough competition to its acceptance, including the employee privacy and confidentiality of the received Data, sensor durability, reasonable manufacturing practice requirements, and the cost and benefit ratio of using the wearable device.

The barriers quite often preclude the user from its adoption. The broad adoption of wearable devices largely depends upon the scientific community's ability to approach some solution and eradicate all the barriers (Schall, Jr., et al., 2018). Here Design and Ergonomics come as helpful tools. Wearable Fitness Technology is a new and flourishing domain. The market for Wearable Fitness Technology is gradually growing, giving researchers an opportunity for a new wave of research. The focus of these researches is mostly on establishing the accuracy and reliability of these devices. However, on the contrary, very little research has been done in the field of its adoption (Lunney, et al., 2016).

This study aims to reduce the negative impacts of ageing by adopting the prescribed set of healthy lifestyle approaches. It deals with developing constructs, determining the possibility of adopting Wearable Fitness Technology among various age groups. Also, it aims to formulate interventions in the design of the Wearable Fitness Technology to ensure its prolonged use. This thesis looks into the possible means and methods of using various health fitness/awareness modern gadgets and their design intervention for better acceptance and motivational usage. Specifically, it addresses wearable fitness tracking devices. The below contemporary issues may be considered background and scope for the study.

1.2. Overview of Elderly Population (Indian Scenario)

Life expectancy has grown high with years, which eventually demand an excellent healthcare system. There has been tremendous growth in the rate of older adults observed from the latest Population Census data of 2011, considered in the study as the census for the year 2021 is yet to be published

worldwide. The following table shows the growth in the elderly population over the last six decades.

Table 1-1. Decadal growth in the elderly population vis-a-vis that of the general population

Period	In General Population	In Elderly Population
1951-1961	21.6	23.9
1961-1971	24.8	33.7
1971-1981*	24.7	33.0
1981*-1991**	23.9	29.7
1991**-2001***	21.5	25.2
2001***-2011***	17.7	35.5

* The 1981 census could not be held in Assam owing to disturbed conditions. The population figures for Assam were worked out by the interpolation method.

** The 1991 census could not be held in Jammu & Kashmir. The population figures were worked out by the interpolation method.

*** The figures include the estimated population of Mao Maram, Paomata, and Purul sub-divisions of Senapati districts of Manipur.

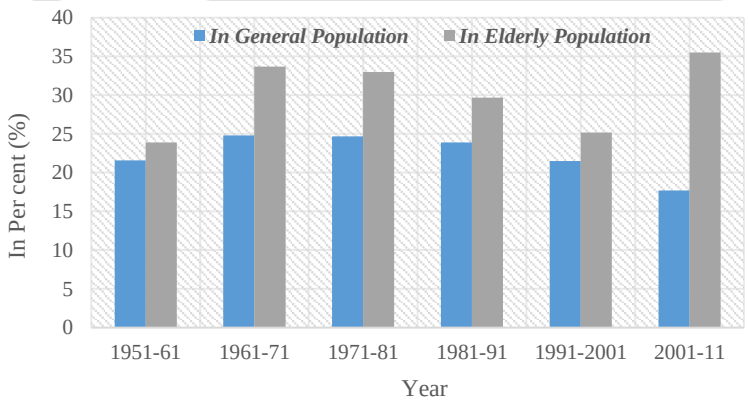


Figure 1-1. Decadal growth in the elderly population of the general population.

Figure 1-1 above shows how the increase in life expectancy has changed the growth in the older adults' population in the last few decades. In addition, Table 1-2. shows the distribution of the elderly population in the rural and urban parts of India (Velayutham, et al., 2016).

Table 1-2. The Elderly population in India in 2011

	Male	Female	Total
Total Population (In Millions)			
Rural	426.6	406.0	833.8
Urban	195.5	181.6	377.1
Total	623.3	587.6	1210.9
Population Aged 60+ (In Millions)			
Rural	36	37.3	73.3
Urban	15.1	15.1	30.6
Total	51.1	52.8	103.9
Share of Elderly Population (In %)			
Rural	8.4	9.2	8.8
Urban	7.7	8.5	8.1
Total	8.2	9.0	8.6

Furthermore, the first wave of the Longitudinal Ageing Survey of India, LASI (2017-2019), reported that the older population of India is presently the world's second-largest, with 140 million people aged 60 and above. The survey registered more than 72000 individuals aged 45 and older and their spouses regardless of age, the world's largest health and retirement study. According to the survey, chronic diseases tend to upsurge with age and increase in older adults aged 60 years or above (Bloom, et al., 2021).

1.3. Ageing – changes inevitable

Ageing refers to how the functions, morphology, and other living organisms' features change with time (Kumashiro, 1997). With advancements in age, physical and sensory impairment is observed with varying degrees of Disability (Velayutham, et al., 2016). The following section gives an overview of the scenario in India related to older adults. According to the central tenet that is has influenced both the health psychology and healthy ageing fields, health is embedded in social attitudes and beliefs. All these factors influence and inform the psychological processes and the mechanisms that affect human behaviour (Cox & Anstey, 2015). Sociocultural attitudes, subjective norms, and perception control are the social determinants of health that are argued to

guide the health behaviours and thereby lead to control the expectancies from oneself. It is widespread in the ageing process that those neuromuscular mechanisms that are not frequently used are the ones most vulnerable to be impaired by ageing (Fisk, et al., 2009). Figure 1-2 shows how the Health Score declines in males and females worldwide over time (WHO, 2011).

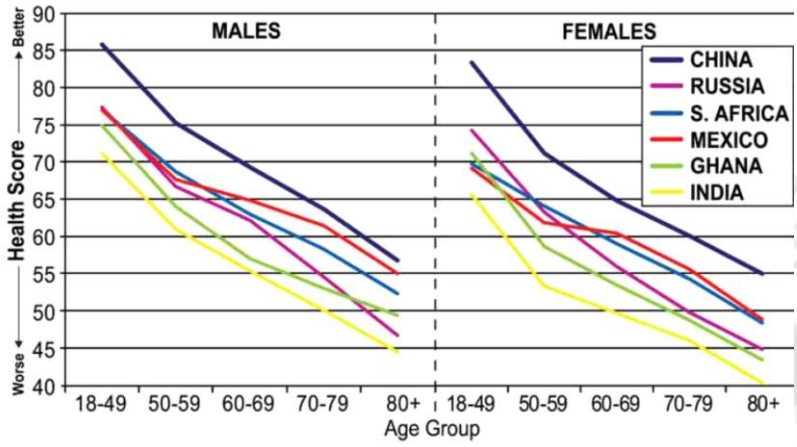


Figure 1-2. Overall health status score for males and females: Circa 2003

The above figure shows how India's health score remains very low compared to other nations. Moreover, the decline in the health index starts at a very early age. Nevertheless, the condition is much worse in the case of females due to various other factors associated with indulgence in heavy workload in younger ages. Furthermore, it is unfortunate to witness health degradation spread in the younger generation nowadays. According to the survey conducted by Blue Cross Blue Shield (BCBS), in 2017, the millennials had an average BCBS Health Index of 95.1. Furthermore, subsequent data analysis reveals that the older millennials had higher prevalence rates for nearly all the top ten conditions of health declination than the generation X members did when they were in this age group (21-36 years of age). It is quite unfortunate to observe the declining health index prevalent at such a young age (BCBS, 2019), as shown in Figure 1-4.

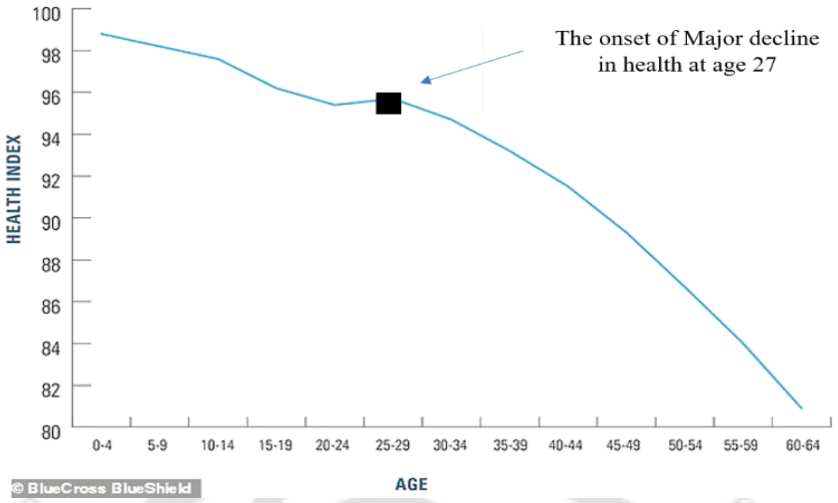


Figure 1-4. A Decline in health index with age

If the younger generation continues facing the health challenges earlier than their previous generations did when they were that age, measuring the millennials' health is crucial to improving this generation's long-term health and wellness (BCBS, 2019). With the decline in health, an individual's work capacity also drops. Maximal aerobic power declines by 1 – 2 per cent per year, significantly beyond the mid - 20s after reaching its peak level. Although the reduction is progressive, the magnitude and rate vary in individual cases. The decrease in the work capacity and performance with age is shown in the subsequent figures.

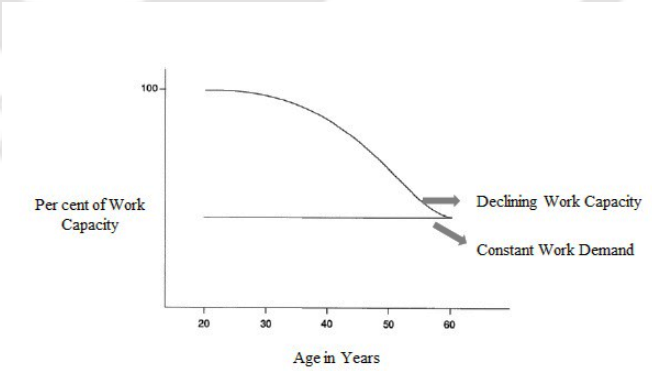


Figure 1-3. Changes in Work Capacity with Age

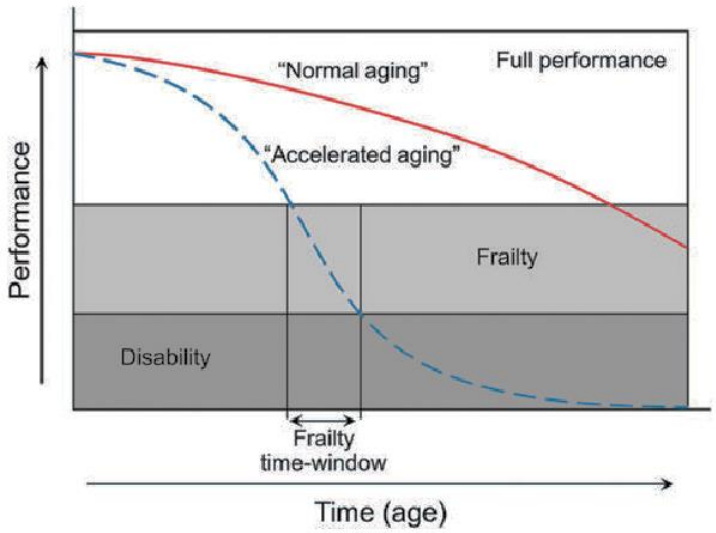


Figure 1-5. Performance declination Curve with Age.

The figure above shows how the performance is degraded in people with age. Moreover, the degradation in functional capacity increases the psychological burden, leading to other health issues. The various causes that impact the millennials, resulting in the declination of their health index, are provided in the following table.

Table 1-3. Top ten conditions affecting the millennials (ages 21-36) in 2017 (BCBS, 2019)

	Conditions	2014 Prevalence	2017 Prevalence	Increase in Prevalence
1.	Major depression	3.8	5.0	31%
2.	Substance Use disorder	1.8	2.0	10%
3.	Alcohol Use disorder	1.5	1.5	1%
4.	Hypertension	7.0	8.1	16%
5.	Hyperactivity	5.2	6.8	29%
6.	Psychotic functions	0.8	0.9	15%
7.	Crohn's diseases/Ulcerative colitis	0.9	1.0	10%
8.	High cholesterol	5.5	6.2	12%
9.	Tobacco use disorder	5.2	5.6	7%
10.	Type 2 diabetes	1.9	2.3	22%

It has been observed in various studies that the health index is slightly better in the men in the labour force compared to other professions shown in Figure 1-6.

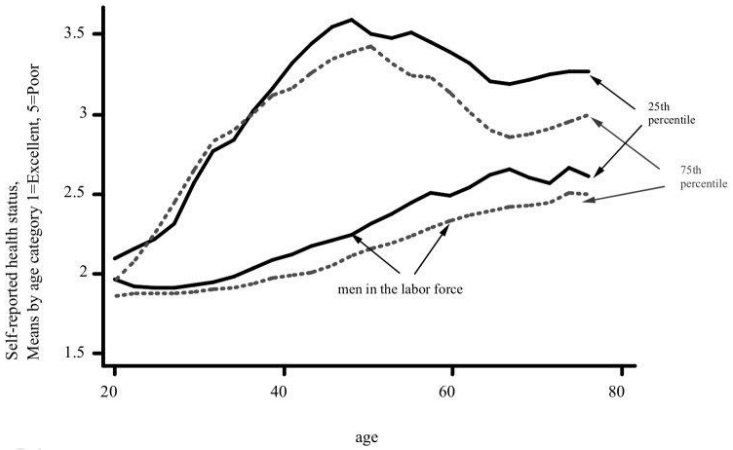


Figure 1-6. Self-rated health status in men in labour force

The worst health condition prevalent in the older age is also not so disturbing in these groups of people. Numerous researchers have significantly addressed self-rated health as one of the most reliable and efficient predictors of survival. It concludes that one can make their health and lifestyle better with adequate physical activity.

Several factors determine a person's health status. Different dimensions play a significant role in maintaining a healthy body and mind. Physical activity has been considered an essential health factor, and monitoring and promoting the level of physical activity in day-to-day life can tremendously improve people's health outcomes. According to the 2010 World Health Organisation (WHO) guideline, adults aged 18-64 should actively engage in at least 150 minutes of moderate-intensity physical activity or 75 minutes of high intensity throughout the week. These recommended physical activity levels are still not achieved in most developed and developing countries (Hardman & Stensel, 2009) (Xie., et al., 2018). An increase in physical activity can tremendously benefit the health and even help lower the risk of chronic diseases such as ischemic heart diseases, stroke, colon cancers, and diabetes. It is a very well-established fact that physical activity is crucial in managing and preventing various chronic illnesses over the lifespan.

Moreover, it has tremendous beneficial health effects in old age and very old age (Beyer, et al., 2015). Engaging in various activities and group activities

benefits older adults' physical and cognitive health, promoting healthy ageing. Despite the positive benefits, due to lack of awareness and negative self-perception of ageing among the elderly population, they do not indulge in physical activity. A more considerable fraction of the older adult population involves sedentary lifestyles with the negative stereotype of ageing. The following section gives a comprehensive study of the health and fitness association between the self-perception about one's health and the impacts caused.

1.3.1. Self-Perception of Ageing (SPA)

According to stereotype embodiment theory, the accumulation of the societal age stereotypes and their internalisation over the life span becomes the self-perceptions of ageing and are directed at oneself during the older age. Due to the negative age stereotype, that in older age, it is evident to accumulate health degradation, hence not indulging in physical activity and mostly live a sedentary lifestyle which thereby causes health problems. The health behaviours such as general physical activity, nutrition, leisure-time exercise, and stress management are potential mediators between self-perceptions of ageing and health. According to several studies, positive self-perceptions of ageing prove beneficial for various health outcomes, physical or mental health, increased physical functioning, self-rated health, and shorter recovery from illness (Beyer, et al., 2015).

As per various research studies, older adults holding positive beliefs about their ageing process showing positive SPA have a better health profile and live longer. Furthermore, on the other hand, worse health conditions are observed in older adults who develop a negative SPA. Positive SPA benefits various positive physical and mental health outcomes; people are more concerned about self-rated health, and increased physical activity is observed. Despite the evidence, significantly less is known about the underlying mechanism and relationship between the SPA and fitness. So far, only two cross-sectional studies have been conducted.

Stereotype Embodiment Theory – the basis of SPA

Levy, in 2003 proposed the stereotype embodiment theory according to which societal age stereotypes are accumulated and internalised over the life span of a person and become the self-perceptions of ageing when directed towards oneself in older age (Beyer, et al., 2015). SPA appears to influence health outcomes in three pathways: i) psychological, physiological, and behavioural. The SPA can generate expectations that act as self-fulfilling prophecies in a psychological pathway. SPA can influence the autonomic nervous system in the physiological pathway while affecting health behaviour in the behavioural pathway. It shows that a positive or a negative SPA impacts health and longevity via cognitive, physiological, or behavioural processes. According to the behavioural pathway concept, the negative SPA acts as the barrier in the path of an individual. It stops engaging in health behaviours such as medication compliance, a healthy diet, or regular physical activity.

1.3.2. Review on Health Degradation with Age

Elderly population rates are going to increase in the coming years. There is an increase in the number and proportion of older people who live in their own homes but with some limitations like mobility disability, dexterity, or restriction in their mental capacity (Grundy, 2003) (Grundy, et al., 1999) (Sarkar & Chakrabarti, 2021). Besides, this scenario does not attribute to any particular country or ethnicity; it has been observed internationally and is a well-recognised social fact (McCreadie & Tinker, 2005) (Grundy, et al., 1999) (Grundy, 2003). An analysis (Velayutham, et al., 2016) shows that one in every twenty Indian elderly citizens [5178 per 100,000] is physically or mentally disabled. The elderly population is the most vulnerable group of society, which is more prone to health adversities. They are more susceptible to chronic diseases, infections, and disabilities (Gupta, et al., 2014). Various studies have shown that older adults are likely to accumulate some health severities with age, which leads to functional disability with time. Over the age of 55, on average, 45 per cent of females and 28 per cent of males report joint pain (Kumar, 1997).

Chakrabarty et al. (2010) reported that 16.16% of the study population was prevalent in Disability. 92.5% were already suffering from one or more chronic conditions. Using the Activity of Daily Living (ADL) scale, the study could identify the risk factors for only 58.2% of the cases (Agrawal, 2016) (Chakrabarty, et al., 2010).

Out of 932 participants, Gupta et al. successfully experimented with 836 participants. In their study, out of these 836 participants, 172 (20.6%) had hypertension, 54 (6.5%) had diabetes, 193 (23.1%) had a history of joint pains, and 114 (13.6%) reported having Chronic Obstructive Pulmonary Disease (COPD) (Gupta, et al., 2014). Another study estimated 37.4% of functional disability among the elderly participants. Of these, 35.9% were men, and 38.8% were women. It suggested that Disability is more prevalent in women than men. Moreover, the study revealed that the prevalence of such comorbidities increases gradually with age. It was 23.7% for 60-64 years old rose to 63.8% for five years (Gupta, et al., 2014) (Agrawal, 2016).

According to Venkatarao et al., functional disability among the elderly population is distributed in different proportions (Venkatarao, et al., 2005). That functional limitation is prevalent in 88% of the senior population, regardless of gender. Prevalence of speech disability, hearing disability, visual disability, and agility (walking, locomotion, climbing stairs, dexterity, and body movement) was 4%, 10%, 56%, and 33%, respectively (Agrawal, 2016) (Venkatarao, et al., 2005). Various factors and reasons are held responsible for such adversities in the ageing process.

Causes for Disability in Older Adults

Some studies suggested that the socio-economic conditions make the elderly more vulnerable to Disability (Rodrigues, et al., 2009). The socio-economic factors, regardless of gender, include the lack of schooling, living in rental housing. The elderly population residing in India's rural parts are more prone to Disability, and a high prevalence of morbidity is observed in those places. Also, chronic illness influences the quality of life in older adults, and shreds of evidence show that the comorbidity's increased risk can lead to Disability (Agrawal, 2016). Chronic conditions also contribute towards Disability in the

elderly population. These include stroke, chronic lung disease, cancer, arthritis, hip fracture, obesity, arthritis, and systemic arterial hypertension. Except for arthritis, functional Disabilities are the same in men and women (Rodrigues, et al., 2009). Regardless of gender, a Body Mass Index (BMI) of more than 25kg/m^2 was the triggering point for functional Disability in one study and 26 kg/ m^2 in another (Rodrigues, et al., 2009) (Oman, et al., 1999). The older adults' psychological well-being and disability status revealed minimal disability, moderate disability, severe disability in 48.5%, 22%, and 17%, respectively (Agrawal, 2016) (Joshi, et al., 2003). Limited diversities in older adults' social relationships also increase the higher risks of functional disability (Rodrigues, et al., 2009). The table below summarises the various factors and conditions responsible for disabilities in older age.

Table 1-4. Risk factors associated with the Disability in older adults.

Biological Factors	Age, Gender, Race
	Height/ Weight Relationship
	Congenital abnormalities or disorders
	Genetic Predisposition
	Sedentary Lifestyle
Behavioural/ Psychological/Lifestyle Factors	Cultural basis
	Use of tobacco, alcohol, other drugs
	Poor nutrition
	Low level of motivation
	Inadequate coping skills
	Difficulty dealing with change or stress
	Negative effect
Physical and Environment Characteristics	Ergonomic characteristics of home and workplace
	Architectural barriers in the home, community, and workplace
Socio-economic Factors	Low level of education
	Low economic Status
	Inadequate access to health care
	Limited family or social support

The prevalence of the risk factors gives rise to the chances of disability in the older age, as shown in the consequent tables (Velayutham, et al., 2016).

Table 1-5. Multiple Disability rates by age, gender, and type of residence in age ≥ 60 years in India 2011

Type of disability	Site		Age 60-69 years		Age 70-79 years		Age 80-89 years	
			Total disabled	Rate per 100000	Total disabled	Rate per 100000	Total disabled	Rate per 100000
Multiple Disability	Rural	Total	171,343	379	189,506	939	157,858	2000
		Male	82,557	373	85,581	848	66,075	1755
		Female	88,786	385	103,925	1029	91,783	2223
	Urban	Total	99,079	233	29,834	483	34,022	1002
		Male	23,726	250	18,555	458	13,147	866
		Female	20,353	213	21,279	507	20,875	1113

Table 1-6. Movement Disability rates by age, gender, and type of residence in age ≥ 60 years in India 2011

Type of disability	Site		Age 60-69 years		Age 70-79 years		Age 80-89 years	
			Total disabled	Rate per 100000	Total disabled	Rate per 100000	Total disabled	Rate per 100000
Movement	Rural	Total	516,690	1143	352,212	1745	175,798	2227
		Male	298,806	1350	189,447	1878	84,568	2246
		Female	217,884	945	132,765	1612	91,230	2210
	Urban	Total	164,339	869	100,311	1216	49,876	1470
		Male	99,371	1045	53,524	1321	21,993	1449
		Female	64,967	691	46,487	1114	27,883	1486

The previous section gives a detailed overview of the vulnerabilities associated with ageing. Furthermore, with the disability prevalence, the older adults' population demands proper facilities to ensure a better living. Here assistive technology plays a substantial role in compensating the lost functionalities.

1.4. Assistive Technology

There is a significant societal change in population ageing globally. Along with the increase in the older population, vulnerability rises. The risks of acquiring chronic diseases and the functional declination in the vision, mobility, hearing and cognitive abilities increase with ageing. Growth in the older population demands proper assistance in daily activities (Chen, 2020). Studies show that, like any age group, older adults also enjoy independence. However, the vulnerabilities associated with ageing make the elderly dependent on care providers. Here, AT plays a significant role in providing a sense of self-dependency through the various assistive aids, which selectively target different dysfunctionalities. Assistive technology is a rehabilitation technique for people with compromised functionality due to disability. Here, rehabilitation endeavours to restore functional incapacities (Kumashiro, 1997).

1.4.1. Assistive Technology Devices for Older Adults

Any device or system that allows an individual to perform a task that they would otherwise be unable to do, or increases the ease and safety with which the task can be achieved, is termed an assistive device (McCreadie & Tinker, 2005) (Cowan & Turner-smith, 1999). According to a systematic review, existing studies have focussed on six types of AT for older adults: i) general information and communication technology, ii) telemedicine, iii) medication management applications, iv) sensor technology, v) video games, and vi) robotics. In aged care, the application of AT focuses on addressing eight issues: chronic disease, dementia, poor well-being, dependent living, depression, fall risk, social isolation, and poor medication management (Chen, 2020). Table 1-7 indicates the requirements of assistive aids in the lives of older adults in Great Britain.

Table 1-7. Percentage of older adults either already using or reporting need of AT in Great Britain

Type of assistive Technology	Level of Disability			
	Moderate		Severe	
	User %	Need %	User %	Need %
Mobility Aids: including wheelchairs, walking sticks, crutches, walking frames, trolleys	55	5	78	10
Vision aids: including guide dog, white cane, magnifying glass, Braille equipment, writing frame, frame for telephone, talking-book machine/cassette recorder, audibles/tactile measuring device, sonic aid, ordinary stick, low vision aid	41	9	39	9
Hearing Aids: including hearing aid, adaptor for telephone, adaptor for TV, adaptor for radio, flashing light for telephone, flashing light for the door, flashing alarm clock, pointer board, typewriter	21	11	23	10
Furniture or daily living aids: including bed-hoist, bed poles, and ladders, the cradle for bedclothes, orthopaedic mattress, ripple mattress, sheepskin mattress, other special bed or bedding, commode, Sani-chair, toilet hoist, other aids to toileting, bath seat, bath hoist, non-slip mat, other aids to bathing, environmental controls, e.g., possum, special chair	28	12	51	17
Gadgets or small aids: special crockery, special cutlery, special utensils (e.g., potato peeler, tin opener), tap turner/ special taps, special door handles, pick-up aid, dressing aids, electric toothbrush, gadget to summon help	19	9	33	14
Adaptation to accommodations: including ramps outside and inside instead of steps, handrails outside and inside, doors alerted for better access, e.g., widened, stair-lift, other alterations for better access, fitted furniture altered (e.g., shelves, cupboards, cooker), new bathroom or toilet added, shower installed, bath grab-rail installed, door answering/opening system	28	19	45	28
Sample Size	1234		551	

Assistive living and assistive devices ensure a self-dependent living for the older adults, delivering an enhanced way of living. Assistive Technology has been receiving a significant amount of attention for many years. It can compensate for the declined function, thereby helping the older adults achieve independent living and enhancing overall well-being (WHO, 2018) (Chen, 2020). World Health Organization (2018) estimated that by 2030 more than two billion people shall be using at least one item from the available AT. The long-term care arrangements aim to reduce the disabling effects of physical impairments and functional limitations (Agree, 1999).

1.4.2. Assistive Technology Intervention for Older Adults

The long-term care arrangements aim to reduce the disabling effects of physical impairments and functional limitations (Agree, 1999), primarily observed in older adults. Agree et al. examined the assistive devices and personal care as the factors while measuring the Disability among persons of about 70 years and more senior in the community. Assistive devices ensure independence to the users by not demanding cooperation from others, and the disabled person can meet their needs on their own. They found that although most elderly spend their life in good functional health, two-thirds of their disabled years are spent with unmet ADL needs. These needs indicate the gap between providing the services and the level of demand in a population (Agree, 1999). In another study, Resnik et al. studied the acceptance of assistive devices among the elderly. They conducted 12 focus groups with 61 community-dwelling persons whose age is either 65 or more. They were from three groups – White, non- Hispanic, Black, and Hispanic. They found that the Hispanics prefer human assistance over assistive devices. Due to social pressures and perceived stigma, deter mobility aids, particularly in the minority community (Resnik, et al., 2009). Kiyoshi et al. had developed a power assisting device. It mainly consisted of two parts in which the upper part was able to provide motion in the horizontal plane. In contrast, the lower part provided the movement in the vertical plane. This device significantly helped the patient transition from a sitting position to a standing or walking position (Nagai, et al., 2002) (Salah, et al., 2011).

McCredie et al. conducted 67 in-depth interviews and tape-recorded in people's own homes. The protocol consisted of three main sections: i) the background, ii) nature and the severity of the disabilities, and iii) the Assistive Technology. The AT section covered the entry and the movement, communications, alarms and safety, baths and lavatories, electrical devices, and other devices. Here, the disability section dealt with the functional capacity to cover the activities of daily living. Their study found that shopping and meal preparation give older adults a sense of independence (McCreadie & Tinker, 2005). It reports the percentage of the elderly population using AT for different kinds of Disability in Great Britain.

Assistive devices

In older adults, the susceptibility to injuries caused by the diseases like osteoporosis or reduced protective reflexes, the danger of falls persists. (Axer, et al., 2010) (Martins, et al., 2012). Assistive devices shown in Table 1-8 can make their life a little easier to some level. Due to mobility disability, the older adults' periphery becomes very narrow, and a significant portion of the elderly population is dependent on others like their family members or caregivers. In extreme cases, older adults demand more sophisticated devices, as shown in Figure 1-7.

Table 1-8. Assistive Devices for Older Adults

Category	Assistive Devices
Washing	Bath seat, Anti-slip mat, Bath support rails, Sponge on a handle
Going to toilet	Handle in a toilet, Commode, The raised toilet seats, Incontinence material
Feeding	Special cutlery set
Dressing	Long shoehorn, Buttonhook, Easy shoes, Socks aid, Elastic shoelaces
Bed-Related activities	Bed raiser, Removable bed rail, Freestanding lifting pole, Hydraulic hospital bed, Adjustable back support in bed
Basic Mobility	Chair raiser, lifting seat, Hoist, Cane, Crutch, walking frame, Rollator, Wheelchair, Electric wheelchair, Grab rails in the room, Doorframe ramp, Staircase lift, Personal alarm system

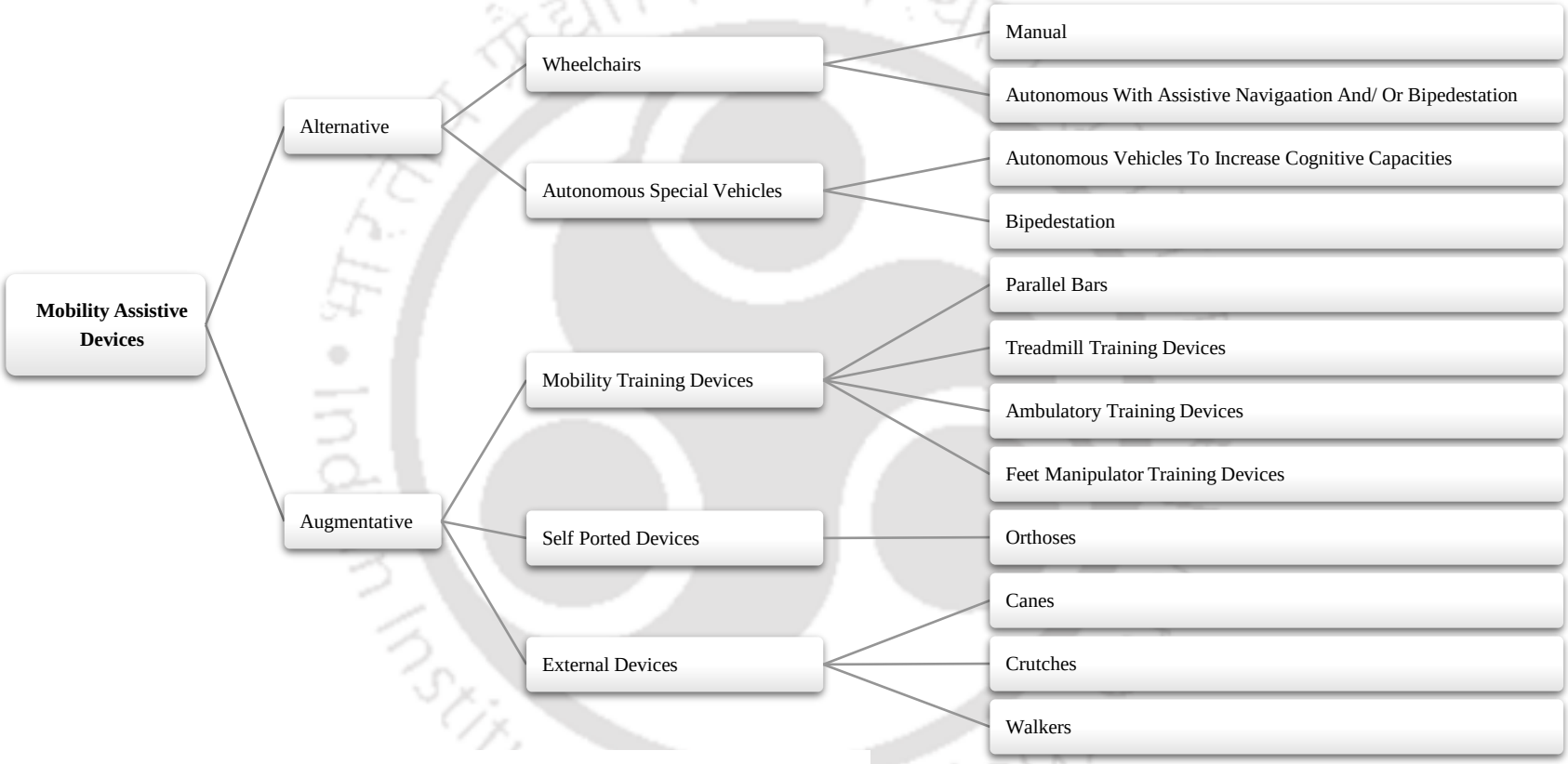


Figure 1-7. Assistive Mobility Devices

I. Alternative Mobility Devices

The alternative devices, wheelchairs, and special vehicles are considered an optimal solution in total incapacity. Prolonged use of such devices can cause health issues like loss of bone mass, degradation of blood circulation and physiological functions, osteoporosis, skin sores. The augmentative devices enable the user to avoid the previously presented health problems and allow the patients to continue using their remaining locomotion capability. In some cases, the patient can regain their previous locomotion ability and relearn to walk safely and efficiently (Martins, et al., 2012).

Figure 1-8. a) Manual wheelchair b) Smart wheelchair c) Bi-pedestation (left to right)

Manual wheelchairs are the basic wheelchairs that assist in a mobility disability. In comparison, intelligent wheelchairs use robotic solutions and provide its user with the facility of autonomous navigation using the technologies like Human-Computer Interfacing (HCI) and Brain-computer Interfacing (BCI) and, in some cases, using Electromyogram (EMG). Continuous use of such alternate devices can cause other side effects like skin sores, degradation in blood circulation, and other physiological functions. It may result in loss of bone mass (Martins, et al., 2012).

II. Augmentative Mobility Devices

The augmentative devices are external devices like crutches, canes, mobility training devices during rehabilitation, or self-ported devices like orthoses and prostheses.

Mobility Training Devices

A mobility training device intends to improve the gait and help the patients' movement during rehabilitation. Parallel bars are considered the most commonly used training devices (Martins, et al., 2012)

Figure 1-9. Parallel bars

The parallel bar technique has yielded promising results during the rehabilitation process. In this process, two or three therapists' involvement is required to assist the patient in walking and their lower limbs to control their movement (Martins, et al., 2012) (Leahy, 2010).

Figure 1-10. Robotic Mobility training Devices: a) Lokomat, b) LokoHelp, c) Lopes (left to right)

Robotic mobility training devices are also available to assist the patient in rehabilitation. According to the literature survey, it is evident that the patients should be intensively engaged in the training procedure; else there is a

tendency of losing interest with time (Martins, et al., 2012) (Colombo, et al., 2007) (Chin, et al., 2010) (Schwartz, et al., 2009). According to the patient's pathologies, the Robotic Mobility Training Devices are classified into three devices, i) treadmill training devices, ii) ambulatory training devices, and iii) feet manipulator devices.

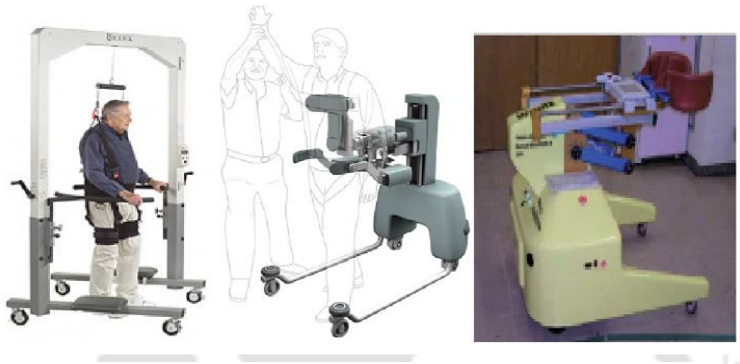


Figure 1-11. Ambulatory Training Devices: a) LiteGait, b) KineAssist c) Where-I (left to right)

The treadmill training devices are the most commonly used. Patients with neurological problems (stroke, cerebral palsy, spinal injury) are treated with treadmill training devices. The ambulatory devices are similar to the treadmill training devices, but it involves less equipment than the latter. In this type of training, there is a provision of over-ground training that is considered practical training over a treadmill.

Figure 1-12. a) GaitTrainer, b) Haptic Walker (left to right)

The feet manipulators are the training devices in which the patient's feet are held in the robotic manipulator where the manipulator supports and gently rehearses the patient with the continuous walking situations. The patients' feet are kept on plates, and the plates' trajectories are fully programmed. They can imitate simple walking patterns like walking, ascending or descending stairs, tripping, or slipping. The artificial foot movements force the slack muscles between the toes and the hips to again into action.

Self-Ported Devices

The self-ported devices are used to either substitute a lost limb (prostheses) or improve the function of the existing movable parts of the body [26, 32]. These devices intend to restore mobility in patients who have severe walking impairments.

Figure 1-14. Self-Ported devices: orthoses a) HAL-5 exoskeleton, b) ReWalkTM, c) RoboKnee, d) MIT active ankle-foot orthoses (left to right)

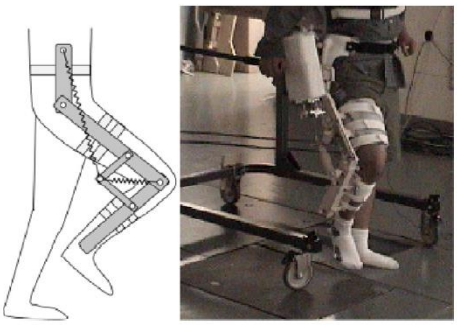


Figure 1-13. Passive Orthoses based on the gravity-balancing principle External Devices

The orthoses are considered either active or passive. The actuators or motors enable the movement in active orthoses by providing energy. While there are no actuators or motors in passive orthoses, the users provide the power. Only springs and links are used in designing the device based on the Gravity Balancing Principle.

External Devices

Canes, walkers, and crutches constitute the external devices. The canes are the most common among all devices. They are commonly used to increase gait stability rather than partially supporting weight.

Figure 1-15. External Devices: a) Standard Canes, b) Multi-feet Cane, c) Crutches, d) Smart Cane, e) Guide Cane (left to right)

A simple cane can reduce falls in patients with imbalance (Martins, et al., 2012) (Van Hook, et al., 2003). Crutches allow direct support to the body, providing more excellent weight support in walking than the canes. However, they are somewhat cumbersome and not favoured because they offer an unnatural gait.

Walkers are elementary devices but have tremendous rehabilitation potential. These are primarily suggested to maintain balance and improve the patient's mobility. Various walkers are available in the markets based on the materials used in manufacturing, accessories, and sizes. These are of two types, i) conventional and ii) smart walkers based on the classification.

Figure 1-16. Conventional Walkers: a) Standard Walker, b) Front-Wheeled Walker, c) Rollator (left to right)

Although a walker is more accessible than a cane, upper body strength and cognitive are required. If not used safely, it can result in an abnormal gait (Martins, et al., 2012) (Costa & Caldwell, 2006). Furthermore, there is a chance that the patient may fall over backwards still holding the walker (Martins, et al., 2012) (Constantinescu, et al., 2007). Rollators are the easiest to use among the three walkers but are considered less stable.

Table 1-9 discusses the advantages and disadvantages of the existing assistive technology that compensates for the desolations associated with ageing. The factor that matters how the older adults perceive the idea of assistive technology and accept it in their lives is explained in the following section.

Table 1-9. Comparison of Assistive Devices

Assistive Device		Pros	Cons	Conditions indicated for use
Canes	Standard Straight Cane	Improves balance; adjustable	Should not be used for weight-bearing; umbrella handle may cause carpal tunnel syndrome	Mild ataxia (sensory, visual, or vestibular); mild arthritis
	Offset Cane	Appropriate for intermittent weight-bearing; shotgun handle puts less pressure on the palm	Commonly used incorrectly (backwards)	Moderate arthritis
	Quadripod Cane	Increased base of support; can bear more significant amounts of weight; stands freely on its own	Slightly heavier than cane; awkward to use correctly with all four points on the ground simultaneously	Hemiparesis

… Continued on next page

Crutches	Axillary Crutches	Able to completely redistribute weight off to lower extremities; permits 80 to 100 per cent weight-bearing support; inexpensive	Challenging to learn to use; requires substantial energy expenditure and strength; risk of nerve or artery compression; unable to use hands	Lower extremity fracture
	Forearm (Lofstrand) Crutches	Free hands without having to drop crutch; less cumbersome to use, particularly on stairs	Permits only occasional weight bearing	Paraparesis
	Platform Crutches	The forearm is used to bear weight rather than hand	Challenging to learn to use	Rheumatoid arthritis
Walkers	Standard Walkers	Most stable walker; folds easily	Needs to be lifted with each step; slower, less natural gait	Severe myopathy; severe neuropathy; cerebellar ataxia
	Front Wheeled (two-wheeled) Walkers	Maintains regular gait pattern; does not need to be lifted with each step	Large tunic arc; less stable than a standard walker	Severe myopathy; severe neuropathy; paraparesis; parkinsonism
	Four Wheeled Walkers	Easy to propel; highly manoeuvrable; with small tunic arc; typically has seat and basket	Not for weight bearing; less stable than front wheeled walker; does not fold easily	Moderate arthritis; claudication; lung disease; congestive heart failure

Acceptance of Assistive Technology by the Older Adults

Although older adults are less likely to use the technology than younger adults, research shows that older adults are willing to use the technology when needed. However, the technology benefit should be evident (Fisk, et al., 2009). A study comprising sixty-seven people aged more than 69 years about their experiences and usage of the wide range of assistive technologies suggested a complex acceptability model, in which a 'felt need' for assistance accompanies the 'product quality.' An essential characteristic of the AT that the users seek is to work correctly, reliably, and safely (McCreadie & Tinker, 2005). The ease of use of a product determines its users. Various assistive devices are available worldwide, but the determination of their usability is of serious concern. According to a study conducted with many samples *(using the standard everyday products)*, 75% of the participants reported difficulties in the usage (Fisk, et al., 2009).

Assistive Technology is a noble approach in providing older adults with health care services. However, the underlying cause and factors are often forgotten responsible for such adversities. Although these devices are an excellent resource for people suffering from disabilities prevalent in older age, prevention is better than cure. If disabilities in older age can be removed, independence is assured, enhancing the essence of living irrespective of any generation. Hence, preventive measures are the utmost requirement of the present scenario for overcoming the disability in the elderly population. Studies show that it is possible to eradicate the sufferings associated with older age with proper physical fitness and psychological well-being. Also, adequate health care before even hitting the older age ensures healthy ageing. The following section elaborates on the essentiality of fitness awareness and its indulgence in daily routine.

1.4.3. Healthcare, Fitness and Older Adults

Health and disease prevention have become very important with the general increase in life expectancy. The older adult's healthcare '*market*' is an increasingly educated and healthy group (Gardner-Bonneau & Gosbee, 1996). Here, physical activity is crucial in preventing and managing various chronic

illnesses associated with ageing (Beyer, et al., 2015). Furthermore, with some behavioural changes, the essence of living can be increased manifold. The subsequent sections deal with such interventions and their benefits.

1.5. Healthcare Interventions Interventions in Older Adults

Many studies have provided preventive strategies for dealing with the hazards of disabilities in the elderly population. Although there is yet to be more research on this serious issue, many researchers are still working on this field dealing with the health concerns in the elderly population. In terms of older adults' health problems, the Institute of Medicine of the National Academy of Sciences in 1991 identified and reported the following frequently occurring geriatric syndromes: i) decreased postural stability, strength, and mobility; ii) failure to thrive; iii) urinary incontinence; iv) medications mismanagement; and v) delirium or acute confusion states. Several transitions have taken place in healthcare to provide adequate care to the elderly, which directly affected the design of devices and systems for older adults (Gardner-Bonneau & Gosbee, 1996). The following table shows the transition in Health Care for the elderly.

Table 1-10. Health Care Emphasis Transition (Gardner-Bonneau & Gosbee, 1996)

	Old	**New**
The central place for care	Hospital	Clinic
Doctor-patient relation	Paternal	Cooperative
Emphasis for resources	Acute treatment	Prevention
Payer or provider focus	Episodic	Continuum
Gatekeeper or manager	None	Family physician
Expectations	Better at age	Living well
Following treatment plan	Compliance	Adherence
Caregivers	Physicians	Nurse practitioners, physician assistants

The shift of the healthcare emphasis and the focus has changed the whole scenario of the health care industry. Moreover, the Central government runs many programs with the State government's help to support persons with disabilities. Having cognitive impairments in older age is a common scenario

responsible for increasing the risk of falls. However, evidence from various studies, daily exercise results in postural stability and prevents falls (Martins, et al., 2012) (Ceres, 2007). Agree (1999) examined assistive devices and personal care as the factors while measuring the Disability among the elderly (70+). The result showed that older people are expected to live functionally for many years. However, they spend their lives with unmet ADL needs for the last two-thirds of the disabled year (Agree, 1999). Eighteen participants (ten women and eight men) underwent a strength-training program using isotonic resistance exercise machines. Reeves et al. (2003) experimented for three days per week for 14 weeks. The study showed enhancement in the specific force by 19% after the strength training program (Reeves, et al., 2004).

Rubenstein et al. studied the effects of low-to-moderate intensity group exercise programs on endurance, mobility, strength, fall rates in older adults already having some chronic impairments and prone to fall. They had taken fifty-nine community-living men, and each had some fall risk factors like leg weakness, impaired gait, or balance, with a mean age of 74 years. The exercise session was held for 90 minutes 3 times per week and lasted for 12 weeks. As a result, there was a significant improvement in gait, endurance, and strength. The iso-kinetic endurance increased by 21% for right knee flexion and 26% for extension (Rubenstein, et al., 2000). Fiatarone et al. conducted a placebo-controlled trial in 100 frail nursing home residents over ten weeks and compared progressive resistance exercise training, multi-nutrient supplement, both interventions and neither. The mean age of 63 women and 37 men was 87.1 ± 0.6 years. After the experiment, the gait velocity increased by 11.8 ± 3.8 % in the exerciser group. The stair-climbing power also improved in the exerciser group. There was no significant effect on the outcome measure due to the nutritional supplement, but in the exercising group, the total energy intake was significantly increased (Fiatarone, et al., 1994)

In another study, Joshua et al. conducted individualised Progressive Resistant Strength Training (PRT) to see whether the PRT is more effective as compared to Traditional Balance Exercise (TBE) or not. They also evaluated the effectiveness of the combination of both. In the experiment, there were three groups. Each group accommodated 18 subjects of age more than 65 years from

the elderly care centres of Mangalore city in Southern India. The TBE group indulged in eight traditional balance exercises for six months (4 times per week); the PRT group indulged in resistance training for the lower extremity's muscles. Results showed PRT intervention to be more effective than TBE among the non-frail older adults (Joshua, et al., 2014). In a 6-month randomised trial with an 18-month follow-up in a sample (N=174) conducted by McAuley et al., the study factors were i) adherence during the trial, ii) affective responses to exercise, ii) exercise value, and iv) social support from the exercise group. They studied the extent to which these factors had either a direct or an indirect effect by mediating exercise self-efficacy on physical activity. In the 18 month-month activity levels, they found that the self-efficacy was enhanced by the social, behavioural, and affective factors and showed higher participation at 6- and 18-month follow-up (McAuley, et al., 2003)

Chiello et al. conducted a trial to determine the short- and long-term effects of resistance training on psychological well-being, muscle strength, control beliefs, memory, and cognitive speed in normally active older adults. They randomly assigned 46 older adults (mean age – 73.2 years); 18 women and 28 men into training and control groups. The training sessions were held only once a week, which constituted 10 minutes of warm-up phase and eight resistance exercises on the machine. The pre-and post-tests were done one week before and after the eight-week-long training intervention. These resistance exercises' efficiency was fully projected, and the maximum dynamic strength significantly increased in the training group. Also, the psychological well-being associated with the decrease in self-attentiveness was enhanced. Significant long-term effects were prominent in the training group's muscular strength and memory performance. It was concluded in the study that with resistance training, muscular strength is improved, and anxiety and self-attentiveness are lessened (Peig-Chiello, et al., 1998).

Hariprasad et al. conducted a randomised clinical trial of yoga-based intervention on the elderly from nine different elderly homes in and around Bangalore city, India, approved by the Institutional Ethical Committee of the National Institute of Mental Health Neurosciences (NIMHANS). 87 elderly (yoga = 62 and the waitlist = 43) completed the trial for six months. For one

month, the yoga group received the yoga sessions weekly until the third month and continued for six months without supervision. There was a significant improvement in the immediate and delayed recall of verbal and visual memory, attention, and working memory (Hariprasad, et al., 2013).

The Central government runs many programs with the State government's help to support people with disabilities in India. The Ministry of Social Justice and Empowerment and Heath and Family Welfare in India have taken specific measures in curbing the menaces of Disability-related problems in India (Kumar, et al., 2012) (Ministry of Social Justice & Empowerment, 2018). District Rehabilitation Centre (DRC) was started in 1985, National Information Centre on Disability and Rehabilitation. Moreover, National Level Institutes like the National Institute Of Mental Health (NIMH), National Institute for the Hearing Handicapped (NIHH), and National Institute for the Visually Handicapped (NIVH) are initiated in India. District Disability Rehabilitation Centre was launched to provide rehabilitation services and implement the Persons with Disability Act 1995 (Kumar, et al., 2012).

Community-Based Rehabilitation (CBR) services have also been promoted, including advocacy, inclusion, participation, sustainability, and empowerment. Understanding the concept of Disability and accepting the CBR as a valid intervention is still a challenge (Kumar, et al., 2012). The Ministry has launched the 'Rashtriya Vayoshri Yojana' (RVY) to provide physical aids and assistive living devices (crutches, walkers, hearing aids, artificial dentures, spectacles) to the senior citizens who belong to the Below Poverty Line (BPL) category and suffering from age-related disabilities. This assistance can bring normalcy to their bodily functions to some extent. A total of 187 districts from all Indian states have been selected under this scheme (Ministry of Social Justice & Empowerment, 2018).

The above studies show a significant positive effect on physical and cognitive health in people irrespective of age. Instead, investigations revealed the benefits of exercise even in very old age despite the age stereotypes. However, the underlying factor for the elderly not indulging in health and fitness is the lack of motivation. The negative Self-Perception of Ageing (SPA) plays a crucial role. To motivate the older section of our population, technology shall

increase its inclination towards eliminating the negative stereotypes and the imbibed self-perception of ageing. Various fitness motivating devices are flooding the fitness market. One such technology has already established its wide presence in Wearable Fitness Technology. The wearable devices are already positively motivating younger users to indulge in fitness regimes and derive health benefits. The ageing population is the most challenging group to be encouraged into the fitness regime. The following sections highlight the research and expansion in Wearable Fitness Technology, its benefits, and areas requiring more work.

1.6. Wearable fitness Technology

Developing wearable devices and their service delivery is an emerging topic in healthcare research (Windasari, et al., 2021). Smart wearable devices can be defined as "a user-worn accessory, with integrated electronics and computing technologies, that captures or reports on some form of data (Puri, 2017) (Gupta, et al., 2020). These wearables range from smart glasses, smart shoes, smartwatches, smart eyewear, and implantable, which work on the principle of embedded sensors directly connected purposefully to the internet intending to share valuable information (Gupta, et al., 2020) (Pal, et al., 2019). Smart fitness wearables, e.g., smartwatches and fitness trackers, constitute approximately 60% of the overall market and are reported as adopted among various age groups (Gupta, et al., 2020). The WFT sales have tremendously increased in recent years, and it is expected to continue to rise by 16.5% annually until 2023 (Windasari, et al., 2021).

Although people are adopting wearable fitness technology on a large scale, it faces challenges in its sustainable usage. Reports say that users tend to abandon wearable devices in less than six months, with an abandonment rate of 30% (Windasari, et al., 2021). A very little is known about the underlying reasons for this abandonment. The market survey of these wearables reveals a gradual increase in their sales. However, the sustainable engagement and adherence to these products tend to diminish with time.

1.7. Research Gap

With the increase in health awareness among people, the use of fitness devices has significantly increased. Although its use is not limited to any particular age, its intensity can vary in different age groups. Various fitness devices have already flooded the fitness market. There are multiple categories of people intending to avail of this facility. Some are either using it personally or are living with someone presently using such devices. Despite the positive prospects and functionality of wearable devices, significantly, very little research is available on the acceptance of wearable devices (Yang, et al., 2015). The correlation between efficiency, accuracy and the overall user experience on user perception has not been well explored. Moreover, no such study explains the acceptance of wearable fitness trackers among different age groups. Furthermore, it lacks such studies that can explain the underlying causes for the unsustainability in its usage and solutions to improve its continuance to benefit the larger periphery of the human population to indulge in positive health and fitness behaviours to eradicate the sufferings stereotyped to be associated with ageing, which may guide towards healthy ageing. The lacunae in the existing studies, as mentioned above, raises the below queries.

1.8. Research Questions

RQ-1. Is there any difference in exercise behaviour in different age groups?

RQ-2. Is the exercise behaviour less or high among people with health issues?

RQ-3. How does the Body Mass Index of people influence exercise behaviour?

RQ-4. What fraction of the age group is positive towards availing the WFT in daily life?

RQ-5. What fraction of the people are already having a WFT?

RQ-6. Does the awareness of the mechanism of the WFT affect the Intention to incorporate the WFT in the daily lives of people?

RQ-7. What fraction of the people are not continuing using the WFT?

RQ-8. What fraction of the people are not continuing using the WFT?

RQ-9. Is the Attitude towards using the wrist-worn fitness tracker is more in people engaging in some fitness regimes?

RQ-10. Is there any difference between the behavioural Intention of WFT among males and females?

RQ-11. To which extent do Social Influence and Perception of Others on WFT affect the acceptance of wearable fitness trackers among people?

RQ-12. Does General and Technology Self-Efficacy play any role in the Behavioural Intention towards WFT?

RQ-13. How does Attitude towards health technology affects the Attitude towards the WFT?

RQ-14. What design interventions can be introduced to prolong the Wearable Fitness trackers' usage to make them more acceptable to the actual consumers and attract more potential customers?

1.9. Motivation of Research

Regarding the above issues, it can be ensured from various longitudinal studies dedicated to understanding the relevance of physical activity over health; a fitness regime ensures a healthy physical and mental state (Ströhle, 2009) and the human race's overall well-being. The ageing population needs more attention as they are more prone to chronic diseases. They essentially require regular monitoring of their vital physiological patterns to prevent severe fatalities. With the capability to monitor such parameters in daily life, the elderly can be aware of their health status. Also, maintaining proper physical fitness by indulging oneself in physical activity can elevate one's standard of living. Here the Wearable Fitness Trackers (WFT) play a vital role in motivating users to indulge in a healthy lifestyle. With the features provided in the fitness tracking devices, one can monitor their daily activities and measure their vital physiological parameters. Instead of relying on assistive devices in old age, if one can prepare themselves for the challenges and proceed towards healthy ageing by adhering to a healthy lifestyle irrespective of any age group, the sense of independence can ensure a healthy and prosperous life. Furthermore, integrating the stereotype embodiment theory can explicitly

address the role of age stereotypes in psychosocial and health development through the socio-cognitive health psychology towards the perceived control of health outcomes (Cox & Anstey, 2015).

1.10. Research Hypotheses

Design intervention in the wearable healthcare fitness tracker devices could look into the motivational perception of the users' needs and aesthetics of experiences for the continuance acceptance of these devices and ensuring healthy ageing.

1.11. Aim and Objectives

The study aims to look into the perception, acceptance, and behavioural issues towards wearable fitness trackers and design interventions to enhance the devices' prolonged use and ensure healthy ageing.

Objectives

i. To study the ageing process and its vulnerabilities and the effect of existing Health and Fitness interventions in older age.
ii. To study the awareness, perception and acceptance of Wearable Fitness Technology among various age groups.
iii. To formulate the constructs for analysing the perception and acceptance of Wearable Fitness Technology and design Intervention Models to enhance the acceptance and continuance behaviour of the WFT.

1.12. Methodology

The following figure represents the basic framework of the study.

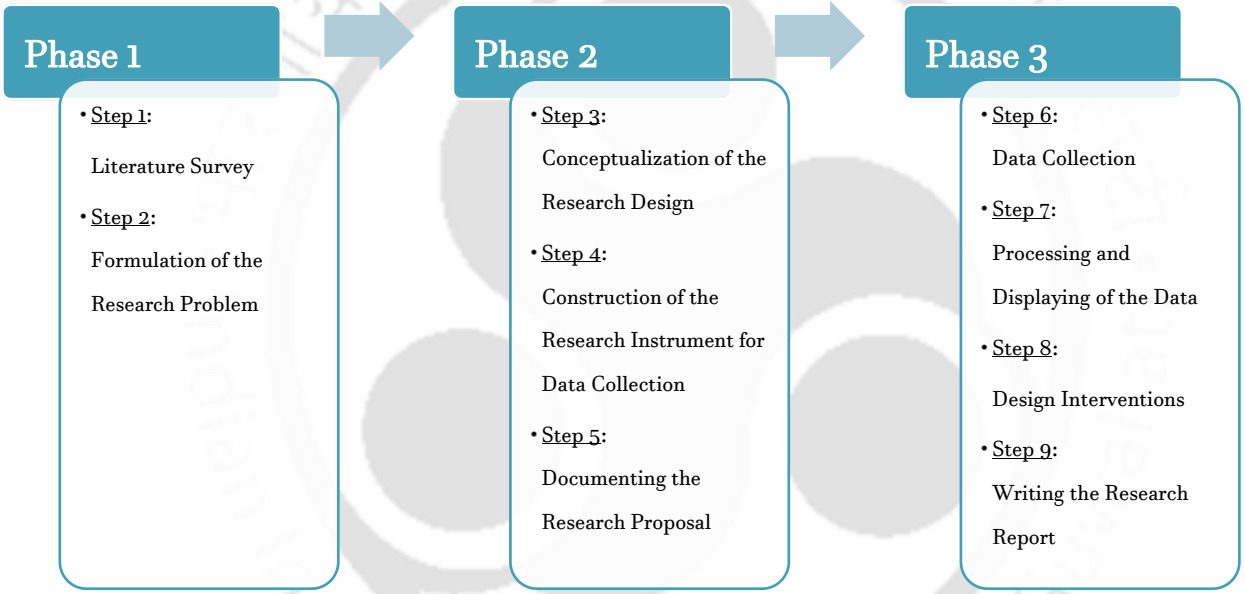


Figure 1-17. Study Design Framework

1.12.1. Study design

The research comprises three primary phases, subdivided into different steps taken subsequently. The following section gives a detailed layout of the study design.

Phase 1

Step 1: Literature Review

The area of ageing, health and fitness has been broadly studied to obtain a general idea regarding the areas which need to be addressed.

Step 2: Formulation of the Research Problem.

The various areas have been covered, studied and cross studied, and the research problem has been identified.

Phase 2

Step 3: Conceptualisation of the Research Design

The research design has been conceptualised to address the research questions and hypotheses.

Research Phase	**Method/ technique**
Phase 1: Qualitative Method	Literature Review Field trials (observations) Interviews
Phase 2: Quantitative Method	Data Interpretation Hypothesis Validation

Step 4: Construction of the Research Instruments for Data Collection

Multiple Research Instruments has been systematically designed, and the validity and reliability have been tested with proper format and procedure.

Step 5: Selection of the Sample

The population for the study has been selected with age 18 years above from various backgrounds and age groups.

Phase 3

Step 6: Data Collection

The instruments were used to collect the data from the target study population with an open approach to embracing all kinds of data.

Step 7: Processing and displaying of the Data

The data collected has been treated with statistical practices using MS Excel, SPSS and Amos.

Step 8: Design Interventions

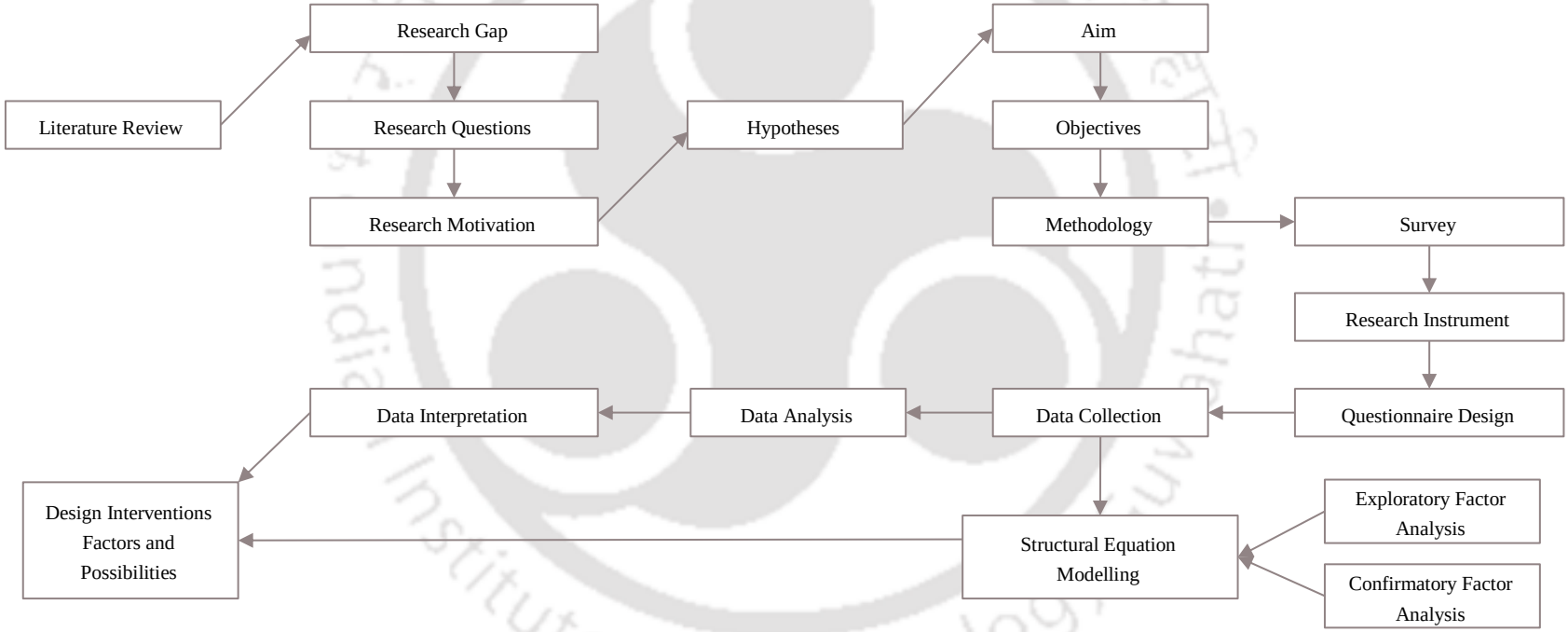
The design intervention has been constructed and validated with proper tools and techniques to address the existing research gap and the research problem.

Step 9: Writing the Research Report

All the observations, data, findings, conclusions, and design interventions have been systematically recorded and compiled in a Research Report.

1.12.2. Flow chart

The study organisation follows the flow chart as shown below



1.13. Thesis Outline

Chapter 1: Introduction

Health and fitness are very significant areas of interest concerning Healthy Ageing. With the growth in the older population, there is an expressed need for better healthcare facilities. This chapter contains an overview of the Ageing process and its associated areas. Exploring various studies could lead to finding the research gap and the motivation. Furthermore, it holds the study design conceptualised to structure the proper methodology for the research.

Chapter 2: Wearable Fitness Technology – a local perception assessment on a select population

Technology plays a significant role in developing healthcare services, and mobile devices have become smarter with time and an essential tool in the field of Technology. one such Technology is wearable fitness technology. This chapter holds a comprehensive study of the wrist-worn Wearable Fitness Trackers and the Experiments carried out to get insight into the perception and acceptance of the devices.

Chapter 3: Design Considerations and Intervention Models

This chapter comprehends the various factors and micro-determinants that are essentially responsible for determining the use behaviour of a product. Furthermore, it aims to relocate the void in the design models for the presently existing wearable fitness trackers, thereby finding solutions and designing Interventions. It discusses the structural equation models and design interventions designed to ensure positive Behavioural Intention towards WFT

and the enhancement in the sustainable usage of such devices. In addition, it contains the various test conducted that validates the formulated hypotheses.

Chapter 4: Discussions

This chapter gives an overview of the study that has been carried out in the research. It also discusses the obtained results and their impact. Furthermore, it also elaborately discusses the issues faced in the acceptance of WFT. Substantially, to achieve solutions toward the sustainable usage of these devices, the chapter provides various insights and interventions.

References

Appendices

The thesis approach has taken a qualitative assessment of the contemporary thoughts and practices in tune with the perception of the target users to motivate them to use the healthcare wearable devices.

Chapter 2

Technology plays a significant role in developing healthcare services, and mobile devices have become smarter with time and an essential tool in the field of Technology. one such Technology is wearable fitness technology. This chapter holds a comprehensive study of the wrist-worn Wearable Fitness Trackers and the Experiments carried out to get insight into the perception and acceptance of the devices.

Chapter 2. **Wearable Fitness Technology – a local perception assessment on a select population**

2.1. Introduction

An increase in social needs and industry-induced competitive pressures have somehow forced the healthcare providers to change the mode of delivery and the composition of the healthcare facilities (Chen, et al., 2018). Furthermore, there is an exponential increase in the interest in smart wearables among the general public. Also, analysis of google trends has recently reflected the tremendous growth in the searches related to fitness trackers and smart wearables. It is estimated that the fitness bands, smartwatches, smart wearables will account for nearly half of the overall wearable unit sales worldwide (Pal, et al., 2019). A study suggests that the global wearable device market will significantly be expected to grow by 78% each year. The users of complex accessories, e.g., Nike+, Fuel Band, Jawbone UP, and Fitbit devices, continue to embrace its simplicity and low-price points. The most striking feature of these devices is the ability to be operated partially independent of any other instruments but fully operational when connected with IP cable devices like smartphones and tablets (IDC, 2014). During the fourth quarter of 2018 (4Q18), the worldwide market for wearable devices grew 31.4 per cent, making it reach a new high of 59.3 million units (IDC, 2019). Statistics and data reveal the expansion of the Wearable Fitness Market and how it has influenced people its inclusion in their daily lives. The consequent sections elaborate this fitness area with more profundity.

2.2. Wearable Devices

A wearable device is a very new technology that comes in the form of very miniaturised hardware capable of tracking and monitoring fitness metrics, e.g., distance walked or run, calories consumed, heart rate tracking, sleep tracking (Kaewkannate & Kim, 2016). These are basically worn externally, either attached to the body as an accessory or embedded in clothes. Its functionality is diverse, equipped with sensors, processors, operating systems, internet connections, and user-friendly HCI systems (Yang, et al., 2015) (Wang, et al., 2014). These are broadly classified under three categories: *"notifiers," "glasses,"* and *"trackers"*, as shown in Figure 2-1.

Figure 2-1. Wearable Technology (Happiest Minds)

The notifiers are responsible for providing information about the world around us (e.g., smartwatches). The glasses create augmented virtual reality with eyeglasses' help (3-D glasses, 3-D games). Furthermore, the third category, i.e., the trackers, uses the sensors to track and record data (e.g., heart rate monitor) (Lunney, et al., 2016).

The various types of wearable devices available are Smartwatches, Sport watches, Head-mounted Displays, Fitness Tracker, Smart Jewelry, Smart Clothing, and Implantable. Smartwatches provide the user's notification for calls, messages, emails. Sport watches are built-in with a GPS tracker and

record the user's heart rate and pace, specially designed for athletes and swimmers. Head-mounted Display provides virtual information sensed by the eyes and takes the user to virtual reality. Fitness Tracker enables the user to track the number of steps taken daily and calculate the number of calories burned. It also calculates the amount of exercise the user does in a day. Smart Jewelry is attributed mainly to women, the improvised and beautified versions of the smartwatches. Like smartwatches, these jewellery pieces can provide notifications of calls, messages, and emails and track users' fitness and health status in real-time (Yang, et al., 2015) (Wearable Technology, 2019). Smart Clothing incorporates electronic devices into wearable clothing to track various parameters while providing a fashionable look. Moreover, Implantable devices are surgically inserted or implanted under the skin. These are merely used for medical purposes like tracking the insulin level (Wearable Technology, 2019) and many other vital physiological signals, as shown in a schematic representation in Figure 2-2.

Figure 2-2. Vitals monitoring using Wearable Technology Devices

Measurement of physiological parameters like arterial blood pressure, heart rate, and body temperature reflects an individual's physical health status. Furthermore, a deviation from a standard range pattern can predict severe health issues; for instance, heart rate can predict cardiovascular fitness. Likewise, daily movement data can provide a general view of the physical level of an individual. Capturing day-to-day health conditions is quite impossible for

healthcare providers. These fitness devices can collect near-continuous real-time data, provide complementary information to existing monitoring devices, and view a patient's health's complete status. These can store and generate the data, assisting healthcare providers (Beh, et al., 2019). More medical-grade smartwatches are expected to be released to the consumer market in the near future, such as Omron's blood pressure smartwatch (Omron 2018), which will benefit large numbers of hypertension patients.

2.3. Wearable Fitness Trackers

There is a directional shift of the focus of the information system, from the mindset of instrumentality and efficiency to facilitating human life in various ways through entertainment (e.g., games) and social connections (e.g., social networking applications) (Hassan, et al., 2019) and wearability (e.g., wearable fitness trackers). WFT can track physical activity in real-time and enable users to track their performance to optimize long-term health benefits. These capabilities have gained significant attention in academics, theory and practice (Windasari, et al., 2021). WFT can track the day-to-day activities and suggest any required behavioural changes to provide a healthy lifestyle. The following sections give a detailed understanding of the benefits and advantages of fitness trackers.

2.3.1. Fitness Tracking Under Various Physical Activity

Providing an accurate assessment of physical activity is a very challenging domain (Gorzelitz, et al., 2020). Some devices can translate the amount of physical activity into understandable parameters. WFT is a tool that can measure such parameters that reflect physical activity performance. Hence, such devices represent opportunities for the measurement of physical activity, which helps in monitoring health and also provides an opportunity for the betterment of oneself (Lunney, et al., 2016) (Kaewkannate & Kim, 2016) (Gorzelitz, et al., 2020). The wearable fitness trackers' ideology promotes physical activities and reduces sedentary behaviour (Gorzelitz, et al., 2020), ensuring a healthy lifestyle. A study revealed that the ' average bodyweight of

subjects having some chronic disease decreased after using the fitness tracker for three months (Gualtieri, et al., 2016).

2.3.2. Awareness of Wearable Fitness Tracking Devices among People

The evident evolution of consumer devices from a simple waist-worn pedometer to integrated devices is massively used at home, workplace wellness programs, research studies, and individuals to build healthier and more active lifestyles (Gorzelitz, et al., 2020). Wearable fitness trackers are the most sought-after accessories among integrated devices. The popularity of the WFT has significantly increased over the years. According to a worldwide survey conducted by the American College of Sports and Medicine, annual sales of Wearable Fitness trackers continue to grow. These devices were listed as the No. 1 fitness trend in 2016 and for the consequent years till 2020 (Chow & Yang, 2020). From the International Data Corporation (IDC) ConsumerScape 360˚ survey of more than 50,000 consumers in 26 countries, Samsung was identified as the most trusted brand for wearable devices, ahead of Apple, Google, and Sony in 2013 (IDC, 2014). The smartwatches grew 55.2 % compared to 4Q17 and accounted for around 34.3% of the overall market. Apple maintained the top position with 16.2 million devices (IDC, 2019), as shown in Figure 2-3.

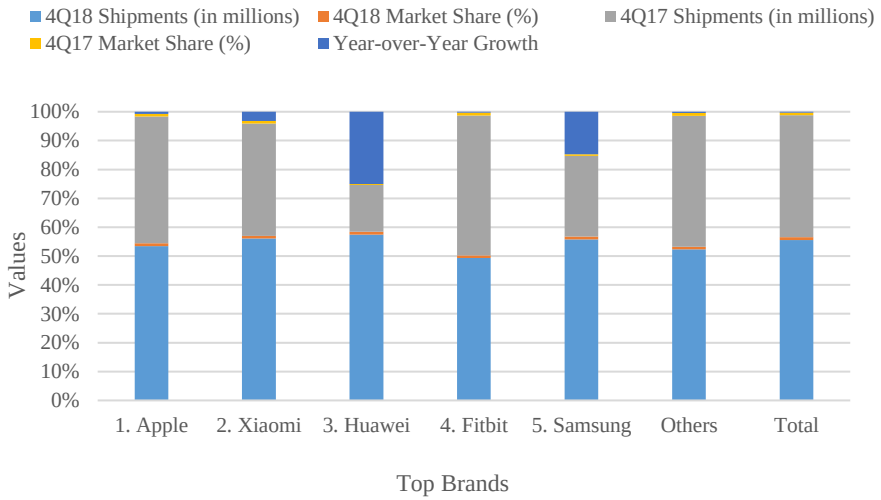


Figure 2-3. Wearable Companies by Shipment Volume, Market Share, and Year-Over-Year Growth (IDC, 2019)

Table 2-1. Top 5 Wearable Companies by Shipment Volume, Market Share, and Year-Over-Year Growth, 2018 (shipments in millions)

Company	2018 Shipments	2018 Market Share	2017 Shipments	2017 Market Share	Year-over-Year Growth
1. Apple	46.2	26.8%	33.1	24.5%	39.5%
2. Xiaomi	23.3	13.5%	16.1	11.9%	44.6%
3. Fitbit	13.8	8.0%	15.4	11.4%	-10.0%
4. Huawei	11.3	6.6%	4.6	3.4%	147.3%
5. Samsung	10.7	6.2%	5.8	4.3%	85.1%
Others	66.8	38.8%	60.0	44.4%	11.2%
Total	172.2	100.0%	135.0	100.0%	27.5%

As per the latest market study, the following table shows the growth in the sales of Wearable Devices (Needham, 2021).

Table 2-2. Top 5 Wearable Companies by Shipment Volume, Market Share, and Year-Over-Year Growth, Q3 2021 (shipments in millions)

Company	3Q2021 Shipments	3Q2021 Market Share	3Q2020 Shipments	3Q2020 Market Share	Year-over-Year Growth
1. Apple	39.8	28.8%	41.3	32.8%	-3.6%
2. Samsung	12.7	9.2%	11.2	8.9%	13.8%
3. Xiaomi	12.7	%	16.7	13.2%	-23.8%
4. Huawei	10.9	7.9%	10.5	8.4%	3.7%
5. Imagine Marketing	10.0	7.2%	3.3	2.6%	206.4%
Others	52.2	37.7%	42.9	34.1%	21.6%
Total	138.4	100%	125.9%	100.0%	9.9%

In the United States (US), the Fitbit and the Jawbone UP flashes the highest awareness level. According to a study, one in three consumers confirms that they have heard of the WFT. It was quite evident from the survey that counting calories and tracking the number of steps taken in a day are the most sought after features by the consumers (50 per cent and 32 per cent, respectively). Six per cent of the consumers were interested in sharing their fitness data over the social media network.

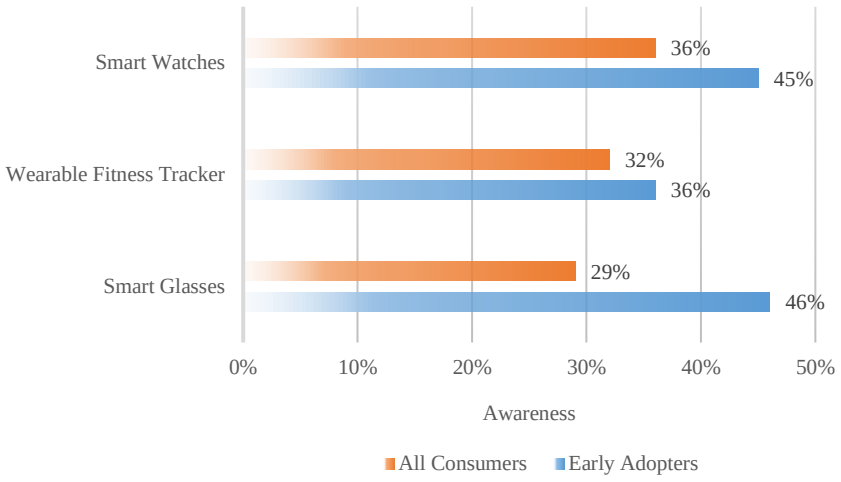


Figure 2-4. Awareness of the Wearable Technology Devices in the United States

It was significantly concluded in the study that demographically, women (58 per cent) outnumber men in the US and are more likely to become prospective buyers (npd, 2014).

India also has been significantly becoming the growing market for wearable device products. Numerous types of wearable devices available in the Indian market are Smartwatches, fitness monitors, and internet-enabled eyeglasses. Indian consumers have shown increased interest in wearable devices in the last few years. With the increase in disposable income and awareness among the Indian people, wearable devices' growth has tremendously increased. The adoption of this technology advances with time with the increased availability of 4G and Wi-Fi networks. In India, the leading players in Wearable technology are Goqii, Fitbit, Xiaomi, Huawei, Garmin. Goqii holds the largest share of the market. Xiaomi and Fitbit also have significant stakes in the market. (Kenneth Research, 2019). On the back of the increase in consumers' interest in wearable devices like fitness trackers, smartwatches, India's wearable devices market is expected to expand progressively in the coming years.

2.4. Acceptance of Wearable Fitness Technology

These technology-enabled wearable devices are gaining wide acceptance in India. With the advancement in favour, many start-ups in this segment have come up with various innovative products, e.g., GPS-enabled smart sports shoes, multifunction Bluetooth devices which alert while in motion. (Research, 2019)**.** Here, **c**ustomer awareness is an essential part of a company's communications and marketing plan.

Recent wearable technology developments have flooded the market with Wearable Fitness Technology devices. Researchers have been provided with a new wave of research with its advancement. However, most researchers focus on establishing the reliability and accuracy of these devices. Although there is increased growth in the wearable device market, significant barriers still exist in health care adoption in India (Nanda, 2017). Moreover, very little research has been focused on the adoption and acceptance of these devices. Various theories which suggest the acceptance behaviour of technology considered in the study are described in the consequent sections.

2.4.1. Technology Acceptance Model

Technology Acceptance Model (TAM) is an information system theory that tells us how users accept and use technology. Fred D. Davis introduced TAM, which provides the framework for the likelihood of acceptance and technology adoption (Lunney, et al., 2016) shown in Figure 2-5.

Figure 2-5. Technology Acceptance Model

Fishbein and Ajzen built the extension to the theory of reasoned action. The TAM postulates that the two key factors that predict a technology acceptance are perceived usefulness and perceived ease of use (Fishbein & Ajzen, 1977). Perceived usefulness describes if the value users will see the WFT's potential and its effectiveness to incorporate it in their day-to-day life. According to the model, the combination of the perceived usefulness and perceived ease of use develops the users' Behavioural Intention, leading to the adoption of the technology. According to research (Gong, et al., 2004), if the perceived usefulness can be increased and the logical arguments can be prepared, there is a high chance of adopting the technology by the users. There is a positive relationship between the perceived usefulness and the Intention to adopt a new kind of information or communication technology (Zaremohzzabieh, et al., 2015). Thereby, it impacts the adoption of Wearable Fitness Technology through attitudes (Lunney, et al., 2016). According to TAM, the two primary constructs responsible for predicting acceptance were: i) Perceived Usefulness and ii) Perceived Ease of Use. Along with these two, the Perceived Health Benefits puts a firm hold on determining healthcare technology acceptance.

Perceived usefulness

Perceived usefulness depicts "the degree to which a person believes that using a particular system will enhance his or her performance" (Davis, 1989). Increasing the perceived usefulness and preparing the logical arguments, there is a high chance of adopting the technology (Gong, et al., 2004). Another study (Zaremohzzabieh, et al., 2015) found a positive relationship between the perceived usefulness and the Intention to adopt a new kind of information communication technology, thereby impacting the adoption of Wearable Fitness Technology through attitudes (Lunney, et al., 2016).

Perceived Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). The perceived ease of use refers to how the Wearable Fitness Technology proves to be easier than another system (Lunney, et al., 2016) and is expected to be used by active

health and fitness-conscious consumers. Morgan (2012) said, "if the platform is not easy to use and intuitively, do not bother with it" (Morgan, 2012). There is a positive association between the ease of use and the consumers' attitude, thereby increasing the chances of adopting the technology. In another study (Hsiao & Tang, 2015), the perceived ease of use significantly influenced the attitude of the elderly consumer. It led them to the adoption of mobile wireless healthcare technology (Lunney, et al., 2016).

Perceived Health Benefits

It has been observed that the customer's attitude towards physical behaviour, motivation, and support of others strongly influence fitness and exercise (Kerner & Grossman, 1988). Perceived Health benefits represent the overview of the customers' perspective towards exercise and fitness (Lunney, et al., 2016). When the health benefits of a particular technology are obvious, the chances of its adoption become more evident. Similarly, the Wearable Fitness Technology adoption is also dependent on its perceived health benefits. Some researchers (Gong, et al., 2004) believe that a positive attitude plays a significant role in accepting technology. A positive attitude is responsible for strengthening the users' belief that the new technology will improve their job performance. Also, Perceived Health benefits are significant factors that enhance the adoption of Wearable Fitness Technology in various age groups.

2.4.2. Unified Theory of Acceptance and Use of Technology

Venkatesh et al. proposed a new model as a new theory of acceptance of Information Technology in 2003. A total of eight models were taken into consideration for its formulation: i) TRA, Theory of Reasoned Action ii) TAM, Technology Acceptance Model, iii) Motivational Model, (MM), iv) Theory of Planned Behaviour (TPB), v) Combined TAM – TPB (C – TAM-TPB) vi) The Model of PC Utilization (MPCU), vii) Social Cognitive Theory (SCT) and viii) DIT (Diffusion of Innovation Theory).

TAM did not include crucial determinants that lead to adopting the new technology, implying the social impact in real situations. So, in this new model,

those missing links were adjusted. A total of four direct determinants, Performance expectancy, Effort Expectancy, Social Influence, and Facilitating conditions, were involved in UTAUT to determine Behavioural Intention, as shown in Figure 2-6.

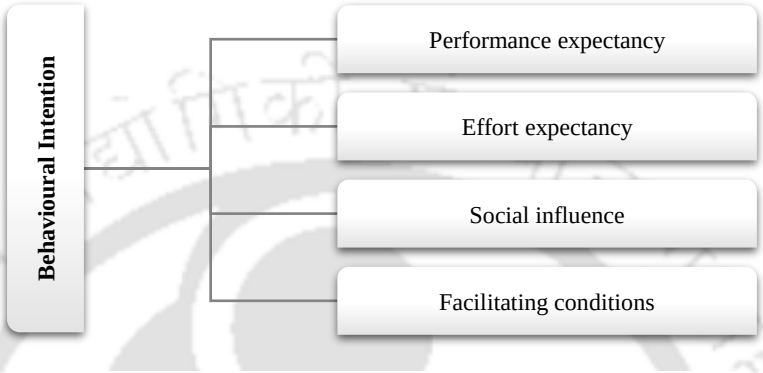


Figure 2-6. Unified Theory of Acceptance and Use of Technology

Performance Expectancy and Effort Expectancy ought to closely resemble the features of perceived usefulness and perceived ease of use, respectively. Various studies have validated the UTAUT2 comprehending the consumer adoption of wearables and thereby recommends further development of the framework with other antecedents (Sergueeva, et al., 2019).

2.4.3. Unified Theory of Acceptance and Use of Technology 2

Despite having the quality of higher explanatory power, certain scholars raised questions that specific critical determinants are being overlooked, responsible for the framework's incompatibilities with new predictors. In the UTAUT model, only those factors were considered relevant to predicting employees' Behavioural Intention. This consideration makes the UTAUT model unfavourable for the prediction of consumer-grade innovations. Regarding customers' perspectives, Venkatesh and Thong modified the model UTAUT by adding three more constructs: Hedonic Motivation, Price Value, and Habit (Venkatesh, et al., 2012). Determinants modelled into UTAUT2 are Performance expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value, and Habit.

With the possibility that cost can influence consumers' Behavioural Intention, in the new model, UTAUT2, Price Value was incorporated as a determinant. The model is shown in the following figure.

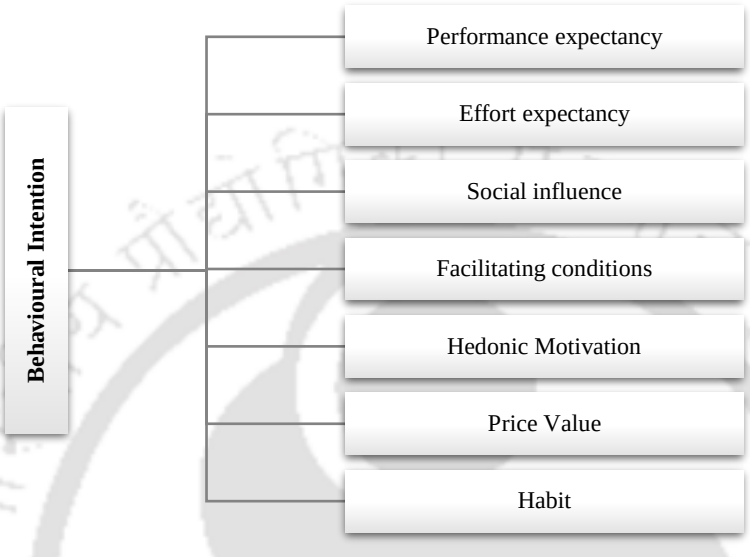


Figure 2-7. Unified Theory of Acceptance and Use of Technology 2 Determinants

Also, unlike in the organizational context, the users ought to bear the cost; hence price stands as very important in determining the user intention of using a specific technology.

2.4.4. Expectation Confirmation Theory

Expectation Confirmation Theory (ECT) is widely used to study consumer satisfaction and post-purchase behaviour. According to ECT, the intention of consumers to continue service use of a product is primarily determined by their level of satisfaction with prior experience with that product or service. Here ‘satisfaction is crucial in building and maintaining the long-term consumer relation base. The ‘expectation’ is an additional determinant of satisfaction. Lower expectance and higher performance may lead to confirmation and continuance of the service. Alternatively, a higher level of expectation may cause a discontinuance of the product due to disconfirmation. Confirmation is directly related to perceived performance and inversely associated with

expectation (Bhattacharjee, 2001). The following schematic representation gives the expectation confirmation model.

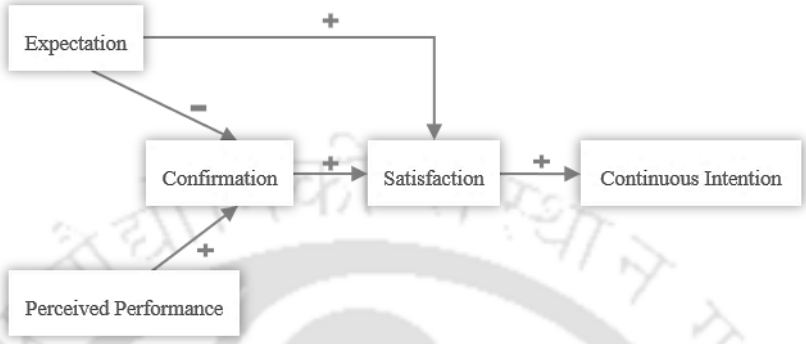


Figure 2-8. Expectation Confirmation Model

2.5. Continuous Intention of Wearable Fitness Trackers

It is evident from studies that adults who started using wearables have been observed to have increased daily activity levels. In a 7-month study, people aged between 36-73 years were provided with WFT. It was observed that the participants continued using it even after seven months (Kononova, et al., 2019). However, a study revealed that out of 8 adults who were 75 years of age or older experienced technical problems with the trackers, which prevented them from gathering any information. Although the adoption of WFT is on a vast scale, it suffers the critical challenge in its sustainable usage. Studies reveal that users are likely to abandon the wearables in less than six months, where the abandonment rate is nearly 30%. A possible explanation for the abandonment of these devices can be the lack of capability to inspire action. Despite the device's functionality, it fails to emboss a meaningful impact on users' behaviours and habits. Determination of such an effective engagement process shall be incorporated in the WFT devices, motivating users to continue the device usage, which is essential in generating sustained value (Windasari, et al., 2021).

2.6. Study objectives

I. Understand the effect of various constructs on the behavioural intention of wrist-worn wearable fitness trackers among different age groups.
II. Study the various factors affecting the continuance of the Wearable Fitness Trackers

2.7. Methods

A mixed-method evaluation design is adopted in this study, including quantitative and qualitative methods. The work carried out is more exploratory research that emphasizes discovering ideas and insights. The research design is initially broadly defined and later transformed into a more precise meaning. The study is broadly divided into three phases: i) Survey, ii) Data analysis and interpretation, and iii) Interventions.

The survey of the concerning literature has been carried out, which gave the direction of the research problem. The various concepts and theories developed in the concerned research field have been studied, which helped in narrowing down the research dimension. Summated scales have been used to construct the data collection method as an item analysis approach, to evaluate people's attitudes towards the WFT. At the final stage, the data analysis is done with the help of Excel, Version 1808, SPSS Statistics, *Version 25* and Amos, *Version 22*.

2.7.1. Survey

A survey was administered among people above 18 years of age from different states of India to carry out the statistical analysis. To derive meaningful data, Research Instruments were selected. The Questionnaires were designed accordingly, following the proper format to investigate the predetermined objectives and keep an open approach to embrace if any new direction in the research is found in the process. The following sections describe the steps taken and the research methods applied to obtain the inputs for data analysis.

Ethics Considerations

The participants' right to anonymity has been considered in the survey. Also, consent regarding their participation has been obtained from each participant before its commencement either through written format (provided in Appendix A) or dropdown option in online form.

2.7.2. Research Instruments

The items for the research instruments were chosen with a vast exploration of concerned fields and logical approaches. The questionnaires were designed using the proper methods and format. The questions were requested to be answered using the Likert Scale rated on a scale of 1-5 how much they disagree/agree. '1' being strongly disagreed, and '5' being strongly agreed.

Constructs Operational Definition

The definitions of each determinant are well described in the consequent section. It aims to deliver a better representation for understanding the various determinants used in the study.

Constructs 2-1. Behavioural Intention Determinants

Constructs	Definitions
Performance Expectancy (PE)	It refers to the degree to which using WFT will benefit the consumers in accomplishing certain activities
Effort Expectancy (EE)	It refers to the level of ease associated with the use of WFT
Social Influence (SI)	It indicates how others influence individuals in considering WFT for use.
Price Value (PV)	It can be defined as the consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost of using WFT.
Hedonic Motivation (HM)	It indicates the pleasure or the enjoyment derived from using the WFT.
Behavioural Intention (BI)	It represents the interest of the consumers towards the inclination and intent of considering the WFT for its use.

Constructs 2-2. Continuous Intention Determinants

Constructs	Definitions
Perceived Ease of Use (PEOU)	It is the degree to which a person believes that using WFT would be free of effort.
Perceived Usefulness (PU)	It is the degree to which a person believes that WFT would enhance their performance.
Satisfaction (SA)	It refers to the sense of fulfilment of expected outcomes using WFT.
Expectation Confirmation (EC)	It refers to the confirmation of the balance between the expectations and the assurance of the service provided.
Continuance Intention (CI)	It refers to the positive intention towards continuing the service provided by WFT.

Constructs 2-3. Determinants for Associated Perceived Risk Towards WFT

Constructs	Definition
Perceived Economic Risk (PER)	It refers to the distress of encountering monetary loss or risk involved using the WFT.
Perceived Social Risk (PSR)	It refers to the anxiety of being judged or evaluated by others for using the WFT.
Perceived Physical Risk (PPRa)	It refers to the distress of coming across physical harm or risk involved using the WFT.
Perceived Privacy Risk (PPRb)	It refers to the fear of privacy invasion risk involved using the WFT.
Perceived Psychological Risk (PPRc)	It refers to the fright of encountering the psychological burden or risk involved using the WFT.

2.7.3. Measurement Models

It represents the theory that specifies how measured variables come together to describe a theory (Statistics Solutions) or an approach. The well-established technology acceptance models are studied and analysed using the data obtained from the survey conducted among people above 18 years of age. Three models have been studied and analysed using the concerning constructs defined above to find the relationship among the constructs and the Perception and Acceptance towards WFT. The following sections provide the detailed layout of the purpose.

To understand the Behavioural Intention of people towards the WFT using the Technology Acceptance Model

The structural model considers seven indicators grouped into two exogenous latent variables: Performance Expectancy and Effort Expectancy to study the endogenous latent variable, Behavioural Intention. The operational definitions of the determinants are provided in Constructs 2-1.

To understand the Behavioural intention of people towards the WFT using the UTAUT2 Model

The structural model was developed using 19 indicators grouped into six exogenous latent variables: Performance Expectancy, Effort Expectancy, Social Influence, Price Value, Hedonic Motivation, and Facilitating Conditions. Furthermore, the endogenous latent variable, Behavioural Intention, was studied. The definitions of the determinants are provided in Constructs 2-1.

To understand the User Perception and Continuous Intention towards the WFT.

The structural model was developed using 21 indicators grouped into Six exogenous latent variables: Performance Expectancy, Effort Expectancy, Social Influence, Price Value, Hedonic Motivation, and Facilitating

Conditions. Furthermore, the endogenous latent variable, Behavioural Intention, was studied. The definitions of the determinants are provided in Constructs 2-2.

To understand the relation between the Associated Perceived Risk and Behavioural intention of people towards the WFT

The structural model was developed using 12 indicators grouped into four exogenous latent variables: Perceived Economic Risk, Perceived Physical Risk, Perceived Psychological Risk, Perceived Privacy Risk, Perceived Social Risk, and Perceived Functional Risk. Furthermore, the endogenous latent variable, Behavioural Intention, was studied. The definitions for the determinants are provided in Constructs 2-3.

2.7.4. Reliability Test of Research Instruments

The scale item analysis of the respective dimensions has been carried out using the SPSS Version 25. The Cronbach alpha value is calculated for each latent variable. It is also referred to as Coefficient alpha which Lee Cronbach developed in 1951. It measures the reliability or the internal consistency of the instrument. The Cronbach alpha tests are performed to see the reliability of the multiple Likert Scale Survey questions (Glen, 2021). The equation for the Cronbach alpha α is given by,

$$\alpha = \frac{N.c}{v + (N-1).c}$$

Equation 2-1. Cronbach Alpha

N, c, and v stands for the number of items, average covariance between the item pairs and average variance, respectively. The general criteria for interpreting the alpha value for the dichotomous questions, e.g. Likert Scale Questions, are given in the following table.

Table 2-3. Criteria for Cronbach's Alpha Value

Cronbach's Alpha	Internal Consistency
$\alpha \geq 0.9$	Excellent
$0.9 \geq \alpha\ 0.8$	Good
$0.8 \geq \alpha\ 0.7$	Acceptable
$0.7 \geq \alpha\ 0.6$	Questionable
$0.6 \geq \alpha\ 0.5$	Poor
$0.5 \geq \alpha$	Unacceptable

Reliability Analysis of Research Instruments

Cronbach alpha has been deduced using SPSS for all the items representing respective exogenous and the endogenous variable for different Instruments in the study.

Table 2-4. Reliability Analysis of Behavioural Intention Towards WFT

Survey Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
PE1	.913	4
PE2		
PE3		
PE4		
EE1	.887	3
EE2		
EE3		
SI1	.942	3
SI2		
SI3		
FC1	.711	3
FC2		
FC3		
HM1	.950	3
HM2		
HM3		
PV1	.827	3
PV2		
PV3		
BI1	.893	3
BI2		
BI3		

Table 2-5. Reliability Analysis of Continuance Intention Towards WFT

Survey Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
PE1	.913	4
PE2		
PE3		
PE4		
PU1	.901	3
PU2		
PU3		
SA4	.939	2
SA5		
EC1	.937	3
EC2		
EC3		
CI1	.931	3
CI2		
CI3		

Table 2-6. Reliability Analysis of Associated Perceived Risk Towards WFT

Survey Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
PER1	.836	2
PER2		
PPRa1	.941	3
PPRa2		
PPRa3		
PSR1	.966	3
PSR2		
PSR3		
PPRb1	.950	3
PPRb2		
PPRb3		
PFR1	.836	3
PFR2		
PFR3		
PPRc1	.896	4
PPRc2		
PPRc3		
PPRc4		

2.7.5. Structural Equation Modelling (SEM)

SEM is a multivariate statistical analysis technique that yields the structural relationship among factors. It represents the theory that shows how the constructs are related to other constructs (Statistics Solutions). It is a systematic approach in which various steps are involved to reach a well-structured conclusion. Exploratory Factor Analysis (EFA) has been done to obtain the dimension of the questions. In the next step, Confirmatory Factor Analysis (CFA) is done.

Exploratory Factor Analysis - It is a statistical approach to determine the correlation among the variables in a research study data set. It provides a factor structure where variables are grouped based on strong and solid correlations (Gaskin, 2021). In addition, Kaiser Meyer Olkin (KMO) Statistics is analysed to verify the adequacy of the data selected for the study. Table 2-7 below gives the strength of the data adequacy for the analysis. Apart from the KMO Statistics, another test is essential to validate the factor analysis, i.e. Bartlett's Test of Sphericity which tests the hypothesis that the correlation matrix is an identity matrix and a significant result (Sig. <0.05) indicates the matrix is a non-identity matrix (Gaskin, 2021).

Table 2-7. Appropriateness of Data Adequacy

Measure	KMO Statistics
Marvellous	.90s
Meritorious	.80s
Middling	.70s
Mediocre	.60s
Miserable	.50s
Unacceptable	<.50

Confirmatory Factor Analysis (CFA) – CFA is the next step after the EFA, confirming the factor structure extracted in the EFA. It determines the factor structure in the dataset and is a method of measuring composite reliability. Composite Reliability measures the internal consistency in the scale items (Glen). It is an essential step to establish the convergent and the discriminant

validity and reliability when performing a CFA. Composite Reliability (CR), Average Variance Extracted (AVE), and Maximum Shared Variance (MSV) are the factors that are useful in establishing validity and reliability. Their adequacy is essential for the validity and reliability to be intact. The formulae for the factors are given as follows:

$$CR = \frac{\left(\Sigma_{i_1}^{p} = 1^{\lambda_i}\right)^2}{\left(\sum_{i=1}^{p} \lambda_i\right)^2 + \sum_{i}^{p} V(\delta_i)}$$

Equation 2-2. Composite Reliability

$$\text{AVE} = \frac{\Sigma_{i_{1=1}}^{p} \lambda_i^{\,2}}{\Sigma_{i_1}^{p} = \lambda_i^{\,2} + \sum_{i}^{p} V(\delta_i)}$$

Equation 2-3. Average Variance Extracted

Here, λ_i is the completely standardised loading of the ith indicator.

$V(\delta_i)$ is the variance of the error term for ith indicator

p is the number of indicators

The following table represents the threshold values for the factors.

Table 2-8. Threshold Values of the Reliability and Validity Factors of CFA (Gaskin, 2016)

Factors	**Threshold**
Reliability	CR > 0.7
Convergent Validity	AVE > 0.5
Discriminant Validity	MSV < AVE Square root of AVE greater than inter construct correlations

The SEM for the different models has been done. Before formulating the models, the respective Exploratory Factor Analysis and Confirmatory Factor Analysis were done using SPSS Statistics *Version 25* and SPSS Amos *Version 22*, respectively. Also, KMO and Bartlett's Test for Sphericity is carried out to validate the data adequacy. Furthermore, to check the validity of the CFA, the mater validity is checked using the Master Validity Plugin (Gaskin & Lim, 2016). The corresponding values for Average Variance Extracted (AVE) and Composite Reliability (CR) have been calculated and comprehended in a tabulated form in the respective sections. The Model Fit Measures are calculated at the final stage through the Model Fit Plugins (Gaskin & Lim,

2016) in AMOS 22. Table 2-9 below provides the cut-off criteria for the model fit to be valid.

Table 2-9. Cut-off Criteria for Model Fit

Measure	Terrible	Acceptable	Excellent
CMIN/DF	> 5	> 3	> 1
CFI	<0.90	<0.95	>0.95
SRMR	>0.10	>0.08	<0.08
RMSEA	>0.08	>0.06	<0.06
PClose	<0.01	<0.05	>0.05

a. Technology Acceptance Model (TAM)

The model developed by Fred Davis was used to study the acceptance of WFT. The constructs, Performance Expectancy (PE) and Effort Expectancy (EE), were considered as the exogenous variables in this model to find their relationship with the endogenous variable, Behavioural Intention (BI).

I. Exploratory Factor Analysis

The following table shows the Exploratory Factor Analysis where the Extraction Method used is Principal Axis Factoring (Statistics Solutions).

Table 2-10. Pattern Matrix for Technology Acceptance Model

Items	Factor		
	1	2	3
PE2	.973		
PE4	.854		
PE3	.766		
PE1	.736		
BI2		.972	
BI3		.849	
BI1		.764	
EE2			.880
EE3			.859
EE1			.828
Extraction Method: Principal Axis Factoring. Rotation Method: Promax with Kaiser Normalization.			
a. Rotation converged in 5 iterations.			

Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, and the Rotation converged in 5 iterations, as shown below.

Table 2-11. KMO and Bartlett's Test for TAM

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.787
Bartlett's Test of Sphericity	Approx. Chi-Square	269.510
	df	45
	Sig.	.000

Furthermore, the KMO is .787, which is above the threshold level of adequacy for the analysis to be acceptable, and Barlett's test for sphericity approves the significance level.

II. Confirmatory Factor Analysis

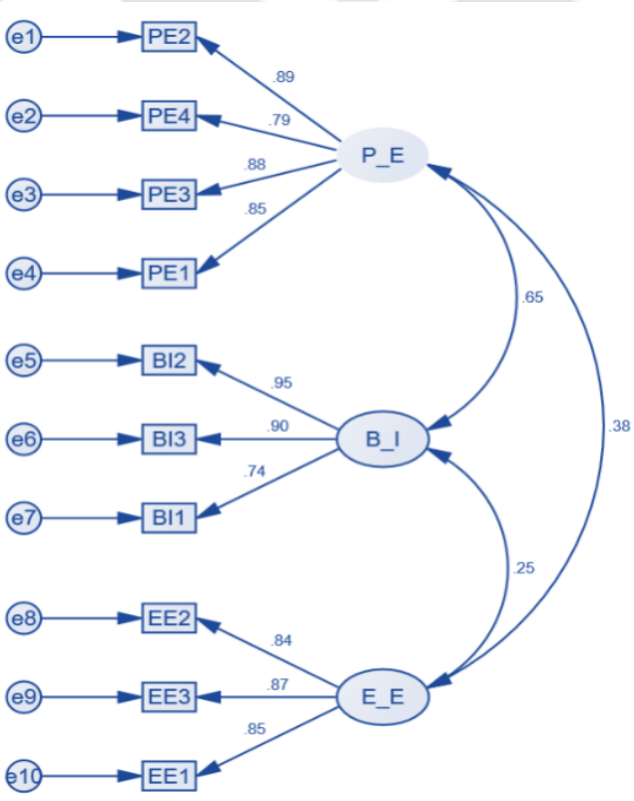


Figure 2-9. Confirmatory Factor Analysis for TAM

III. **Validity of the Factor Analysis**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA.

Table 2-12. Master Validity for TAM Factor Analysis

	CR	AVE	MSV	MaxR(H)	P_E	B_I	E_E
P_E	0.915	0.731	0.421	0.921	0.855		
B_I	0.900	0.753	0.421	0.936	0.649**	0.868	
E_E	0.889	0.728	0.147	0.890	0.383*	0.246	0.853

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

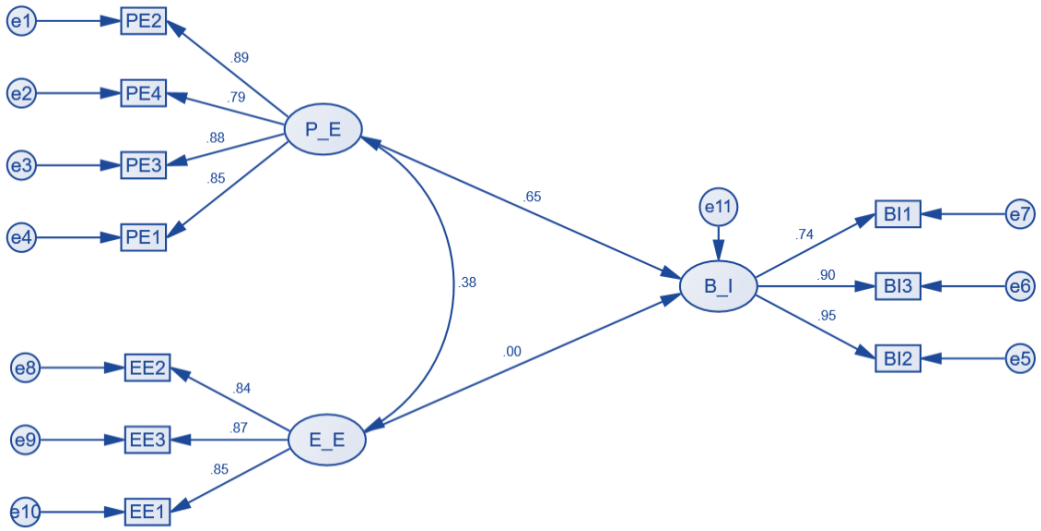


Figure 2-10 Structural Equation Modelling for TAM

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN/DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured.

Table 2-13. A Measure of the Model Fit of the Technology Acceptance Model

Measure	Estimate	Threshold	Interpretation
CMIN	31.710	--	--
DF	32	--	--
CMIN/DF	0.991	Between 1 and 3	Excellent
CFI	1.000	>0.95	Excellent
SRMR	0.072	<0.08	Excellent
RMSEA	0.000	<0.06	Excellent
PClose	0.622	>0.05	Excellent

The above table shows that the model fit approves the recommended threshold values, and thus the model is considered fit and accepted.

b. Behavioural Intention Model

The model developed by Venkatesh and Thong was used to study the acceptance of WFT. Performance Expectancy, Effort Expectancy, Social Influence, Hedonic Motivation, and Price Value, were considered as the exogenous variables in this model to find its relationship with the endogenous variable, Behavioural Intention.

I. Exploratory Factor Analysis

The Extraction Method used in the EFA is Principle Component Analysis, where the total variance in the data is considered for the study. The diagonal of the correlation matrix consists of unities, and complete variance is brought into the factor matrix (Statistics Solutions).

Table 2-14. Pattern Matrix of UTAUT2 Model

	Component					
	1	2	3	4	5	6
HM3	.979					
HM1	.933					
HM2	.860					
SI1		.931				
SI2		.912				
SI3		.853				
PE4			.924			
PE2			.808			
PE3			.647			
PE1			.600			
EE2				.940		
EE3				.901		
EE1				.860		
BI1					.949	
BI2					.868	
BI3					.824	
PV1						.855
PV3						.851
PV2						.716
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.						

Table 2-15. KMO and Bartlett's Test Behavioural Intention Towards WFT

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.754
Bartlett's Test of Sphericity	Approx. Chi-Square	668.981
	Df	171
	Sig.	.000

Furthermore, the KMO is .754, which is above the threshold level of adequacy for the analysis to be acceptable, and Barlett's test for sphericity approves the significance level.

II. **Confirmatory Factor Analysis**

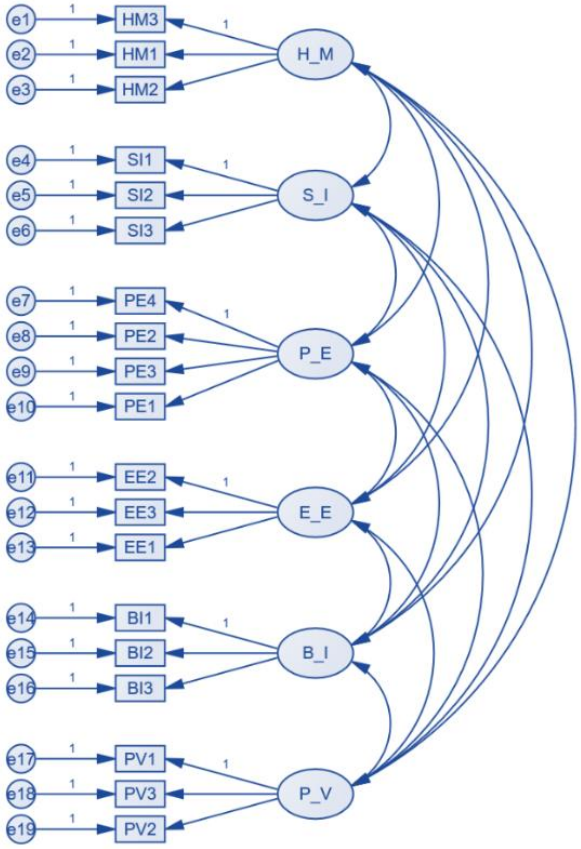


Figure 2-11. Confirmatory Factor Analysis for Behavioural Intention Towards WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA

Table 2-16. Master Validity for Behavioural Intention Towards WFT Factor Analysis

	CR	AVE	MSV	MaxR(H)	H_M	S_I	P_E	E_E	B_I	P_V
H_M	0.952	0.869	0.514	0.956	0.932					
S_I	0.944	0.849	0.304	0.956	0.516**	0.921				
P_E	0.915	0.729	0.514	0.921	0.717**	0.551**	0.854			
E_E	0.889	0.728	0.223	0.890	0.364†	0.223	0.386†	0.853		
B_I	0.900	0.752	0.427	0.935	0.555**	0.516*	0.653**	0.248	0.867	
P_V	0.842	0.643	0.223	0.896	0.282	0.398*	0.206	0.472*	-0.027	0.802

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

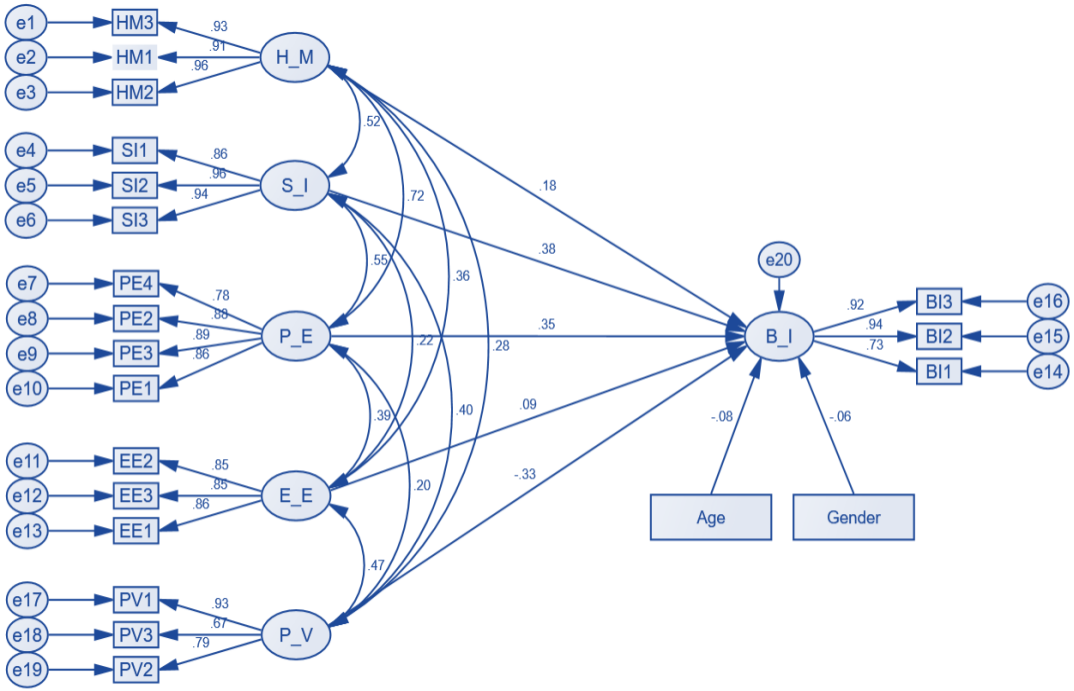


Figure 2-12. Structural Equation Modelling for Behavioural Intention Towards WFT

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN/DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured. The threshold values are provided in the table below.

Table 2-17. Measurement of the Model Fit of the Behavioural Intention Towards WFT

Measure	Estimate	Threshold	Interpretation
CMIN	278.717	--	--
DF	174	--	--
CMIN/DF	1.602	Between 1 and 3	Excellent
CFI	0.844	>0.95	Need More DF
SRMR	0.102	<0.08	Terrible
RMSEA	0.126	<0.06	Terrible
PClose	0.000	>0.05	Terrible

The above table shows that the model fit needs some improvement as the recommended threshold values are not achieved, and thus the model is considered unfit for use.

c. **Continuance Intention Model**

The ECT model was used to study the acceptance of WFT. The constructs, Performance Expectancy (PE), Perceived Usefulness (PU), Expectation Confirmation (EC), and Satisfaction (SA), were considered as the exogenous variables in this model to find its relationship with the endogenous variable, Continuance Intention (CI).

I. **Exploratory Factor Analysis**

The Extraction Method used in the EFA is Principle Component Analysis. (Statistics Solutions). Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, where the Rotation converged in 7 iterations, as shown below.

Table 2-18. Pattern Matrix for Continuance Intention Towards WFT

	Component				
	1	2	3	4	5
PE2	.954				
PE4	.848				
PE3	.816				
PE1	.732				
EC2		.990			
EC3		.857			
EC1		.821			
PU2			.894		
PU1			.873		
PU3			.571		
CI3				.853	
CI2				.630	
CI1				.610	
SA4					.854
SA5					.680
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.					

Table 2-19. KMO and Bartlett's Test for Continuance Intention Towards WFT

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.860
Bartlett's Test of Sphericity	Approx. Chi-Square	577.746
	df	105
	Sig.	.000

Furthermore, the KMO is .860, which is above the threshold level of adequacy for the analysis to be acceptable, and Barlett's test for sphericity approves the significance level.

II. **Confirmatory Factor Analysis**

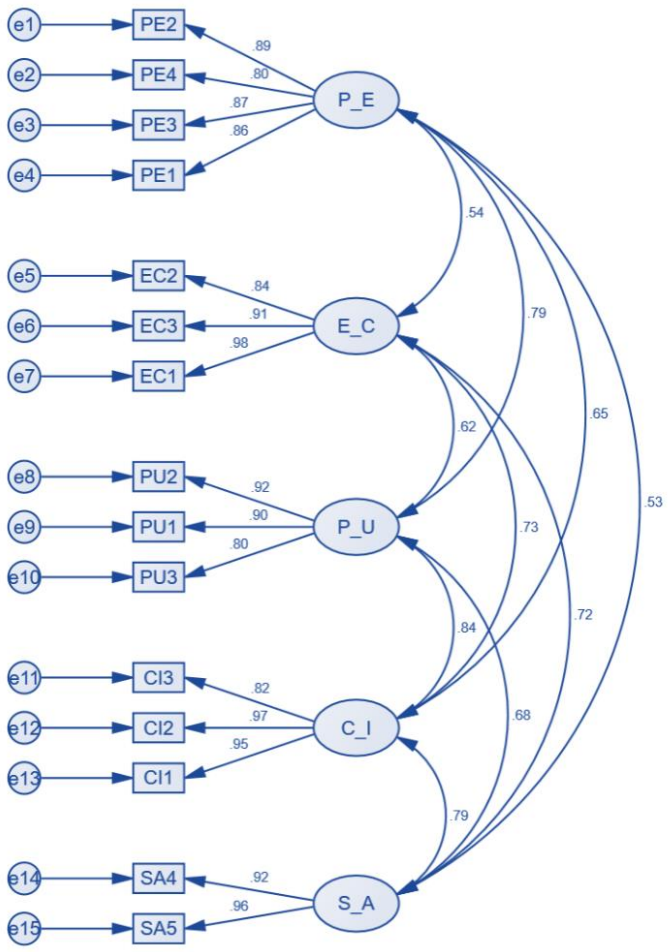


Figure 2-13. Confirmatory Factor Analysis for Continuance Intention Towards WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA.

Table 2-20. Master Validity for Continuance Intention Towards WFT

	CR	AVE	MSV	MaxR (H)	P_E	E_C	P_U	C_I	S_A
P_E	0.916	0.731	0.632	0.920	0.855				
E_C	0.937	0.834	0.534	0.972	0.537**	0.913			
P_U	0.905	0.761	0.710	0.917	0.795***	0.622**	0.872		
C_I	0.940	0.841	0.710	0.968	0.652**	0.731**	0.843***	0.917	
S_A	0.940	0.887	0.628	0.949	0.532**	0.725**	0.685**	0.793***	0.942

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

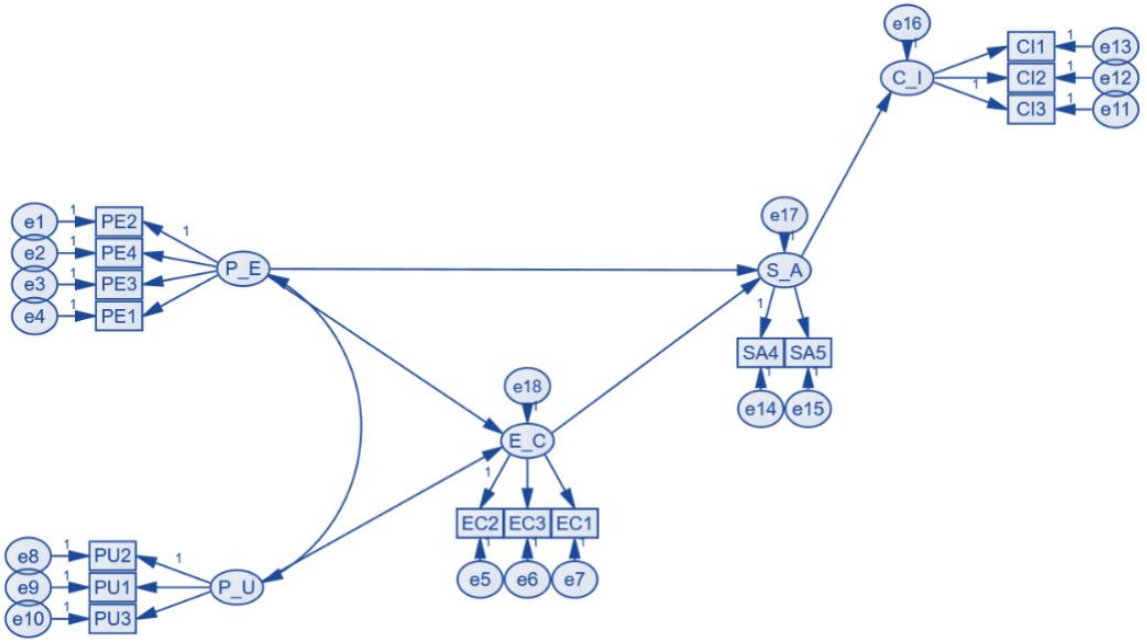


Figure 2-14. Structural Equation Modelling for Continuance Intention Towards WFT

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN/DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured. The threshold values are provided in the table below.

Table 2-21. Measurement of the Model Fit for Continuance Intention Towards WFT

Measure	Estimate	Threshold	Interpretation
CMIN	112.059	--	--
DF	84	--	--
CMIN/DF	1.334	Between 1 and 3	Excellent
CFI	0.951	>0.95	Excellent
SRMR	0.108	<0.08	Terrible
RMSEA	0.094	<0.06	Terrible
PClose	0.084	>0.05	Excellent

The above table shows that the model fit needs some improvement as the recommended threshold values are not achieved, and thus the model is considered unfit for use.

d. **Relationship among the freedom from Associated Perceived Risk and the Behavioural Intention towards the WFT.**

From the survey and the data analysis, it is inferred that people are very much concerned regarding the risk associated with the use of WFT. The exploratory factor analysis has been carried out to determine how people shall accept the WFT if there is no Associated Perceived Risk. Hence the responses obtained from the research instruments were systematically re-coded onto different variables indicating the freedom from perceived associated risk from WFT.

I. **Exploratory Factor Analysis**

The Extraction Method used in the EFA is Principal Component Analysis. Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, where the Rotation converged in 5 iterations, as shown below.

Table 2-22. Pattern Matrix for Freedom Perceived Risk and Behavioural Intention

	Component				
	1	2	3	4	5
PPRc2R	.944				
PPRc3R	.862				
PPRc1R	.844				
PPRc4R	.837				
PPRa2R		.960			
PPRa3R		.923			
PPRa1R		.873			
PPRb3R			.960		
PPRb2R			.933		
PPRb1R			.915		
BI2				.943	
BI3				.929	
BI1				.849	
PER1R					.955
PER2R					.891
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.					
a. Rotation converged in 5 iterations.					

Table 2-23. KMO and Bartlett's Test For Free from Risk

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	496.367
	df	105
	Sig.	.000

Furthermore, the KMO is .720, which is above the threshold level of adequacy for the analysis to be acceptable, and Barlett's test for sphericity approves the significance level.

II. Confirmatory Factor Analysis

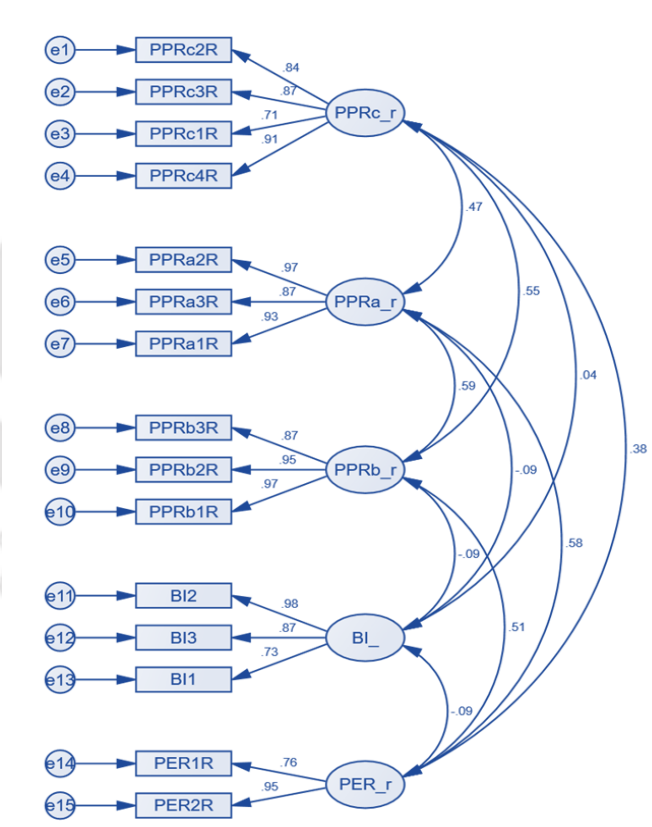


Figure 2-15. CFA for Freedom from Perceived Risk towards WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA.

Table 2-24. Master Validity for Freedom from Associated Risk and Behavioural Intention Towards WFT

	CR	AVE	MSV	MaxR(H)	PPRc_r	PPRa_r	PPRb_r	BI_	PER_r
PPRc_r	0.901	0.695	0.304	0.918	0.834				
PPRa_r	0.947	0.856	0.352	0.964	0.474*	0.925			
PPRb_r	0.952	0.868	0.352	0.968	0.551**	0.594**	0.931		
BI_	0.899	0.751	0.008	0.967	0.039	-0.088	-0.088	0.867	
PER_r	0.847	0.737	0.332	0.910	0.384†	0.576*	0.505*	-0.090	0.859

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

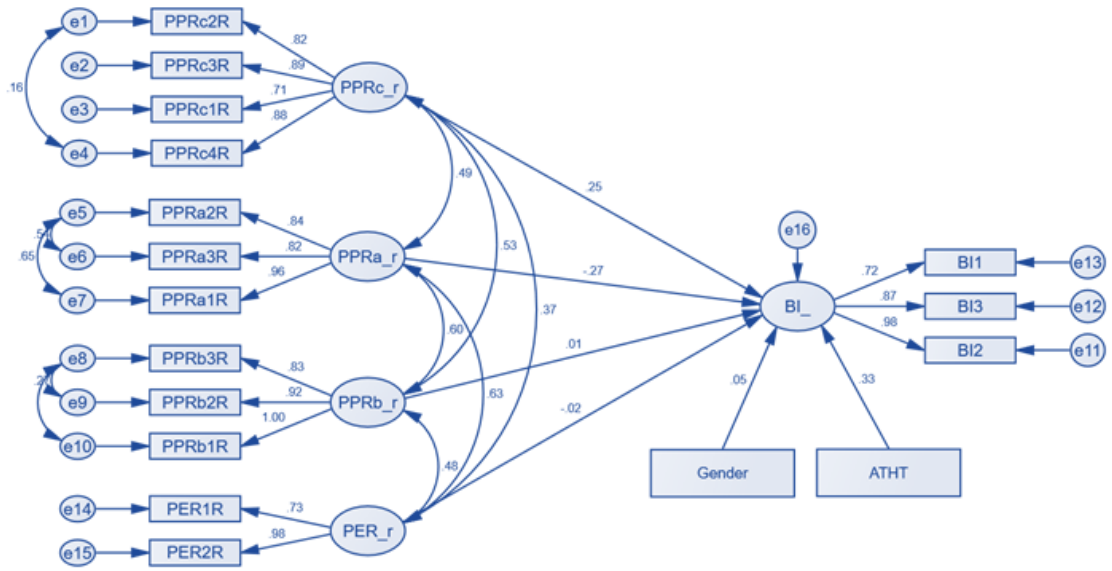


Figure 2-16. Structural Equation Model for Freedom from Perceived Risk and Behavioural Intention Towards WFT

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN/DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured. The threshold values are provided in the following table.

Table 2-25. Measurement of the Model Fit for Freedom from the Associated Risk and Behavioural Intention Towards WFT

Measure	Estimate	Threshold	Interpretation
CMIN	129.182	--	--
DF	104	--	--
CMIN/DF	1.242	Between 1 and 3	Excellent
CFI	0.948	>0.95	Acceptable
SRMR	0.095	<0.08	Acceptable
RMSEA	0.080	<0.06	Acceptable
PClose	0.164	>0.05	Excellent

The above table shows that the model fit approves the recommended threshold values; thus, the model is considered fit and accepted.

2.8. Responses and Data Analysis

The responses obtained through various instruments are systematically recorded and processed in Excel and SPSS. The data interpreted through statistical practice is provided in the following subsections to give the data analysis's detailed layout.

2.8.1. Demographics of study participants

The essential informational data have been collected from people from different parts of India. The demographic layout and the distribution have been provided in Table 2-26.

Table 2-26. Demographics of Study Participants

Variables	Groups	Frequency	Frequency (%)
Gender	Male	14	35.9
	Female	25	64.1
Age	18-29	24	61.5
	30-44	11	28.2
	45 and above	4	10.3
Education	High School	1	2.6
	Graduation	10	25.6
	=>Post-Graduation	28	71.8
Computer Experience	None	0	0
	Very Little	1	2.6
	Average	24	61.5
	Quite Extensive	9	23.1
	Very Extensive	5	12.8
WFT Experience	Yes	16	41
	No	23	59
Health Issues	Yes	5	12.8
	No	34	87.2

2.8.2. Correlation study of the Various Constructs

The following tables provide the coherence intensity between the various constructs that have been used in the study.

Table 2-27. Correlation among various constructs used to determine the Behavioural Intention of WFT

		MEANPE	MEANEE	MEANSI	MEANHM	MEANPV	MEANBI
MEANPE	Pearson Correlation	1	.352*	.527**	.646**	.250	.596**
	Sig. (2-tailed)		.028	.001	.000	.125	.000
	N	39	39	39	39	39	39
MEANEE	Pearson Correlation	.352*	1	.212	.329*	.356*	.183
	Sig. (2-tailed)	.028		.195	.041	.026	.265
	N	39	39	39	39	39	39
MEANSI	Pearson Correlation	.527**	.212	1	.505**	.399*	.439**
	Sig. (2-tailed)	.001	.195		.001	.012	.005
	N	39	39	39	39	39	39
	Sig. (2-tailed)	.134	.000	.012	.010	.005	.173
	N	39	39	39	39	39	39
MEANHM	Pearson Correlation	.646**	.329*	.505**	1	.275	.543**
	Sig. (2-tailed)	.000	.041	.001		.091	.000
	N	39	39	39	39	39	39

Continued from the previous page -

		MEANPE	MEANEE	MEANSI	MEANHM	MEANPV	MEANBI
MEANPV	Pearson Correlation	.250	.356*	.399*	.275	1	-.024
	Sig. (2-tailed)	.125	.026	.012	.091		.884
	N	39	39	39	39	39	39
MEANBI	Pearson Correlation	.596**	.183	.439**	.543**	-.024	1
	Sig. (2-tailed)	.000	.265	.005	.000	.884	
	N	39	39	39	39	39	39

Table 2-28. Correlation among various constructs used to determine the Continuous Intention of WFT

		MEANPE	MEANEE	MEANPU	MEANSA	MEANEC	MEANCI
MEANPE	Pearson Correlation	1	.352*	.746**	.510**	.495**	.601**
	Sig. (2-tailed)		.028	.000	.001	.001	.000
	N	39	39	39	39	39	39
MEANEE	Pearson Correlation	.352*	1	.265	.438**	.375*	.307
	Sig. (2-tailed)	.028		.102	.005	.019	.058
	N	39	39	39	39	39	39

		MEANPE	MEANEE	MEANPU	MEANSA	MEANEC	MEANCI
MEANPU	Pearson Correlation	.746**	.265	1	.630**	.588**	.774**
	Sig. (2-tailed)	.000	.102		.000	.000	.000
	N	39	39	39	39	39	39
MEANSA	Pearson Correlation	.510**	.438**	.630**	1	.674**	.775**
	Sig. (2-tailed)	.001	.005	.000		.000	.000
	N	39	39	39	39	39	39
MEANEC	Pearson Correlation	.495**	.375*	.588**	.674**	1	.686**
	Sig. (2-tailed)	.001	.019	.000	.000		.000
	N	39	39	39	39	39	39
MEANCI	Pearson Correlation	.601**	.307	.774**	.775**	.686**	1
	Sig. (2-tailed)	.000	.058	.000	.000	.000	
	N	39	39	39	39	39	39

The tables above show the strong correlation and coherence among the various established constructs. These successfully provide a general idea regarding the perception of people on wearable fitness devices. However, the existing constructs are still not adequate in determining the behavioural and continuance intention of the WFT. Moreover, it lacks essential determinants that can deliver a better approach towards the acceptance and adherence of these devices.

2.8.3. Response to Research Questions

To find the underlying cause of the lack of sustainability in the WFT usage and hence provide solutions through design interventions, various research questions were selected for statistical practice and derived conclusions. The following section answers the research questions relevant to the study and interventions through design practice.

RQ.1 **Is there any difference in exercise behaviour in different age groups?**

Table 2-29. Frequency Table for Age Group vs Exercise Behaviour

		Age group (in years)			Total
		18-29	30-44	=>45	
Q9_Have_you_engaged_yourself _in_any_fitness_regime	1 Yes	12	7	3	22
	2 No	12	4	1	17
Total		24	11	4	39

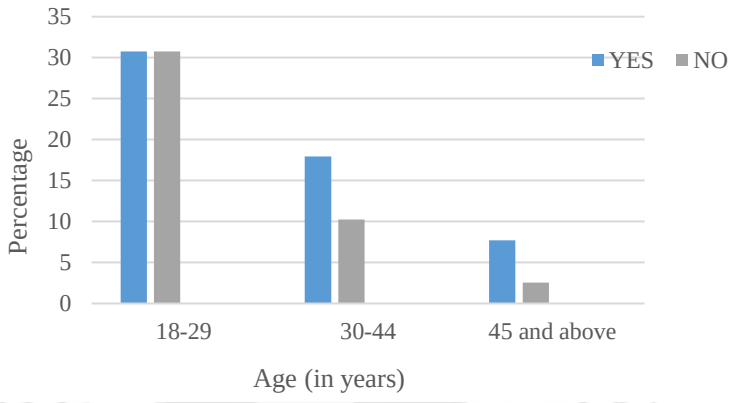


Figure 2-17. Age group vs Exercise Behaviour

The frequency table and the graph above represent the distribution of the involvement of people from the various age group in fitness activities. The distribution pattern of people engaged in fitness behaviour is similar in all the age groups. In addition, the analysis of variance (ANOVA) for the present research question has been provided below, which gives statistical support to the conclusion.

Table 2-30. ANOVA for Age group vs Exercise Behaviour

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.294	2	.147	.570	.571
Within Groups	9.295	36	.258		
Total	9.590	38			

The table above shows no significant difference (*level of significance=0.571*) in the involvement in fitness regimes among different groups. However, it has been observed that exercise behaviour is slightly more predominant in the age group 18-29 years than in the other groups.

RQ.2 **Is the exercise behaviour less or high among people with health issues?**

The health status of the study population has been recorded, and it was found that 12.8 per cent had some Health issues. To find the relationship if the health issues have any role in the exercise behaviour of a person, the respective statistical analyses have been done.

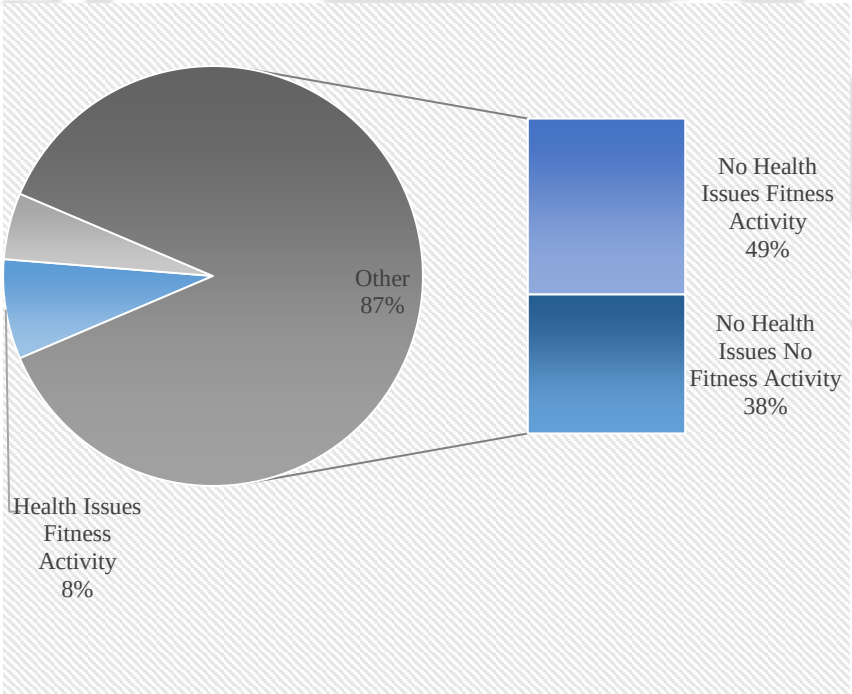


Figure 2-18. Health Issues vs Health and Fitness Consciousness

Table 2-31. ANOVA of Health Issues vs Exercise Behaviour

Q9_Have_you_engaged_yourself_in_any_fitness_regime					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.007	1	.007	.029	.867
Within Groups	9.582	37	.259		
Total	9.590	38			

Table 2-32. Cross Tabulation of Health Issues vs Exercise Behaviour

		Q9_Have_you_engaged_yourself_in_any_fitness_regime		Total
		Yes	No	
Health Issues	Yes	3	2	5
	No	19	15	34
Total		22	17	39

The tables above explain that there is no significant difference in the involvement of people in fitness regimes based on either having or being free from some health issues.

RQ.3 How does the Body Mass Index of people influence exercise behaviour?

A sedentary lifestyle has become an essential factor in health degradation in all age groups. Cross-tabulation has been done between the weight class and the Exercise behaviour to understand how a person's excess weight influences the involvement in fitness behaviour shown in Table 2.33. Before that, descriptive statistics are obtained to determine the frequency of people belonging to various weight classes.

Table 2-33. Weight Class * Age_group Crosstabulation

Count					
		Age_group			Total
		18-29	30-44	45 and above	
Weight Class	1 Underweight	2	0	0	2
	2 Normal	14	6	2	22
	3 Overweight	6	5	1	12
	4 Very overweight	2	0	1	3
Total		24	11	4	39

Table 2-34. Crosstabulation of Weight Class and Exercise Behaviour

Q9_Have_you_engaged_yourself_in_any_fitness_regime			Yes	No	
Overweight	yes	Count	8	7	15
		% within Overweight	53.3%	46.7%	100.0%
		% within Q9_Have_you_engaged_yourself_in_any_fitness_regime	36.4%	41.2%	38.5%
	no	Count	14	10	24
		% within Overweight	58.3%	41.7%	100.0%
		% within Q9_Have_you_engaged_yourself_in_any_fitness_regime	63.6%	58.8%	61.5%
Total	Count		22	17	39
	% within Overweight		56.4%	43.6%	100.0%
	% within Q9_Have_you_engaged_yourself_in_any_fitness_regime		100.0%	100.0%	100.0%

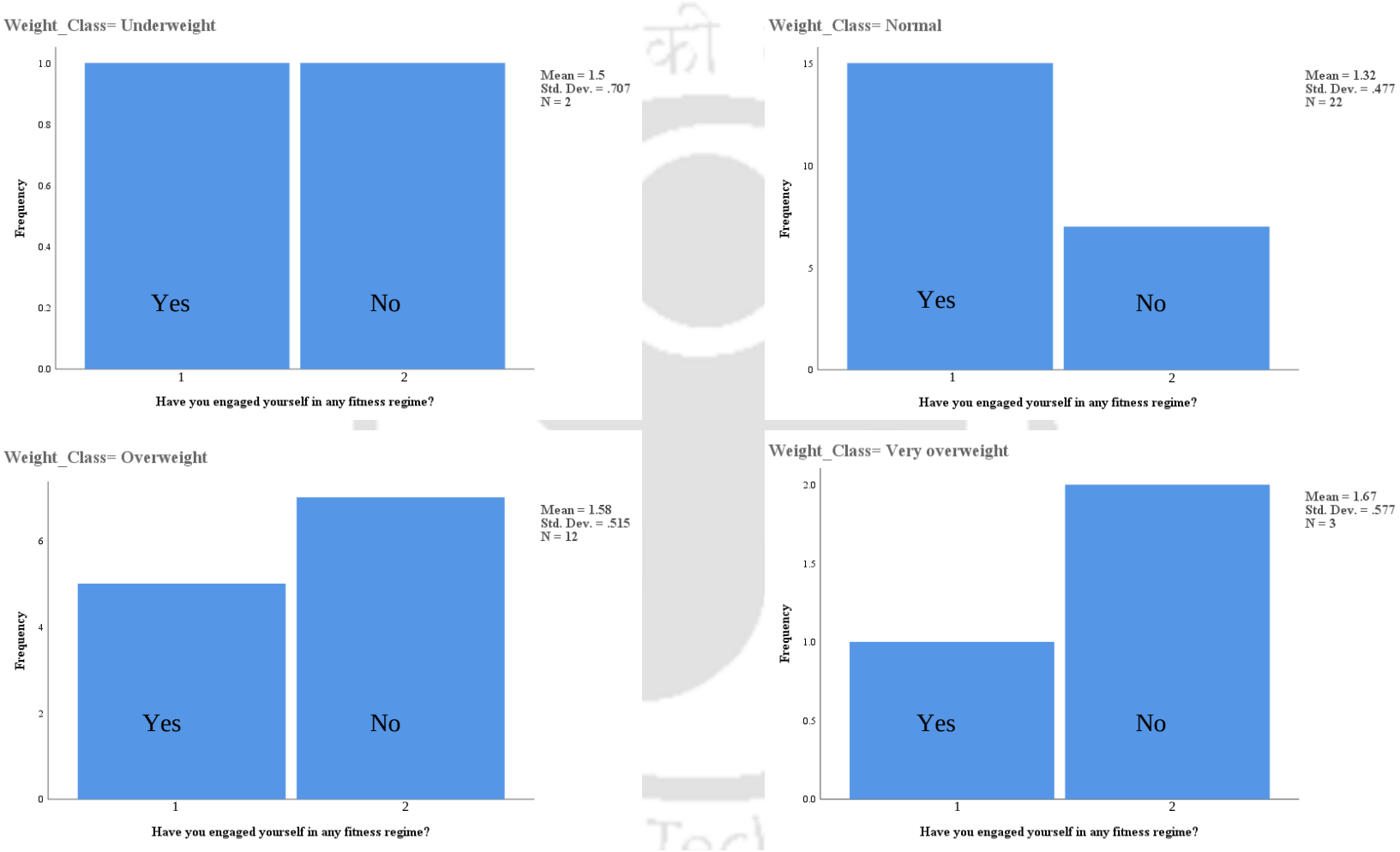


Figure 2-19. Weight Class vs Exercise Behaviour (Variable = Engaged in Exercise: Value = 1, Engaged in Exercise = Yes. Value = 2, Engaged in Exercise = No)

The previous figure displays how the weight class affects the behaviour of individuals towards health and fitness. Here the mean and standard deviation values represent the direction towards which the inclination of participants is in regard to exercise behaviour belonging a particular weight class. Graphs show that the participants with average weight exhibited an interest in exercise involvement. In contrast, a significant fraction of people who were either overweight or very obese exhibited no participation in any fitness regimes.

RQ.4 **What fraction of the age group is positive towards availing the WFT in daily life?**

The following table gives an overview of the people who had shown their respective opinion over the usage of the WFT.

Table 2-35. Frequency of Attitude towards WFT

Q7_Do_you_think_you_shall_wear_a_Wearable_Fitness_Tracker					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Affirmative	29	74.4	74.4	74.4
	2 Negative	4	10.3	10.3	84.6
	3 May be	4	10.3	10.3	94.9
	4 Other	2	5.1	5.1	100.0
	Total	39	100.0	100.0	

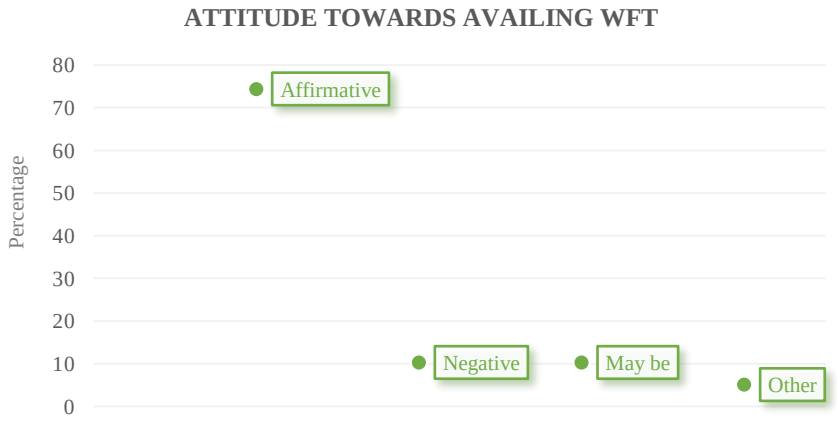


Figure 2-20. Percentage of positive Intention towards Availing WFT

The analysis represents that, more than 70 per cent of the study population had a positive approach towards availing the WFT, as shown in the graph above.

RQ.5 **What fraction of the people are already having a WFT?**

In the survey, it was found that 41 per cent of the study population were already having a WFT, and 59 per cent were not, as shown in the table and graph given below.

Table 2-36. Descriptives of WFT owner

Owner		Frequency	Per cent	Valid Percent	Cumulative Percent
Valid	1 Yes	16	41.0	41.0	41.0
	2 No	23	59.0	59.0	100.0
	Total	39	100.0	100.0	

Table 2-37. WFT Owner * Gender Crosstabulation

Count				
		Gender		Total
		Female	Male	
WFT Owner	Yes	11	5	16
	No	14	9	23
Total		25	14	39

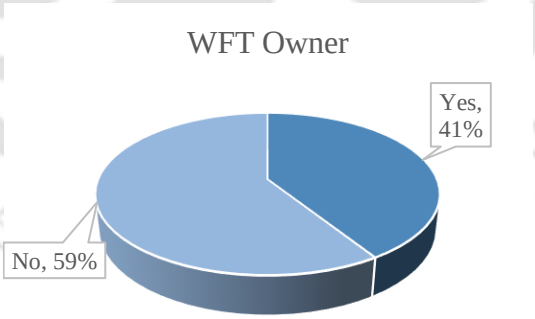


Figure 2-21. Distribution of WFT Owner

RQ.6 **Does the awareness of the mechanism of the WFT affect the Intention to incorporate the WFT in the daily lives of people?**

In order to understand if the awareness about the functioning of the WFT can influence their behaviour and attitude towards these devices, the following statistical analysis has been carried out.

Table 2-38. Descriptives of WFT Mechanism Awareness vs Positive Intention Towards Using WFT for values (5 – Strongly Agree, 4 – Agree, 3 – Neither Agree nor Disagree, 2 – Disagree, 1 – Strongly Disagree)

Q7_Do_you_think_you_shall_wear_a_Wearable_Fitness_Tracker								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Yes	18	1.56	1.097	.258	1.01	2.10	1	4
No	20	1.40	.681	.152	1.08	1.72	1	3
Insignificant	1	1.00	.	.	.	.	1	1
Total	39	1.46	.884	.142	1.17	1.75	1	4

Table 2-39. ANOVA Table: Mechanism Awareness vs Positive Intention Towards Using WFT

Q7_Do_you_think_you_shall_wear_a_Wearable_Fitness_Tracker					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.448	2	.224	.276	.761
Within Groups	29.244	36	.812		
Total	29.692	38			

The analysis of the Variance test gives a significance of .761, which shows that there is no such significant difference in the behaviour of acceptance in people irrespective of their awareness regarding the mechanism incorporated in the WFT.

RQ.7 What fraction of the people are not continuing using the WFT?

After studying the fraction of study of the population who had a WFT, it was observed that many have stopped using the device. The information is provided with statistical support below.

Table 2-40. Descriptives of Continuing User of WFT

Current user		Frequency	Per cent	Valid Per cent	Cumulative Percent
Valid	1 Yes	10	62.5	62.5	62.5
	2 No	6	37.5	37.5	100.0
	Total	16	100.0	100.0	

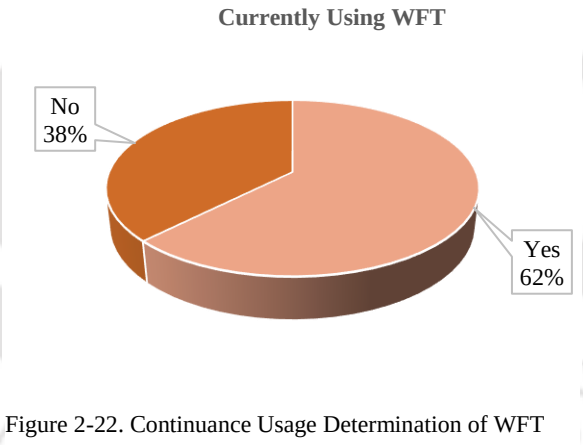


Figure 2-22. Continuance Usage Determination of WFT

The pie-chart above shows that 38 per cent of the WFT owner had stopped using their WFT.

RQ.8 **Is the attitude towards using Wearable Fitness Tracker the same in all age groups?**

The study has been carried out across different age groups to determine the attitude towards using WFT. The following statistical analysis recorded in tabulated form gives a brief idea regarding the same.

Table 2-41. Descriptives of the Attitude Towards Using the WFT in Different Age Groups

	N	Mean ATU	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-29	24	14.4167	3.43785	.70175	12.9650	15.8683	4.00	20.00
30-44	11	16.2727	2.83164	.85377	14.3704	18.1750	12.00	20.00
45 and above	4	15.0000	2.16025	1.08012	11.5626	18.4374	12.00	17.00
Total	39	15.0000	3.21182	.51430	13.9588	16.0412	4.00	20.00

Table 2-42. ANOVA for Attitude towards Using WFT vs Age group

	MEANATU				
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.624	2	.812	1.278	.291
Within Groups	22.876	36	.635		
Total	24.500	38			

Table 2-43. Multiple Comparisons between the ATU and Age Groups

Dependent Variable: MEANATU - Tukey HSD						
(I) Age_group	(J) Age_group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
18-29	30-44	-.46402	.29025	.259	-1.1735	.2454
	45 and above	-.14583	.43051	.939	-1.1981	.9065
30-44	18-29	.46402	.29025	.259	-.2454	1.1735
	45 and above	.31818	.46543	.774	-.8195	1.4558
45 and above	18-29	.14583	.43051	.939	-.9065	1.1981
	30-44	-.31818	.46543	.774	-1.4558	.8195

The analysis of the Variance test shows that there is no significant difference in WFT acceptance within the various age groups considered in the study.

RQ.9 **Is the attitude towards using the wrist-worn fitness tracker is more in people engaging in some fitness regimes?**

The following table gives the basic information regarding people's attitude towards using the WFT based on their involvement level in fitness and exercise behaviour.

Table 2-44. Descriptives of the Attitude of Using WFT Concerning Involvement in Fitness Activity

Fitness Involvement	N	Mean ATU	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1 Yes	22	4.0795	.60448	.12888	3.8115	4.3476	3.00	5.00
2 No	17	3.3235	.84208	.20423	2.8906	3.7565	1.00	4.50
Total	39	3.7500	.80296	.12858	3.4897	4.0103	1.00	5.00

Table 2-45. ANOVA for Attitude towards Using WFT vs Involvement in Fitness Activity

	MEANATU				
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.481	1	5.481	10.663	.002
Within Groups	19.019	37	.514		
Total	24.500	38			

The Analysis of Variance test shows a significant difference between the attitude of people towards using WFT who are involved in the fitness regime and those who are not.

RQ.10 **Is there any difference between the behavioural intention of WFT among males and females?**

The survey has been conducted among people from various parts of India, among which 64.1 per cent are female's ad 35.9 per cent are males, as the distribution is shown in the following table.

Table 2-46. Gender-Specific Frequency Distribution for Behavioural Intention Towards WFT

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	25	64.1	64.1	64.1
	Male	14	35.9	35.9	100.0
	Total	39	100.0	100.0	

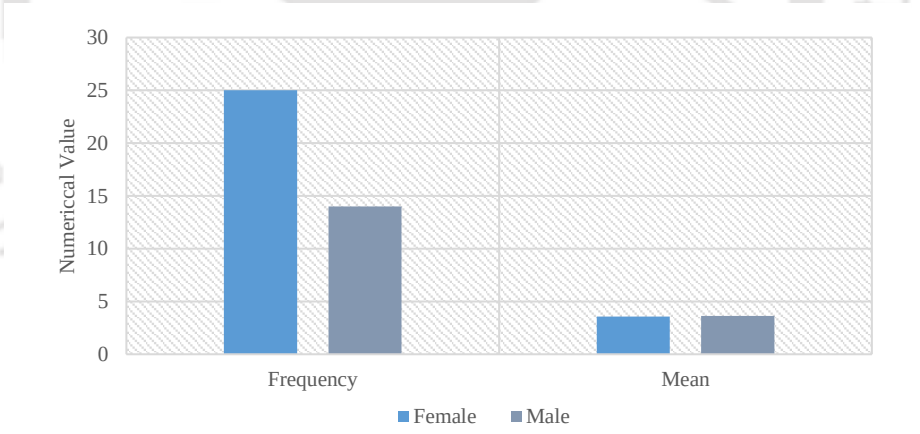


Figure 2-23. Behavioural Intention Towards WFT vs Gender

Accordingly, the mean for the Behavioural Intention among the males and females have been studied and seen the Intention is slightly less in females than the males as shown in Figure 2-23, but the difference is very insignificant. A test for Analysis of Variance has been performed to establish the statement.

Table 2-47. Descriptive Statistics of Behavioural Intention of WFT among males and females

MEANBI								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Female	25	3.5600	1.15378	.23076	3.0837	4.0363	1.00	5.00
Male	14	3.6186	.70122	.18741	3.2137	4.0234	1.67	4.33
Total	39	3.5810	1.00488	.16091	3.2553	3.9068	1.00	5.00

Table 2-48. ANOVA Table for Behavioural Intention among Males and Females

MEANBI					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.031	1	.031	.030	.864
Within Groups	38.341	37	1.036		
Total	38.372	38			

The above table shows that the significance value is .864, which means that there is no significant difference among the males and females towards the Behavioural Intention towards WFT.

RQ.11 **To which extent do Social Influence and Perception of others on WFT affect the acceptance of wearable fitness trackers among people?**

To answer the research question, specific statistical analyses have been performed between the two determinants: Social Influence and Behavioural Intention towards WFT.

Table 2-49. Descriptive Statistics of Social Influence on the Behavioural Intention of WFT

	Mean	Std. Deviation	N
MEANSI	3.1792	1.09713	39
MEANBI	3.5810	1.00488	39

Table 2-50. Correlation between the Social Influence and Behavioural Intention

		MEANSI	MEANBI
MEANSI	Pearson Correlation	1	.439**
	Sig. (2-tailed)		.005
	N	39	39
MEANBI	Pearson Correlation	.439**	1
	Sig. (2-tailed)	.005	
	N	39	39
**. Correlation is significant at the 0.01 level (2-tailed).			

The correlation table shows a significant directional coherence between the two determinants which implies that people are concerned about how people perceive their acceptance and usage of WFT.

Table 2-51. Regression Analysis of Social Influence and Behavioural Intention

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.439[a]	.192	.171	.91516
a. Predictors: (Constant), MEANSI b. Dependent Variable: MEANBI				

Table 2-52. Analysis of Variance Test for Social Influence vs Behavioural Intention

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.384	1	7.384	8.816	.005[b]
	Residual	30.988	37	.838		
	Total	38.372	38			
a. Dependent Variable: MEANBI b. Predictors: (Constant), MEANSI						

The corresponding test for Analysis of Variance depicts that the Social Influence or the Perceived risk of being judged on the usage of WFT can alter people's behavioural Intention towards the WFT.

2.9. Discussion

In the survey, people from different states of India contributed their opinions and perceptions on WFT. The percentage distribution of the study population is shown in the figure below.

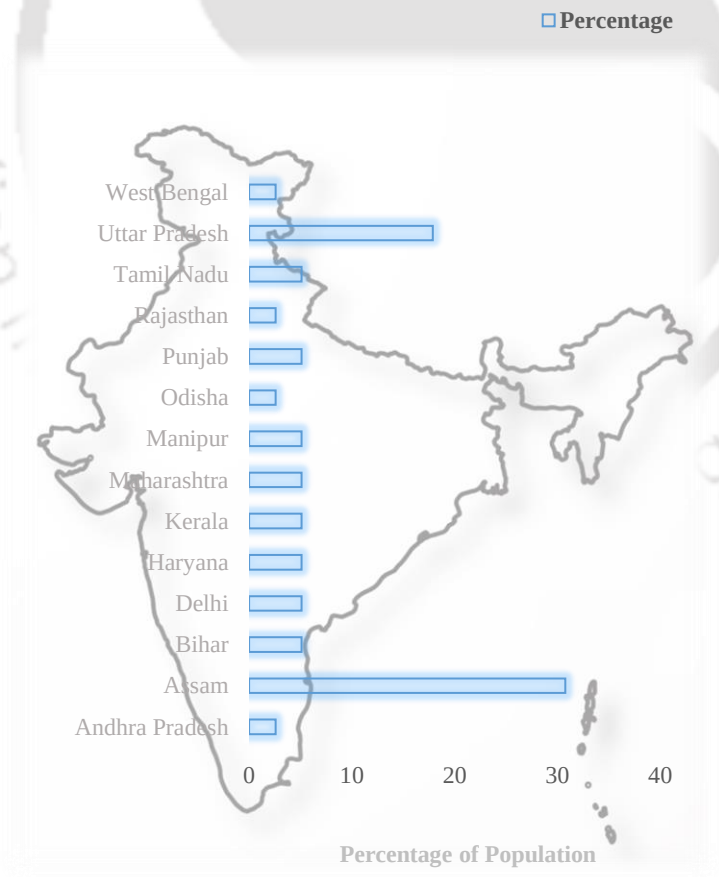


Figure 2-24. Demographics of Study Population

To obtain relevant data from people, purposive random sampling has been carried out. Multiple dimensions have been explored to find the relationship among them to reach a stage to find a solution for the research gap found during the literature survey. One such dimension is the involvement of people in health and fitness behaviour. From the analysis it has been observed that there is no significant difference in the involvement in fitness regimes among different groups. However, it has been observed that exercise behaviour is slightly more significant in the age group 18-29 years than in the other groups. Furthermore, people either 45 years of age or above shows the least involvement in the exercise. From this, it can be concluded that there is no significant difference in the participation in fitness regimes in people with or without any health issues.

Furthermore, the relationship and association among the weight class and the exercise behaviour has been studied. Graphs display the weight class's effect on the behaviour of individuals towards health and fitness. It says that the participants with average weight exhibited an interest in exercise involvement. In contrast, a significant fraction of people who were either overweight or very obese exhibited no participation in any fitness regimes. In a parallel analysis, a substantial fraction (74.4 per cent) of the sample population are affirmative towards availing WFT. However, among the users, only 62% were continuing the usage of WFT. It could be visible through the study that a comparable fraction of the WFT users tend to abandon the device after some time.

To achieve valid justifications and reasons regarding the use attitude towards WFT, systematic survey and analysis has been carried out. Furthermore, the coherence of the directionality among the constructs used to determine the Behavioural Intention of WFT is well explored and displayed accordingly.

2.10. Concluding remarks

Statistical analysis and cross interpretations show that Social Influence and Perceived Social Risk play a significant and essential role in determining the inclusion of the WFT in their daily lives. To enhance the acceptance and continuance of such devices, specific design considerations and Interventions

are crucial in the present situation. People are very conscious about the judgement they might have to encounter while using such devices. Also, the perceived risks associated with the usage of WFT might restrain them from benefitting from such devices to have a better and healthy life. A design approach shall ensure that they no longer have to encounter the fear of being judged or monitored.

For this purpose, to provide a proper model to monitor the perception and behavioural Intention of the WFT, new determinants and moderators are essential to be established. Moreover, to enhance the usage of WFT, the continuance intention model shall also be refurnished. Here, the question arises, “What type of design intervention is required?” Multiple constructs have been introduced in the next chapter to answer the questions during the research survey and analysis. New intervention models have been constructed to address the issues expected to deliver a beneficial solution in the future.

Chapter 3

This chapter comprehends the various factors and micro-determinants that are essentially responsible for determining the use behaviour of a product. Furthermore, it aims to relocate the void in the design models for the presently existing wearable fitness trackers, thereby finding solutions and designing Interventions. It discusses the structural equation models and design interventions designed to ensure positive Behavioural Intention towards WFT and the enhancement in the sustainable usage of such devices. In addition, it contains the various test conducted that validates the formulated hypotheses.

Chapter 3. **Design Considerations and Intervention Models**

3.1. Introduction

The design of a product determines its user and its acceptance. It is often visible that consumers do not use the products for more extended periods despite the excellent and competitive design. They usually have difficulty operating the array of consumer products. The users often blame themselves for their problems while using a particular technology instead of attributing their challenges to the technology, the root cause of the design process.

Designers often incorporate degrees of complexity into the interfaces, devices, and instructions that create an imbalance between the demands imposed by these products and the mental and physical resources at the user's disposal (Fisk, et al., 2009). While targeting non-homogenous consumers, the designers consumers is often hampered due to the lack of understanding of their requirements and preferences. In such cases, the inclusive design approach helps create products that serve and communicate as many people as possible. "While accessibility is a core objective, inclusive means much more" (Xiao, 2018). A good design process ensures that the business requirements meet the users' needs, and both are satisfied with feasible technical possibilities. It is very essential for designers to keep the body figures of individual from different age groups and their limitations in mind while designing for masses (Chakrabarti, 1997). Figure 3-1 depicts the various tangible or intangible factors responsible for mediating device usage (Gardner-Bonneau & Gosbee, 1996).

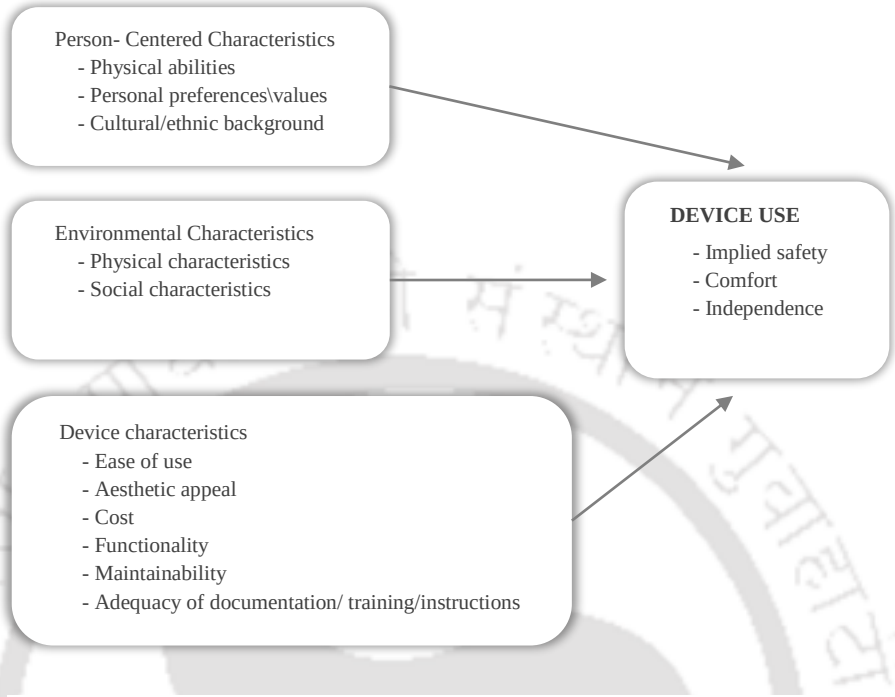


Figure 3-1. Impact of person, environment, and device characteristics on device use.

Ergonomic Entropy and Unsustainable Usage

Aesthetic and Ergonomic disturbances often lead to the instability of product usage. Lack of Also, the perceived usage compatibility plays a crucial role in the very initial stage of the idea of purchasing a product that remains active even post-purchase. The essential task of ergonomics is to create tolerable working conditions, which is believed not to create known dangers to human life or health. After assuring these basic requirements, its next goal is to generate acceptable conditions upon which the people can voluntarily agree, according to the current scientific knowledge and under given sociological, technological and organizational circumstances (Kroemer, et al., 2001). The poor compatibility leads to unsustainability in the usage of the product. To overcome the challenges associated with the unsustainability of wearable fitness trackers, the designers must focus on developing these devices, enabling users to adhere to these devices.

3.2. Design Approach

A systematic approach has been taken to develop the Design Interventions for the Wearable Fitness Trackers To address the lack of sustainability issues and enhance the acceptance of the Wearable Fitness trackers among the actual and potential consumers. The following sections describe the design considerations and principles accommodated in the present research study to develop the design Interventions.

3.2.1. Experience design

In recent years, western societies have shifted from material to experiential. They are more inclined towards living experiences than owning things. Studies reveal that experiential purchases make people happier than material purchases of the same value (Baylé, 2018). The designers and vendors of interactive products face challenges while designing such products. User experience is not about the good industrial design, fancy interfaces, and multi-touch but transcending the material. It is more like creating a smooth experience through a device. Designing an interactive product demands aesthetics of experience (Hassenzahl, 2021) which can travel through the users' minds while interacting with the product.

Developing interactive technology products requires a better understanding of how users perceive the device and its adherence to its user. Experience Design can be an essential tool for the design process in these cases. It cannot be denied that experience is intangible and volatile while an interactive product is tangible. Unifying these two domains is a challenge that the designers can accept better to understand human behaviours and their interaction with the products. Figure 3-2 exhibits the process of Designing an Experience through the interaction with an object. The idea is to transfer the concept from the self to the world through proper and significant methodology, as depicted in Figure 3-2 (Hassenzahl, 2021).

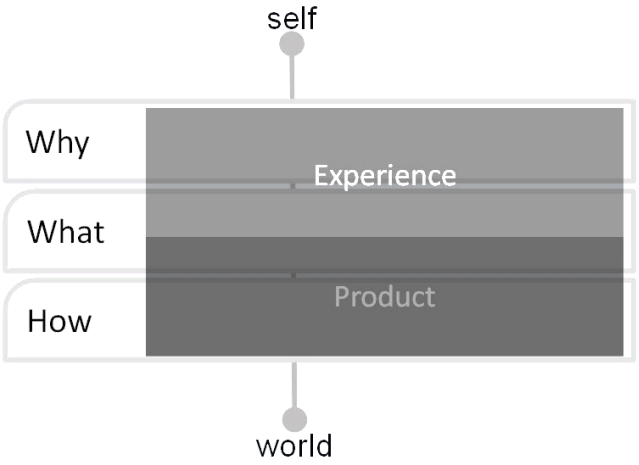


Figure 3-2. Level for Creating Design for Technology

The various steps have definite meanings and are essential in designing emotions. The 'Why' tries to clarify the needs and feelings involved in any activity associated, which gives a beginning of the experience. The 'What' addresses the extent of what people can do with these interactive devices. Furthermore, the 'How' is the typical realm of Interaction Designers, which addresses acting through an object on an operational, sensory-motor level to make the given functionality accessible in an aesthetically pleasing way (Hassenzahl, 2021).

3.2.2. Inclusive Designs - accessible design

While targeting a larger periphery of consumers, it is essential to incorporate the methods to design products that are easy to use. Also known as Universal Design, Inclusive Designs are the specific design of products and the environment suitable for everyone to use the best of their adaptability without intending any adaptation or specialized design (Resources, 2021).

Older adults prefer dependence on medication over physical fitness (Fisk, et al., 2009). They seem to have more trust over medication tools in believing to ensure a healthy life. Engaging older adults in fitness routines require a thoughtful and subtle approach in designing tools that can adhere them to

health activities and relate and engage themselves to such devices. The existing concepts can help assist in the learning of new ones by drawing analogies between the new system and the systems the users already understand.

Despite age-related circumstances and declination, a person's self-efficacy plays a significant role in developing healthy habits to sustain a graceful life and maintain it even at an older age. Hence, to reach a negotiable point where the older adults and their younger counterparts both shall benefit from wearable fitness devices, understanding their health behaviours and self-efficacy shall be studied and considered while designing these devices.

3.2.3. Self-efficacy and Health Behaviours

Self-efficacy refers to how people's belief in their capabilities affect their actions. It has a significant role in determining the performance of a particular task, what activities a person chooses to engage in, and the persistence invested in them (Backlund, et al., 2008). Perceived control plays a significant role in indulging someone in a particular behaviour. It can be defined as the extent to which people believe they have the necessary authority or agency over changes in the environment through their actions and decisions. Moreover, perceived control has been widely incorporated in health domains to understand better the behaviours involving health care seeking and indulging in physical activity. Therefore, incorporating this factor while designing such interactive technology devices may help enhance the adherence to these interactive technology devices.

3.3. Study objectives

i) Study the relationship between self-efficacy and attitude towards using health technology.
ii) To develop intervention models to understand the User Perception and thereby highlight the necessary determinants to enhance the Behavioural and Continuance Intention towards the WFT
iii) To design Intervention ensuring the sustainability of the Wearable Fitness Trackers.

3.4. Methods

A mixed-method evaluation design was adopted in the study, including quantitative and qualitative methods. The items for the research instruments were chosen with an in-depth study, exploration and logical approaches. Design Thinking and the User Experience Processes show that Experiential Purchases provide more satisfaction than materialistic purchases. The questionnaires were designed accordingly using the proper methods and format. The same is provided in the Appendices, Pg. 196 for references.

3.4.1. Survey

Statistical analysis has been done from the survey administered among people above 18 years of age. Accordingly, Questionnaires were designed to derive meaningful data from the investigation. An open approach was kept to embrace any new research direction found in the process. The following sections describe the steps taken and the research methods applied to obtain the inputs for data analysis.

Ethics Considerations

The participants' right to anonymity has been considered in the survey. Also, consent regarding their participation has been obtained from each participant before its commencement.

3.4.2. Research Instruments

The items for the research instruments were accordingly selected from the exploratory and observational study and rational approaches. Moreover, the questionnaires were designed employing the proper methods and format. The questions were requested to be answered using the Likert Scale rated on a scale of 1-5 how much they disagree/agree. '1' being strongly disagreed, and '5' being strongly agreed. Questionnaires are provided in the Appendices are provided for reference.

Operational Definitions of Modified Determinants

Constructs 3-1. Determinants for Attitude Towards Health Technology

Constructs	**Definitions**
General Self Efficacy (GSE)	It refers to how confident a person feels in accomplishing daily activities
Computer Self Efficacy (CSE)	It refers to how self-assured a person is while carrying out a task on the computer
Technology Self Efficacy (TSE)	It refers to how a person feels to be empowered in dealing with technology devices
Attitude towards Health Technology (ATHT)	It refers to the attitude and perception of a person towards the available prospective health technology.

Constructs 3-2. Modified Determinants for Understanding the Behavioural Intention towards WFT

Constructs	**Definitions**
Performance Expectancy (PE)	It refers to the degree to which using WFT will benefit the consumers in accomplishing certain activities
Effort Expectancy (EE)	It refers to the level of ease associated with the use of WFT
Social Influence (SI)	It indicates how others influence individuals in considering WFT for use.
Price Value (PV)	It can be defined as the consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost of using WFT.
Hedonic Motivation (HM)	It indicates the pleasure or the enjoyment derived from using the WFT.
Design Aesthetics (DA)	It refers to the experience and pleasure obtained through the aesthetical experiences of WFT.
Purchase Intention (PI)	It refers to the intention of spending on purchasing WFT
Behavioural Intention (BI)	It represents the interest of the consumers towards the inclination and intent of considering the WFT for its use.

Constructs 3-3. Modified Determinants for Continuance Intention Towards WFT

Constructs	**Definitions**
Perceived Ease of Use (PEOU)	It is the degree to which a person believes that using WFT would be free of effort.
Perceived Usefulness (PU)	It is the degree to which a person believes that WFT would enhance their performance.
Hedonic Motivation (HM)	It indicates the pleasure or the enjoyment derived from using the WFT.
Design Aesthetics (DA)	It refers to the experience and pleasure obtained through the aesthetical experiences of WFT.
Satisfaction (SA)	It refers to the sense of fulfilment of expected outcomes using WFT.
Expectation Confirmation (EC)	It refers to the confirmation of the balance between the expectations and the assurance of the service provided.
Continuance Intention (CI)	It refers to the positive intention towards continuing the service provided by WFT.

Constructs 3-4. Determinants for Understanding the Aesthetics of Experiences (AOE) for WFT Design Intervention

Constructs	Definition
Freedom from Perceived Economic Risk (PER_r)	It refers to the freedom from the distress of encountering monetary loss or risk involved using the WFT.
Freedom from Perceived Social Risk (PSR_r)	It refers to the freedom from the anxiety of being judged or evaluated by others for using the WFT.
Freedom from Perceived Physical Risk (PPRa_r)	It refers to the freedom from the distress of coming across physical harm or risk involved using the WFT.
Freedom from Perceived Privacy Risk (PPRb_r)	It refers to the freedom from the fear of privacy invasion risk involved using the WFT.
Freedom from Perceived Psychological Risk (PPRc_r)	It refers to the freedom from the fright of encountering the psychological burden or risk involved using the WFT.
Hedonic Motivation (HM)	It indicates the pleasure or the enjoyment derived from using the WFT.
Design Aesthetics (DA)	It refers to the experience and pleasure obtained through the aesthetical experiences of WFT.

3.4.3. Measurement Models

As inferred from the survey and the data analysis, three models have been constructed to find the relationship among the various determinants, which can answer the underlying factors in the determination of Behavioural and Continuance Intention towards WFT. The following sections provide the detailed layout of the purpose.

To understand the Attitude towards Health Technology due to different forms of self-efficacies.

The Attitude towards Health Technology is analysed through the different self-efficacies possessed by an individual. To quantify the self-efficacies using 16 indicators, three exogenous latent variables were grouped: General Self Efficacy, Technology Self Efficacy, and Attitude Towards Health Technology. Furthermore, all the latent variables were computed to result in overall Self Efficacy.

To understand the Behavioural Intention of WFT using the modified determinants.

The structural model was developed using 22 indicators grouped into seven exogenous latent variables: Performance Expectancy, Effort Expectancy, Social Influence, Price Value, Design Aesthetics, Hedonic Motivation, Facilitating Conditions and Purchase Intention. Furthermore, the endogenous latent variable, Behavioural Intention, was studied.

To understand the Continuance Intention of WFT using the modified determinants

The structural model was developed using 19 indicators grouped into five exogenous latent variables: Performance Expectancy, Design Aesthetics, Hedonic Motivation, Satisfaction, Expectation

Confirmation. Furthermore, the endogenous latent variable, Continuance Intention, was studied.

3.4.4. Reliability Test of Research Instruments

The scale item analysis of the respective dimensions has been carried out using the SPSS Version 25. The Cronbach Alpha values were obtained for all the latent variables, and the items with negative directionality were recorded accordingly. The consequent section represents the reliability analysis of the research instruments.

Table 3-1. Reliability Analysis of Self Efficacy and Attitude Towards Health Technology Survey Items

Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
GSE1	.778	7
GSE2		
GSE3		
GSE4		
GSE5		
GSE66R		
GSE77R		
CSE1	.838	9
CSE22R		
CSE33R		
CSE55R		
CSE66R		
HTSE1		
HTSE2		
HTSE33R		
HTSE44R		
ATHT1	.703	4
ATHT2		
ATHT3		
ATHT55R		

Table 3-2. Reliability Analysis of Behavioural Intention Towards WFT Survey Items

Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
PE1	.913	4
PE2		
PE3		
PE4		
EE1	.887	3
EE2		
EE3		
SI1	.942	3
SI2		
SI3		
FC1	.711	3
FC2		
FC3		
HM1	.950	3
HM2		
HM3		
PV1	.827	3
PV2		
PV3		
DA1	.866	3
DA2		
DA4		
PI1	.841	3
PI2		
PI3		
BI1	.893	3
BI2		
BI3		

Table 3-3. Reliability Analysis of Continuance Intention Towards WFT Survey Items

Items	Reliability Statistics	
	Cronbach's Alpha	N of Items
PE1	.913	4
PE2		
PE3		
PE4		
PU1	.901	3
PU2		
PU3		
DA1	.866	3
DA2		
DA4		
HM1	.950	3
HM2		
HM3		
SA4	.939	2
SA5		
EC1	.937	3
EC2		
EC3		
CI1	.931	3
CI2		
CI3		

3.4.5. Responses and Data Analysis

The responses obtained through various instruments are systematically recorded and interpreted through statistical practice using SPSS Statistics version 25 and Amos 22. The following subsections give the detailed layout of the data analysis.

❋ **Self-Efficacy and Attitude Towards Health Technology**

A systematic analysis has been carried out between the determinants to understand how the various kinds of self-efficacy affect a person's attitude towards health technology. The table below shows the descriptive statistics of the determinants and their correlation.

Table 3-4. Descriptive Statistics of Different Self Efficacies and Attitude towards Health Technology

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Mean_GSE	39	2.29	2.71	5.00	3.7505	.62961	.233	.378	-.727	.741
Mean_CSE	39	3.20	1.80	5.00	3.6051	.91707	-.176	.378	-.744	.741
Mean_TSE	39	2.67	2.11	4.78	3.5159	.72532	-.102	.378	-.920	.741
Mean_Self_Efficacy	39	2.08	2.63	4.71	3.6346	.56975	.189	.378	-1.168	.741
Mean_ATHT	39	3.25	1.75	5.00	3.5449	.69508	-.288	.378	-.063	.741
Valid N (listwise)	39									

Table 3-5. Correlation Between the Various Self Efficacy Determinants and Attitude towards WFT

		Mean_GSE	Mean_CSE	Mean_TSE	Mean_Self_Efficacy	Mean_ATHT
Mean_GSE	Pearson Correlation	1	.340*	.412**	.815**	.526**
	Sig. (2-tailed)		.034	.009	.000	.001
	N	39	39	39	39	39
Mean_CSE	Pearson Correlation	.340*	1	.972**	.806**	.020
	Sig. (2-tailed)	.034		.000	.000	.903
	N	39	39	39	39	39
Mean_TSE	Pearson Correlation	.412**	.972**	1	.864**	.118
	Sig. (2-tailed)	.009	.000		.000	.474
	N	39	39	39	39	39
Mean_Self_Efficacy	Pearson Correlation	.815**	.806**	.864**	1	.366*
	Sig. (2-tailed)	.000	.000	.000		.022
	N	39	39	39	39	39
Mean_ATHT	Pearson Correlation	.526**	.020	.118	.366*	1
	Sig. (2-tailed)	.001	.903	.474	.022	
	N	39	39	39	39	39
*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).						

❋ Constructs Mediating Behavioural Intention Towards WFT

A systematic analysis has been carried out between the determinants to understand how the various constructs mediate the behavioural intention towards the WFT. It shows the descriptive statistics of the determinants and shows the correlation among them.

Table 3-6. Descriptive Statistics of Various Determinants for Behavioural Intention of WFT

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
MEANPE	39	4.00	1.00	5.00	3.6987	1.01499	-1.127	.378	1.299	.741
MEANEE	39	3.00	2.00	5.00	4.0597	.83026	-.775	.378	-.179	.741
MEANSI	39	4.00	1.00	5.00	3.1792	1.09713	-.519	.378	-.378	.741
MEANFC	39	3.33	1.67	5.00	3.8041	.84378	-.445	.378	-.410	.741
MEANHM	39	4.00	1.00	5.00	3.8036	1.06197	-.931	.378	.679	.741
MEANPV	39	4.00	1.00	5.00	3.2562	.86679	-.036	.378	.123	.741
MEANDA	39	3.50	1.50	5.00	3.6923	.81810	-.216	.378	-.023	.741
MEANHT	39	4.00	1.00	5.00	2.7179	1.09301	.250	.378	-.634	.741
MEANATU	39	4.00	1.00	5.00	3.7500	.80296	-.934	.378	2.394	.741
MEANBI	39	4.00	1.00	5.00	3.5810	1.00488	-.977	.378	.956	.741
MEANPI	39	4.00	1.00	5.00	3.4269	.94573	-.986	.378	1.643	.741
Valid N (listwise)	39									

Table 3-7. Correlation Between the Determinants Mediating Behavioural Intention Towards WFT

		MEAN PE	MEAN EE	MEAN SI	MEAN DA	MEAN HM	MEAN PV	MEAN ATU	MEAN PI	MEAN BI
MEAN PE	Pearson Correlation	1	.352*	.527**	.442**	.646**	.250	.640**	.497**	.596**
	Sig. (2-tailed)		.028	.001	.005	.000	.125	.000	.001	.000
	N	39	39	39	39	39	39	39	39	39
MEAN EE	Pearson Correlation	.352*	1	.212	.114	.329*	.356*	.230	.142	.183
	Sig. (2-tailed)	.028		.195	.491	.041	.026	.158	.389	.265
	N	39	39	39	39	39	39	39	39	39
MEAN SI	Pearson Correlation	.527**	.212	1	.397*	.505**	.399*	.346*	.643**	.439**
	Sig. (2-tailed)	.001	.195		.012	.001	.012	.031	.000	.005
	N	39	39	39	39	39	39	39	39	39
MEAN DA	Pearson Correlation	.442**	.114	.397*	1	.419**	.212	.367*	.301	.334*
	Sig. (2-tailed)	.005	.491	.012		.008	.196	.021	.063	.038
	N	39	39	39	39	39	39	39	39	39
MEAN HM	Pearson Correlation	.646**	.329*	.505**	.419**	1	.275	.605**	.484**	.543**
	Sig. (2-tailed)	.000	.041	.001	.008		.091	.000	.002	.000
	N	39	39	39	39	39	39	39	39	39

MEAN PV	Pearson Correlation	.250	.356*	.399*	.212	.275	1	-.016	.216	-.024
	Sig. (2-tailed)	.125	.026	.012	.196	.091		.924	.187	.884
	N	39	39	39	39	39	39	39	39	39
MEAN ATU	Pearson Correlation	.640**	.230	.346*	.367*	.605**	-.016	1	.486**	.799**
	Sig. (2-tailed)	.000	.158	.031	.021	.000	.924		.002	.000
	N	39	39	39	39	39	39	39	39	39
MEAN PI	Pearson Correlation	.497**	.142	.643**	.301	.484**	.216	.486**	1	.696**
	Sig. (2-tailed)	.001	.389	.000	.063	.002	.187	.002		.000
	N	39	39	39	39	39	39	39	39	39
MEAN BI	Pearson Correlation	.596**	.183	.439**	.334*	.543**	-.024	.799**	.696**	1
	Sig. (2-tailed)	.000	.265	.005	.038	.000	.884	.000	.000	
	N	39	39	39	39	39	39	39	39	39
*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).										

❋ Constructs Mediating the Continuance Intention towards WFT

Table 3-8. Descriptive Statistics of Various Determinants for Continuance Intention of WFT

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
MEANPE	39	4.00	1.00	5.00	3.6987	1.01499	-1.127	.378	1.299	.741
MEANHM	39	4.00	1.00	5.00	3.8036	1.06197	-.931	.378	.679	.741
MEANDA	39	3.50	1.50	5.00	3.6923	.81810	-.216	.378	-.023	.741
MEANSA	39	4.00	1.00	5.00	3.4872	1.01623	-.836	.378	.971	.741
MEANEC	39	4.00	1.00	5.00	3.4105	1.00712	-.722	.378	.743	.741
MEANCI	39	4.00	1.00	5.00	3.7015	.82991	-.783	.378	1.951	.741
Valid N (listwise)	39									

Table 3-9. Correlation Between the Constructs Mediating the Continuance Intention Towards WFT

		MEAN PE	MEAN DA	MEAN HM	MEAN SA	MEAN EC	MEAN CI
MEAN PE	Pearson Correlation	1	.442**	.646**	.510**	.495**	.601**
	Sig. (2-tailed)		.005	.000	.001	.001	.000
	N	39	39	39	39	39	39
MEAN DA	Pearson Correlation	.442**	1	.419**	.324*	.249	.336*
	Sig. (2-tailed)	.005		.008	.044	.126	.037
	N	39	39	39	39	39	39
MEAN HM	Pearson Correlation	.646**	.419**	1	.599**	.573**	.631**
	Sig. (2-tailed)	.000	.008		.000	.000	.000
	N	39	39	39	39	39	39
MEAN SA	Pearson Correlation	.510**	.324*	.599**	1	.674**	.775**
	Sig. (2-tailed)	.001	.044	.000		.000	.000
	N	39	39	39	39	39	39
MEAN EC	Pearson Correlation	.495**	.249	.573**	.674**	1	.686**
	Sig. (2-tailed)	.001	.126	.000	.000		.000
	N	39	39	39	39	39	39
MEAN CI	Pearson Correlation	.601**	.336*	.631**	.775**	.686**	1
	Sig. (2-tailed)	.000	.037	.000	.000	.000	
	N	39	39	39	39	39	39

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

❋ **Determinants for Aesthetics of Experience Mediating the Behavioural Intention towards WFT**

Table 3-10. Descriptive Statistics for the various constructs determining the Aesthetics of Experiences

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PER_r Mean	39	3.50	1.00	4.50	2.6538	.84413	-.341	.378	-.009	.741
PPRa_r_Mean	39	4.00	1.00	5.00	3.1967	1.19637	-.104	.378	-.747	.741
PPRb_r_Mean	39	4.00	1.00	5.00	2.8803	1.13806	.228	.378	-.702	.741
PPRc_r_Mean	39	4.00	1.00	5.00	2.9744	1.00622	-.130	.378	-.440	.741
PSR_r_Mean	39	4.00	1.00	5.00	3.6154	1.24876	-.434	.378	-.804	.741
PFR_r_Mean	39	4.00	1.00	5.00	2.9749	.89318	.071	.378	-.302	.741
AOE	39	2.22	2.21	4.43	3.5154	.51000	-.505	.378	.350	.741
HM_Mean	39	4.00	1.00	5.00	3.8036	1.06197	-.931	.378	.679	.741
DA_Mean	39	3.50	1.50	5.00	3.6923	.81810	-.216	.378	-.023	.741
Valid N (listwise)	39									

Table 3-11. Correlation Between the Constructs Mediating the Aesthetic Experiences

		PER_r Mean	PPRa_r Mean	PPRb_r Mean	PPRc_r Mean	PSR_r Mean	PFR_r Mean	DA MEAN	HM MEAN
PER_r Mean	Pearson Correlation	1	.556**	.435**	.291	.494**	.366*	-.364*	.020
	Sig. (2-tailed)		.000	.006	.072	.001	.022	.023	.904
	N	39	39	39	39	39	39	39	39
PPRa_r Mean	Pearson Correlation	.556**	1	.559**	.427**	.862**	.530**	-.499**	-.167
	Sig. (2-tailed)	.000		.000	.007	.000	.001	.001	.310
	N	39	39	39	39	39	39	39	39
PPRb_r Mean	Pearson Correlation	.435**	.559**	1	.503**	.449**	.745**	-.397*	-.190
	Sig. (2-tailed)	.006	.000		.001	.004	.000	.012	.247
	N	39	39	39	39	39	39	39	39
PPRc_r Mean	Pearson Correlation	.291	.427**	.503**	1	.476**	.537**	-.123	-.020
	Sig. (2-tailed)	.072	.007	.001		.002	.000	.458	.906
	N	39	39	39	39	39	39	39	39
PSR_r Mean	Pearson Correlation	.494**	.862**	.449**	.476**	1	.524**	-.373*	-.235
	Sig. (2-tailed)	.001	.000	.004	.002		.001	.019	.150
	N	39	39	39	39	39	39	39	39

PFR_r Mean	Pearson Correlation	.366*	.530**	.745**	.537**	.524**	1	-.261	-.092
	Sig. (2-tailed)	.022	.001	.000	.000	.001		.109	.579
	N	39	39	39	39	39	39	39	39
DA MEAN	Pearson Correlation	-.364*	-.499**	-.397*	-.123	-.373*	-.261	1	.419**
	Sig. (2-tailed)	.023	.001	.012	.458	.019	.109		.008
	N	39	39	39	39	39	39	39	39
HM MEAN	Pearson Correlation	.020	-.167	-.190	-.020	-.235	-.092	.419**	1
	Sig. (2-tailed)	.904	.310	.247	.906	.150	.579	.008	
	N	39	39	39	39	39	39	39	39
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).									

3.4.6. Response to Research Questions

RQ.12 **Does General and Technology Self-Efficacy play any role in the Attitude towards health Technology?**

Regression analysis is carried out to answer this question. The Behavioural Intention is the Dependent Variable, and General Self Efficacy and Technology Self Efficacy are the concerned dependent Variable shown in Table 3-12 and Table 3-13.

Table 3-12. Regression Analysis Technology Self Efficacy vs Attitude towards health Technology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.537[a]	.288	.249	.60255
a. Predictors: (Constant), Mean_GSE, Mean_TSE				

Table 3-13. ANOVA for General Self Efficacy, and Technology Self Efficacy vs Attitude Towards Health Technology

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.289	2	2.644	7.283	.002[b]
	Residual	13.070	36	.363		
	Total	18.359	38			

Table 3-14. Coefficients [a] of Regression Analysis between General Self Efficacy, Technology Self Efficacy and Attitude Towards Health Technology

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.566	.644		2.434	.020
	Mean_TSE	-.114	.148	-.119	-.771	.446
	Mean_GSE	.635	.170	.575	3.723	.001
a. Dependent Variable: Mean_ATHT						

From the above tables, it is seen that higher levels of General and Technology Self Efficacy result in a higher value of Attitude towards Health Technology. Hence, it can be concluded that people with High General and Technology Self Efficacy are more interested in using Health Technology.

RQ.13 **How does Attitude towards health technology affects the attitude towards the WFT?**

From above, it has been concluded that general and technology self-efficacy has a significant role in determining Attitude towards health technology. A correlation test has been done to understand the relationship between attitude towards the health technology and attitude towards the WFT and find the person correlation coefficients and the level of coherence and directionality between ATHT, ATU and BI towards WFT.

Table 3-15. Correlation between ATHT, ATU and BI

		Mean_ATHT	**MEANBI**	**MEANATU**
Mean_ATHT	Pearson Correlation	1	.404*	.395*
	Sig. (2-tailed)		.011	.013
	N	39	39	39
MEANBI	Pearson Correlation	.404*	1	.799**
	Sig. (2-tailed)	.011		.000
	N	39	39	39
MEANATU	Pearson Correlation	.395*	.799**	1
	Sig. (2-tailed)	.013	.000	
	N	39	39	39
*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).				

Results show a solid and robust correlation between the three, with very high coherence between ATU and BI, i.e., (0.799). Moreover, the corresponding p-value indicates that the correlation is significant at 0.05 and 0.01 levels. Also, a regression analysis has been done between Behavioural Intention and Attitude Towards Health Technology to find how the ATHT affects the BI of the WFT shown in Table 3-16 and Table 3-17.

Table 3-16. Model Summary [a] for Regression Analysis between ATHT and BI

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.404[a]	.164	.141	.93139
a. Predictors: (Constant), Mean_ATHT				

Table 3-17. ANOVA [a] for Attitude towards Health Technology vs Behavioural Intention towards WFT

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.275	1	6.275	7.233	.011[b]
	Residual	32.097	37	.867		
	Total	38.372	38			
a. Dependent Variable: MEANBI b. Predictors: (Constant), Mean_ATHT						

Table 3-18. Coefficients of ANOVA for ATHT vs BI

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.509	.785		1.922	.062
	Mean_ATHT	.585	.217	.404	2.690	.011
a. Dependent Variable: MEANBI						

The regression analysis shows that the attitude towards health technology has a linear relationship with the behavioural intention towards WFT. Hence, the attitude towards health technology can moderate the behaviour of a person towards the WFT

RQ.14 **What design interventions can be introduced to prolong the Wearable Fitness trackers' usage to make them more acceptable to the actual consumers and attract more potential customers?**

The subsequent section deals with the necessary design interventions.

3.4.7. Structural Equation Model

a. **Model 1 – Relationship among Perceived Risk and the Behavioural Intention towards the WFT.**

From the survey and the data analysis, it is observed that people are very much concerned regarding the risk associated with the use of WFT. The exploratory factor analysis has been carried out to obtain the relation between the Perceived Risk and the behavioural Intention towards the WFT.

I. Exploratory Factor Analysis

The Extraction Method used in the EFA is Principal Component Analysis. Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, where the Rotation converged in 5 iterations, as shown below.

Table 3-19. Pattern Matrix for Perceived Risk and Behavioural Intention

	Component				
	1	2	3	4	5
PPRc2R	.944				
PPRc3R	.862				
PPRc1R	.844				
PPRc4R	.837				
PPRa2R		.960			
PPRa3R		.923			
PPRa1R		.873			
PPRb3R			.960		
PPRb2R			.933		
PPRb1R			.915		
BI2				.943	
BI3				.929	
BI1				.849	
PER1R					.955
PER2R					.891
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.					
a. Rotation converged in 5 iterations.					

Table 3-20. KMO and Bartlett's Test for Model 1

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	496.367
	df	105
	Sig.	.000

The KMO is .720, which is above the threshold level of adequacy for the analysis to be acceptable.

II. **Confirmatory Factor Analysis**

The CFA is obtained using the AMOS *Version 22*, and the corresponding regression weight is shown in the following figure. The CFA for understanding the relationship among the various determinants shows their corresponding regression weights

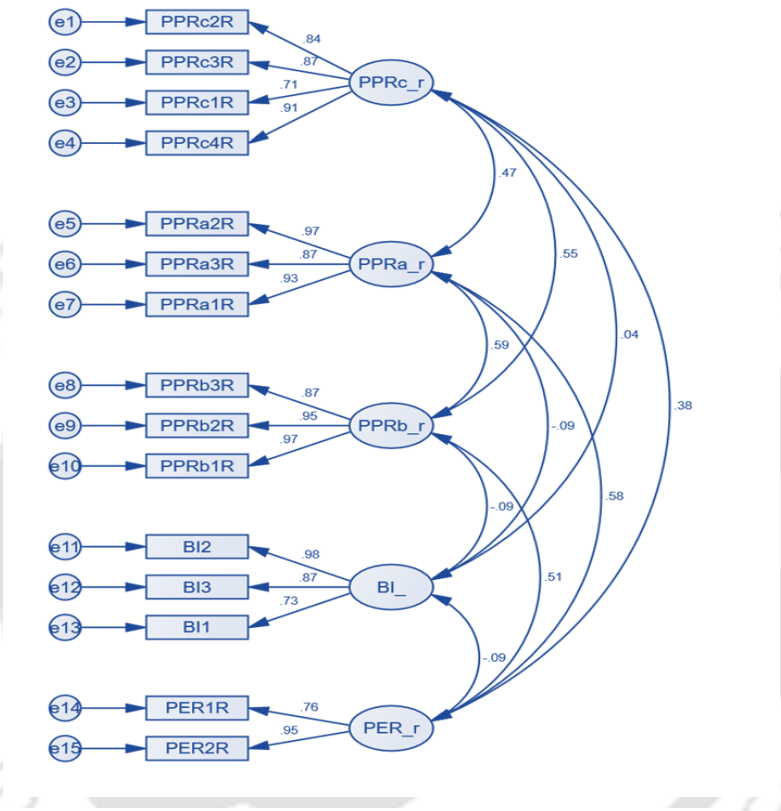


Figure 3-3. CFA for Risk-free attitude and Behavioural Intention Towards WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA

Table 3-21. Master Validity for Model 1

	CR	AVE	MSV	MaxR(H)	PPRc_r	PPRa_r	PPRb_r	BI_	PER_r
PPRc_r	0.901	0.695	0.304	0.918	0.834				
PPRa_r	0.947	0.856	0.352	0.964	0.474*	0.925			
PPRb_r	0.952	0.868	0.352	0.968	0.551**	0.594**	0.931		
BI_	0.899	0.751	0.008	0.967	0.039	-0.088	-0.088	0.867	
PER_r	0.847	0.737	0.332	0.910	0.384†	0.576*	0.505*	-0.090	0.859

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

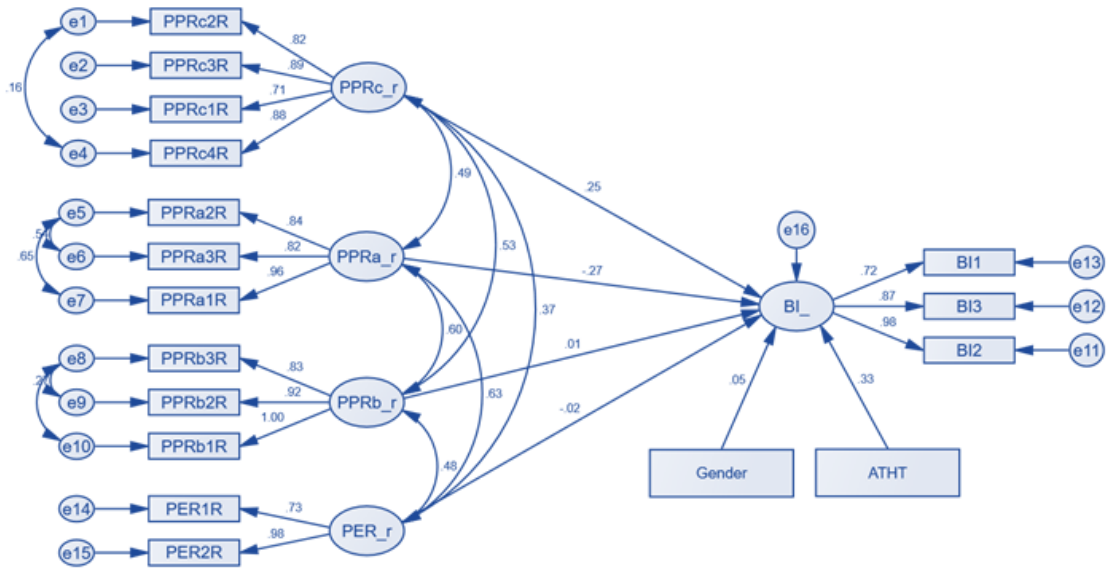


Figure 3-5. Structural Equation Model for Association of Perceived Risk into the Behavioural Intention Towards WFT

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN, DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured.

Table 3-22. Measurement of the Model Fit of the Model 1

Measure	Estimate	Threshold	Interpretation
CMIN	129.182	--	--
DF	104	--	--
CMIN/DF	1.242	Between 1 and 3	Excellent
CFI	0.948	>0.95	Acceptable
SRMR	0.095	<0.08	Acceptable
RMSEA	0.080	<0.06	Acceptable
PClose	0.164	>0.05	Excellent

The above table shows that the model fit approves the recommended threshold values, and thus the model is considered fit and accepted.

b. **Model 2 – Intervention Design Model for the Behavioural Intention towards WFT**

The model for the acceptance of technology demands an in-depth approach for understanding the basic emotional expectations, thereby providing better solutions concerning the acceptance of WFT. The following model incorporates the essential constructs in determining the Perception and Acceptance of WFT.

I. **Exploratory Factor Analysis**

The Extraction Method used in the EFA is Image Factoring which is constructed on the correlation matrix of the predicted dependent variables rather than the actual variables. With the help of multiple regression, each variable is projected from the other (Statistics Solutions). Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, where the Rotation converged in 8 iterations, as shown below.

Table 3-23. Pattern Matrix for Modified Model for Understanding the Behavioural Intention of WFT

	Component							
	1	2	3	4	5	6	7	8
ATU2	.989							
ATU4	.929							
ATU3	.870							
BI1	.864							
BI2	.775							
BI3	.636							
ATU1	.561							
SI1		.912						
SI2		.795						
SI3		.791						
DA2			.926					
DA1			.851					
DA4			.837					
DA3			.688					
HM3				.995				
HM1				.881				
HM2				.851				
EE2					.938			
EE3					.888			
EE1					.840			
PE4						.896		
PE2						.761		
PE3						.585		
PE1						.511		
PV1							.851	
PV3						.514	.837	
PV2							.692	
PI2								.735
PI3								.663
PI1								.567
Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization.								
a. Rotation converged in 8 iterations.								

Table 3-24. KMO and Bartlett's Test for Model 2

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.653
Bartlett's Test of Sphericity	Approx. Chi-Square	929.998
	df	300
	Sig.	.000

The KMO is .653, which is above the threshold level of adequacy for the analysis to be acceptable.

II. **Confirmatory Factor Analysis**

The CFA is obtained using the AMOS *Version 22*, and the corresponding regression weight is shown in the following figure. The CFA for understanding the relationship among the various determinants shows their corresponding regression weights.

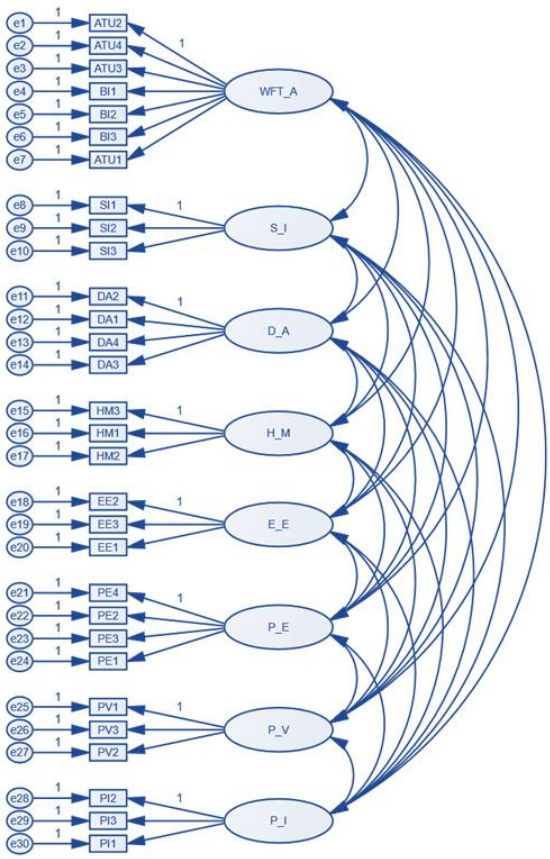


Figure 3-6. CFA of Behavioural Intention Towards WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA.

Table 3-25. Master Validity for Model 2

	CR	AVE	MSV	Max R(H)	WFT_A	S_I	D_A	H_M	E_E	P_E	P_V	P_I
WFT_A	0.942	0.702	0.464	0.960	0.838							
S_I	0.944	0.848	0.475	0.956	0.405*	0.921						
D_A	0.863	0.617	0.228	0.903	0.399*	0.434*	0.786					
H_M	0.952	0.868	0.513	0.957	0.617**	0.515**	0.430*	0.932				
E_E	0.889	0.728	0.223	0.890	0.274	0.223	0.180	0.366†	0.853			
P_E	0.915	0.730	0.513	0.921	0.681**	0.552**	0.477*	0.716**	0.386†	0.854		
P_V	0.840	0.641	0.223	0.894	-0.056	0.400*	0.253	0.286	0.472*	0.207	0.801	
P_I	0.858	0.671	0.475	0.901	0.605**	0.689**	0.384*	0.570**	0.217	0.529*	0.178	0.819

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

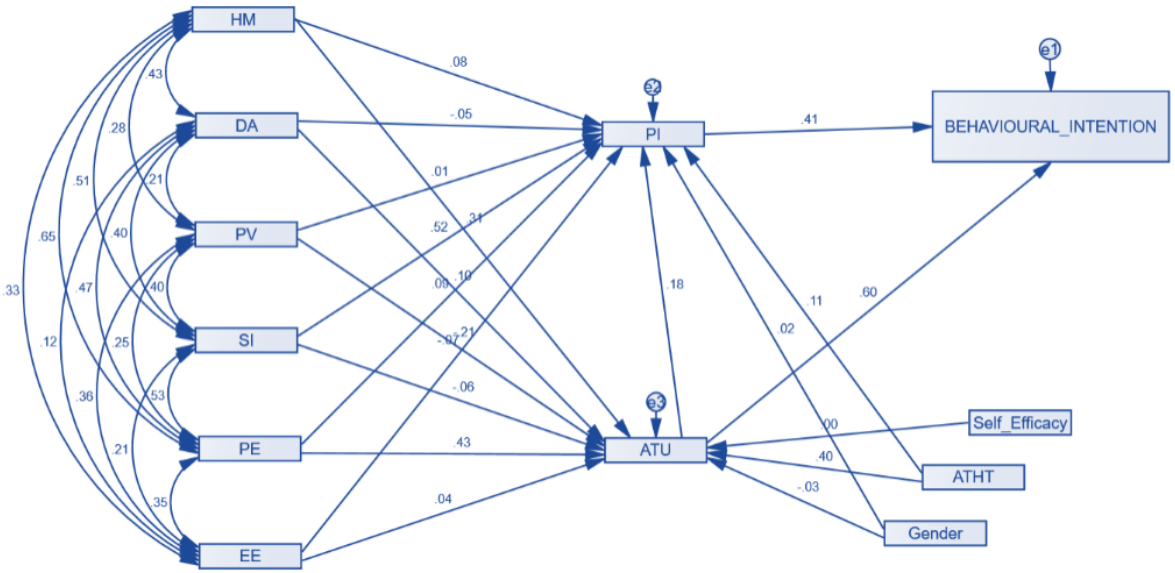


Figure 3-7. Proposed Structural Equation Model for Understanding Behavioural Intention towards WFT

V. Model Fit Measures

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. The corresponding values of CMIN, DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured.

Table 3-26. The measure of the Model Fit of the Model 2

Measure	Estimate	Threshold	Interpretation
CMIN	24.612	--	--
DF	31	--	--
CMIN/DF	0.794	Between 1 and 3	Excellent
CFI	1.000	>0.95	Excellent
SRMR	0.094	<0.08	Acceptable
RMSEA	0.000	<0.06	Excellent
PClose	0.868	>0.05	Excellent

The above table shows that the model fit approves the recommended threshold values, and thus the model is considered fit and accepted.

c. Model 3 - Design Intervention Model for the Continuance Intention towards WFT

Despite the functionality of the existing WFT, the device suffers unsustainability in its usage. Hence, enhancing these devices' adherence demands an in-depth approach for understanding the basic emotional expectations. The following model incorporates those constructs which are considered to be essential.

I. Exploratory Factor Analysis

The Extraction Method used in the EFA is Image Factoring. Furthermore, Promax with Kaiser Normalization is used as the Rotation Method, where the Rotation converged in 7 iterations, as shown below.

Table 3-27. Pattern Matrix for Modified Continuance Intention of WFT

	Factor					
	1	2	3	4	5	6
EC3	.888					
EC2	.873					
EC1	.814					
HM1		.971				
HM3		.905				
HM2		.832				
PE4			.943			
PE2			.895			
PE3			.645			
PE1			.541			
CI1				.963		
CI2				.907		
CI3				.633		
DA2					.848	
DA1					.796	
DA4					.721	
SA4						.719
SA5						.636
Extraction Method: Image Factoring. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 7 iterations.						

Table 3-28. KMO and Bartlett's Test for Modified Continuance Intention of WFT

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.829
Bartlett's Test of Sphericity	Approx. Chi-Square	701.310
	df	153
	Sig.	.000

Furthermore, the KMO is .829, which is above the threshold level of adequacy for the analysis to be acceptable, and Barlett’s test for sphericity approves the significance level.

II. **Confirmatory Factor Analysis**

The CFA is obtained using the AMOS *Version 22*, and the corresponding regression weight is shown in the following figure. The CFA for understanding the relationship among the various determinants shows their corresponding regression weights

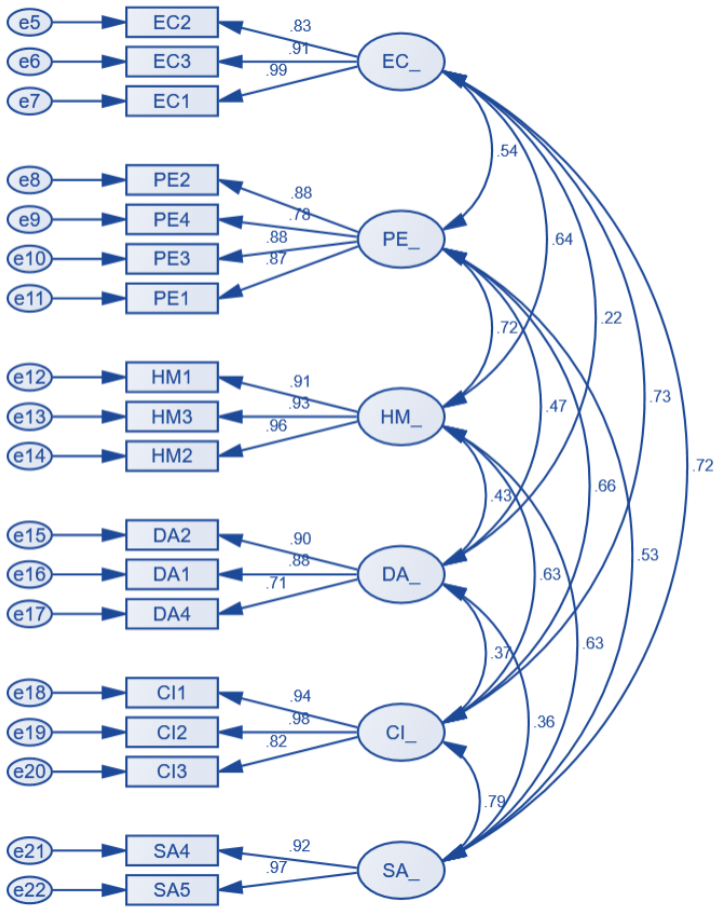


Figure 3-8. CFA for Modified Continuance Intention of WFT

III. **Validity Master**

The corresponding values of the reliability and the reliability factors were calculated using the master validity plugin. The values are provided in tabulated form. All the threshold values are achieved in the CFA.

Table 3-29. Master Validity for Modified Continuance Intention of WFT

	CR	AVE	MSV	MaxR(H)	EC_	PE_	HM_	DA_	CI_	SA_
EC_	0.936	0.831	0.528	0.982	0.912					
PE_	0.914	0.728	0.521	0.920	0.541**	0.853				
HM_	0.952	0.868	0.521	0.957	0.638**	0.722**	0.931			
DA_	0.873	0.698	0.219	0.898	0.218	0.468*	0.431*	0.835		
CI_	0.941	0.842	0.618	0.972	0.727**	0.655**	0.625**	0.368*	0.918	
SA_	0.940	0.887	0.618	0.951	0.721**	0.533**	0.628**	0.356†	0.786***	0.942

The reliability, convergent and determinant validity values obtained from the analysis show no validity concerns.

IV. **Structural Model**

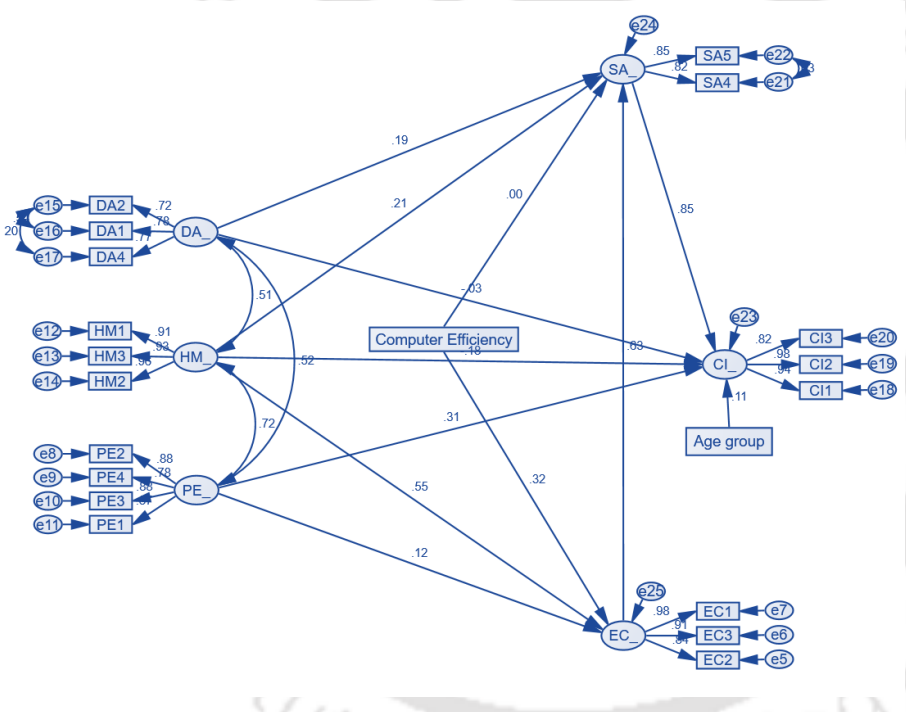


Figure 3-9. Proposed Structural Equation Model for Understanding Continuance Intention towards WFT

V. **Model Fit Measures**

The measures of the structural model are checked in AMOS using the Model Fit Measure Plugin. CMIN, DF, CMIN/DF, CFI, SRMR, RMSEA, and PClose are measured.

Table 3-30. A Measure of the Model Fit of the Model 3

Measure	Estimate	Threshold	Interpretation
CMIN	190.688	--	--
DF	154	--	--
CMIN/DF	1.238	Between 1 and 3	Excellent
CFI	0.947	>0.95	Acceptable
SRMR	0.071	<0.08	Excellent
RMSEA	0.079	<0.06	Acceptable
PClose	0.127	>0.05	Excellent

The above table shows that the model fit approves the recommended threshold values, and thus the model is considered fit and accepted.

3.5. Hypothesis Testing

To establish the hypothesis as true or false, three tests have been conducted as given below.

Test 1

Aim: To find the relation between attitude towards health technology and behavioural and continuous intention towards the WFT.

A correlation analysis has been carried out to find the directional coherence between the Attitude towards Health Technology and Behavioural intention (BI) towards WFT. In addition, to understand the difference, regression analysis has been carried out between attitude towards Health Technology (ATHT) and Behavioural Intention (BI) towards WFT. Furthermore, it exhibits the Analysis of Variance Test that produces the Residual Value and the Significance

to determine whether the BI means are significantly different for different levels of ATHT.

Table 3-31. Descriptive Statistics for ATHT vs BI

	Mean	Std. Deviation	N
Mean_ATHT	3.5449	.69508	39
MEANBI	3.5810	1.00488	39

Table 3-32. Correlations between ATHT and BI

		Mean_ATHT	MEANBI
Mean_ATHT	Pearson Correlation	1	.404*
	Sig. (2-tailed)		.011
	N	39	39
MEANBI	Pearson Correlation	.404*	1
	Sig. (2-tailed)	.011	
	N	39	39
*. Correlation is significant at the 0.05 level (2-tailed).			

There is a significant correlation between the Attitude towards Health Technology and the Behavioural Intention towards WFT, which implies that a person's attitude towards the health technology may alter the behavioural Intention towards the device.

Table 3-33. ANOVA table for Test 1

		Sum of Squares	df	Mean Square	F	Sig.
MEANBI	Between Groups	9.143	2	4.572	5.631	.007
	Within Groups	29.229	36	.812		
	Total	38.372	38			
MEANCI	Between Groups	10.649	2	5.324	12.347	.000
	Within Groups	15.524	36	.431		
	Total	26.173	38			

The Analysis of Variance Test significantly shows a significant difference in the mean of Behavioural and Continuous Intention in people with a more positive attitude towards health technology.

Table 3-34. Multiple Comparisons of Attitude towards Health Technology Towards Behavioural and Continuance Intention

Dependent Variable		(I) ATHT	(J) ATHT	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
MEANBI	Tukey HSD	low	medium	.71543	.52761	.374	-.5742	2.0051
			high	-.54230	.43869	.440	-1.6146	.5300
		medium	low	-.71543	.52761	.374	-2.0051	.5742
			high	-1.25772*	.38217	.006	-2.1919	-.3236
		high	low	.54230	.43869	.440	-.5300	1.6146
			medium	1.25772*	.38217	.006	.3236	2.1919
MEANCI	Tukey HSD	low	medium	.98200*	.38451	.039	.0421	1.9219
			high	-.39837	.31971	.434	-1.1798	.3831
		medium	low	-.98200*	.38451	.039	-1.9219	-.0421
			high	-1.38037*	.27852	.000	-2.0612	-.6996
		high	low	.39837	.31971	.434	-.3831	1.1798
			medium	1.38037*	.27852	.000	.6996	2.0612
*. The mean difference is significant at the 0.05 level.								

Through the multiple comparisons among the people with different levels of Attitude towards health technology, i.e., low medium and high and their behavioural and Continuance Intention towards WFT, it is visible that there are significant differences in the mean of Behavioural and Continuance Intention in people having different attitudes towards health technology. Hence it can be concluded that a positive attitude towards Health Technology influences the behavioural intention of WFT, which is accepted.

Test 2

Aim: To find the Influence of the Aesthetical Experience design in the Behavioural intention of the WFT.

A correlation analysis has been carried out to find the directional coherence between the Design Aesthetic, Hedonic Motivation, Aesthetics of Experience (AOE) and Behavioural intention (BI) towards WFT. A regression analysis has also been carried out to find the directionality and relation between the Aesthetics of Experience and Behavioural Intention towards WFT.

Table 3-35. Descriptive Statistics of Behavioural Intention towards WFT and Associated factors

	Mean	Std. Deviation	N
MEANDA	3.6746	.89033	39
MEANHM	3.8036	1.06197	39
MEANBI	3.5810	1.00488	39
AOE_Mean	3.5100	.52257	39

Table 3-36. Correlation among Behavioural Intention towards WFT and Associated factors

		MEANDA	MEANHM	MEANBI	AOE_Mean
MEANDA	Pearson Correlation	1	.419**	.334*	.619**
	Sig. (2-tailed)		.008	.038	.000
	N	39	39	39	39
MEANHM	Pearson Correlation	.419**	1	.543**	.831**
	Sig. (2-tailed)	.008		.000	.000
	N	39	39	39	39
MEANBI	Pearson Correlation	.334*	.543**	1	.531**
	Sig. (2-tailed)	.038	.000		.001
	N	39	39	39	39

AOE_ Mean	Pearson Correlation	.619**	.831**	.531**	1
	Sig. (2-tailed)	.000	.000	.001	
	N	39	39	39	39
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).					

The correlation among the design Aesthetics, Hedonic Motivation, Aesthetics of Experiences and the Behavioural Intention towards WFT is significant, and their directional coherence is very high.

Table 3-37. Regression Analysis Model Summary for Behavioural Intention Towards WFT and Aesthetics of Experiences

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.531[a]	.282	.262	.86320	.282	14.498	1	37	.001
a. Predictors: (Constant), AOE_Mean b. Dependent Variable: MEANBI									

Table 3-38. ANOVA Table for Behavioural Intention Towards WFT And Associated Aesthetics of Experiences

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.803	1	10.803	14.498	.001[b]
	Residual	27.569	37	.745		
	Total	38.372	38			
a. Dependent Variable: MEANBI b. Predictors: (Constant), AOE_Mean						

The Analysis of Variance between the Aesthetics of Experiences and the Behavioural Intention towards WFT has been performed. It gives a significant relationship among the two, as clearly visible from the table above. The change is that the AOE has a significant influence on the change in the BI. Hence it can be concluded that Aesthetics of Experience influences the behavioural intention of WFT is Accepted.

Test 3

Aim: To find the Influence of the Aesthetical Experience design in the continuance intention of the WFT.

A correlation analysis has been carried out to find the directional coherence between the Design Aesthetics (DA), Hedonic Motivation (HM), Aesthetics of Experience (AOE) and Continuance Intention (CI) towards WFT. A regression analysis has also been carried out to find the directionality and relation between the Design and Aesthetics of Experience through the constructs, namely, Design Aesthetics and Hedonic Motivation (HM) with the Continuance Intention (CI) towards WFT.

Table 3-39. Descriptive Statistics

	Mean	Std. Deviation	N
MEANDA	3.6746	.89033	39
MEANHM	3.8036	1.06197	39
AOE_Mean	3.5100	.52257	39
MEANCI	3.7015	.82991	39

Table 3-40. Correlation among Continuance Intention towards WFT and Associated factors

		MEANDA	MEANHM	AOE Mean	MEANCI
MEAN DA	Pearson Correlation	1	.419**	.619**	.336*
	Sig. (2-tailed)		.008	.000	.037
	N	39	39	39	39
MEAN HM	Pearson Correlation	.419**	1	.831**	.631**
	Sig. (2-tailed)	.008		.000	.000
	N	39	39	39	39
AOE Mean	Pearson Correlation	.619**	.831**	1	.560**
	Sig. (2-tailed)	.000	.000		.000
	N	39	39	39	39
MEAN CI	Pearson Correlation	.336*	.631**	.560**	1
	Sig. (2-tailed)	.037	.000	.000	
	N	39	39	39	39
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).					

The correlation among the design Aesthetics, Hedonic Motivation, Aesthetics of Experiences and the Continuance Intention towards WFT is essentially significant, and their directional coherence is very high.

Table 3-41. Regression Analysis Model Summary[b] for Behavioural Intention Towards WFT and Associated Aesthetics of Experiences

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.560[a]	.314	.295	.69660	.314	16.936	1	37	.000
a. Predictors: (Constant), AOE_Mean b. Dependent Variable: MEANCI									

Table 3-42. ANOVA[a] Table for Behavioural Intention Towards WFT And Associated Aesthetics of Experiences

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.218	1	8.218	16.936	.000[b]
	Residual	17.955	37	.485		
	Total	26.173	38			
a. Dependent Variable: MEANCI b. Predictors: (Constant), AOE_Mean						

The Analysis of Variance between the Aesthetics of Experiences and the Behavioural Intention towards WFT has been performed. It gives a significant relationship among the two, as clearly visible from the table above. The change is that the AOE has a significant influence on the change in the CI. Hence it can be concluded that Aesthetics of Experience mediates the continuous intention of WFT is Accepted.

Hence, the research hypothesis - Design intervention in the wearable healthcare fitness tracker devices could look into the motivational perception of the users' needs and aesthetics of experiences for the continuance acceptance of these devices and ensuring healthy ageing **is accepted.** With the acceptance of the hypothesis, a direction has been achieved to proceed towards the Design Intervention.

3.6. Design Intervention

In this section, various design modifications are proposed for the better and sustainable usage of the devices. Before explaining the interventions suggested, it is essential to understand the primary mechanism of these devices. The following section gives how these devices can convert a person's vitals into health parameters and code and decode them into understandable information through various algorithms.

3.6.1. Wearable Fitness Tracker – how it works

It is essential to study these devices to understand the working mechanism of WFT. It can track an individual's physical activity and quantify it into meaningful data with various functionality. The following figure gives a schematic representation of the fitness tracker components (Nield, 2017).

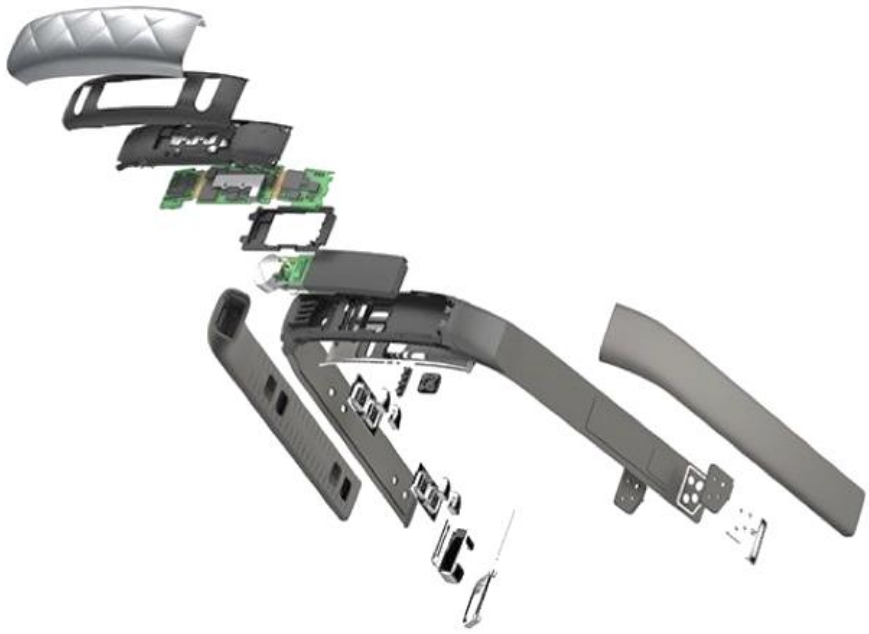


Figure 3-10. Schematic Representation of the Components of Wearable Fitness Trackers

These trackers measure motion with the help of the embedded 3-axis accelerometer to track movement in all directions. These data are then

converted into steps and activities (Nield, 2017). Furthermore, the calories expenditure and sleep quality are deduced from these parameters. Next, it has an altimeter capable of measuring the person's altitude, which gives the data for stairs or height climbed during regular access of stairs or trekking. Figure 3-11 presents the schematic representation of the sensors embedded in these devices.

Figure 3-11. Sensors used in the Wearable Fitness Tracker (Nield, 2017)

Some trackers use optical sensors that shine on a person's skin and measure the pulse through it. The process here involved is known as photoplethysmography. The light illuminates the blood capillaries, and a sensor measures the blood's rate being pumped through blood vessels. This process can gauge the overall heart condition but is more effective in reading the heart rate while performing physical activities. Furthermore, the sleep tracking process, also known as actigraphy, involves the sensors where the trackers translate the wrists movement into the sleep pattern detection method. The components in these activity trackers are pretty progressive and competent in their respective domains, are shown in the following figure and table.

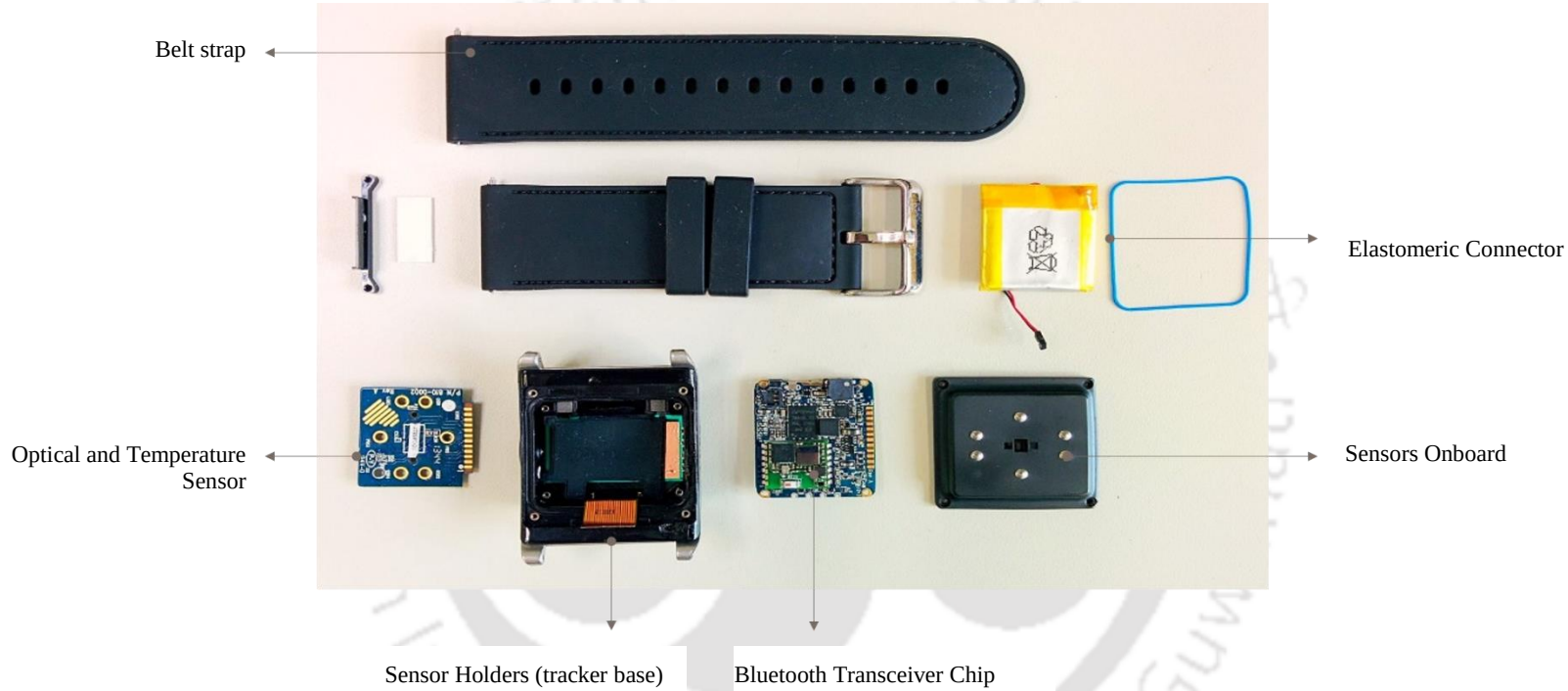


Figure 3-12. Teardown of the Wearable Fitness Tracker

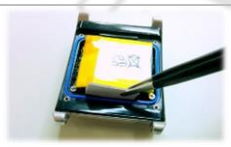
The figure above gives the teardown components of one of such fitness activity trackers (Choe, et al., 2014), where each element represents a specific function proving its essentiality in the process. All the components embedded in the fitness trackers significantly addresses the various functionalities necessary for tracking the various activities an individual perform every day.

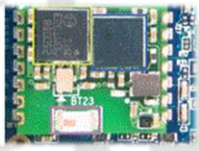
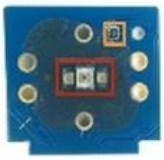
The following table provides a detailed layout and the technical specifications of WFT, where the coloured bulleted labels represent the corresponding components in the adjacent images.

Table 3-43. Description of the components used in the Wearable Fitness Trackers

	• Technical Specifications
	  • 1 MHz RISC 16 Bit MicroController, Active Mode @ 400uA
	  • Ultra Low-Power Consumption at Standby Mode @ 1.3uA, and Off-Mode with RAM Retention @ 0.22uA
	  • Sensors onboard: Optical blood flow; Galvanic Skin response (perspiration), Ambient Temperature, Body Temperature, 3-Axis Accelerometer

	• Remove the elastomeric (aka zebra) connector

	• 1st Temperature Sensor (Texas Instruments) TMP112 marked as OBS. This might be one of the sensors that detects the *ambient temperature* as it is positioned away from the human body • 25P32V6G - ST 32MB NOR Serial Flash Memory • Analog Devices - ADXL335B, 3-Axis Accelerometer • Freescale MPR121 Proximity Capacitive Touch Sensor Controller (for the 4 capacitive touch buttons) as listed at this site & pictured here • MSP430xG461x- Texas Instruments MSP430 family of ultralow-power mixed signal microcontroller. Built-in Temperature Sensor.
	• Cortex M3 - STM32F103C6; Low-density performance line, ARM-based 32-bit MCU with 16 or 32 KB Flash, USB, CAN, 6 timers, 2 ADCs, 6 communication interfaces. Built-in temperature sensor here • Unknown 2500D8, 90MT323 Bluetooth Transceiver Chip • Chip Antenna
	• The wire bonded Optical Blood Flow Sensor (under a magnifying glass) with the two LED • 2nd Temperature Sensor (Texas Instruments) TMP112 marked as OBS. This might be one of the sensors that detects the *body temperature* as it is positioned nearer to the human body

3.6.3. Design Considerations

The following model represents the proposed design approach to construct and configure the ideology behind the development of Wearable Fitness Trackers, which shall ensure prolonged and continuous usage of these devices.

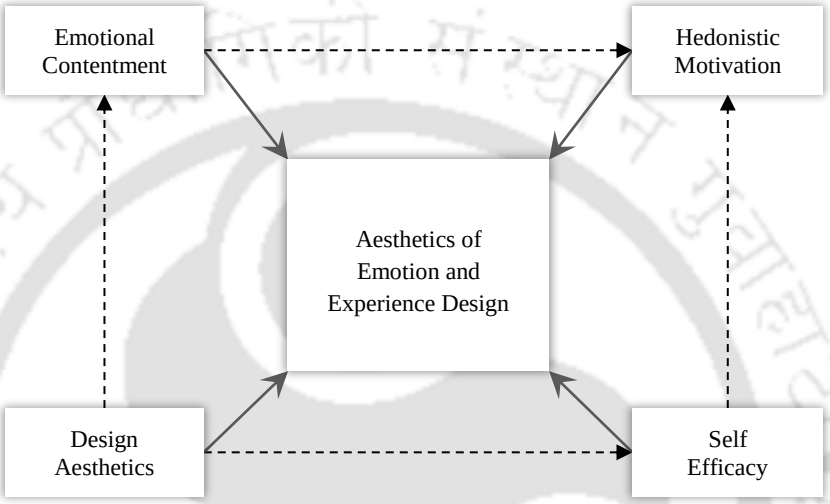


Figure 3-13. Design Intervention Model for WFT

The solid lines represent the direct influence of the factors on the Aesthetics of Experiences, and the dashed lines represent the inter-relationship among the factors.

3.6.4. Proposed Design Characteristics

The ideology behind the design is as follows:

i. It ensures the protection of the emotional attachment to the old beliefs and fashions of the older adults.
ii. It ensures the user's privacy and being free from judgment for using such devices.
iii. It is considered to reduce the recognizability or visibility of such devices such that people can wear them comfortably without others recognising the device to avoid any burden of being judged or commented on.

iv. Camouflaging the devices with apparent apparel or accessory reduces the cost of the facilitating conditions.

Dimensions

The existing wrist-worn WFT is available in varied shapes and sizes. The proposed model has been conceptualised considering a similar dimension to avoid any ergonomic entropy.

Existing Models Dimension

While designing the product, the dimensions of the top-selling and top-featured wearable fitness tracker have been considered, as shown in the table below:

Table 3-44. Dimensions of Existing Wrist-Worn Fitness Tracker Models (Omondi, 2021)

Model	Height (mm)	Width (mm)	Depth (mm)	Display (mm)	Weight (g)
Apple Watch Series 3					
38mm	38.6	33.3	11.4	34	42.4
42mm	42.5	36.4	11.4	40	52.8
Huawei Band 3 Pro	45	19	11	24.1	25
Huawei Watch 2	48.9	45	12.6	30	40
Samsung Galaxy Watch Active	39.5	39.5	10.5	28.1	25

The following figures give a schematic visual description of the dimensions of the Fitness Trackers.

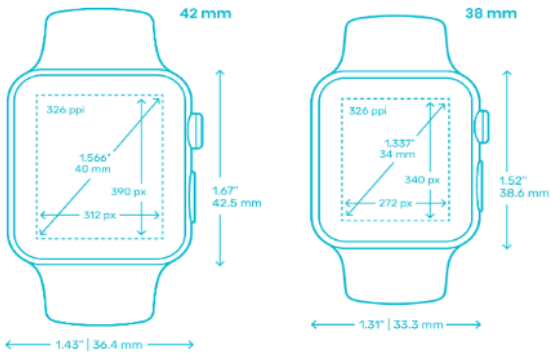


Figure 3-14. Apple Watch Series 3

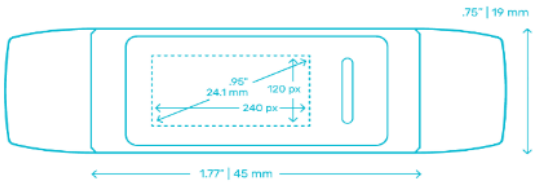


Figure 3-16. Huawei Band 3 Pro

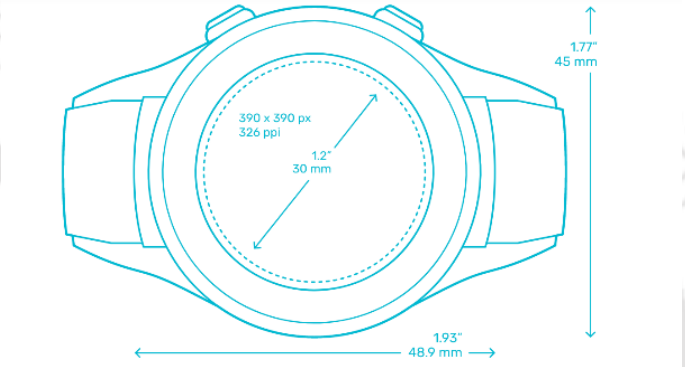


Figure 3-15. Huawei Watch 2

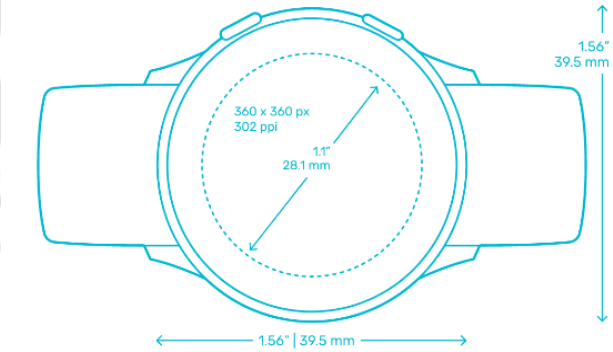


Figure 3-17. Samsung Galaxy Watch Active

3.6.5. Conceptualised Design Model

After considering the dimension of the existing models and understanding the ergonomic requirements, the following dimension has been finalised.

Table 3-45. Final Concept Design Dimension

Components	Height (mm)	Width (mm)	Depth (mm)
Sensor On-Board	19	39.5	2
Sensor Chip	14	25.5	2
Contact Plate	19	39.5	1.5

Conceptualised Designs

The following design concepts give the representations of the proposed design of WFT.

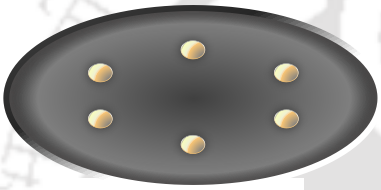


Figure 3-21. Contact plate

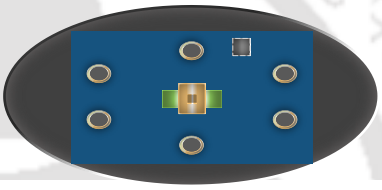


Figure 3-20. Optical and Temperature Sensor

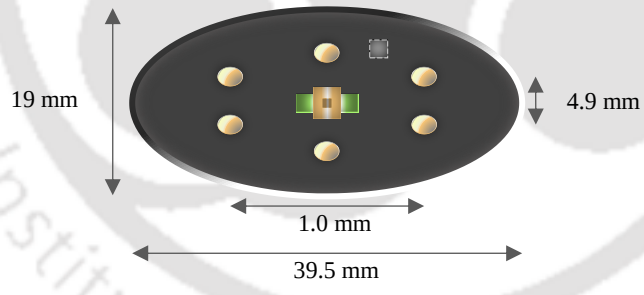


Figure 3-19. Sensor Onboard

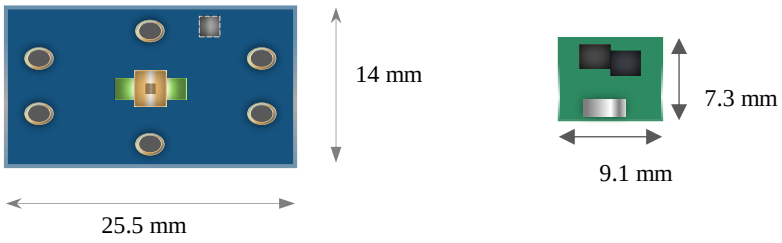


Figure 3-18. Sensor Chip Dimension

The following figures show the various essential components incorporated in the WFT.

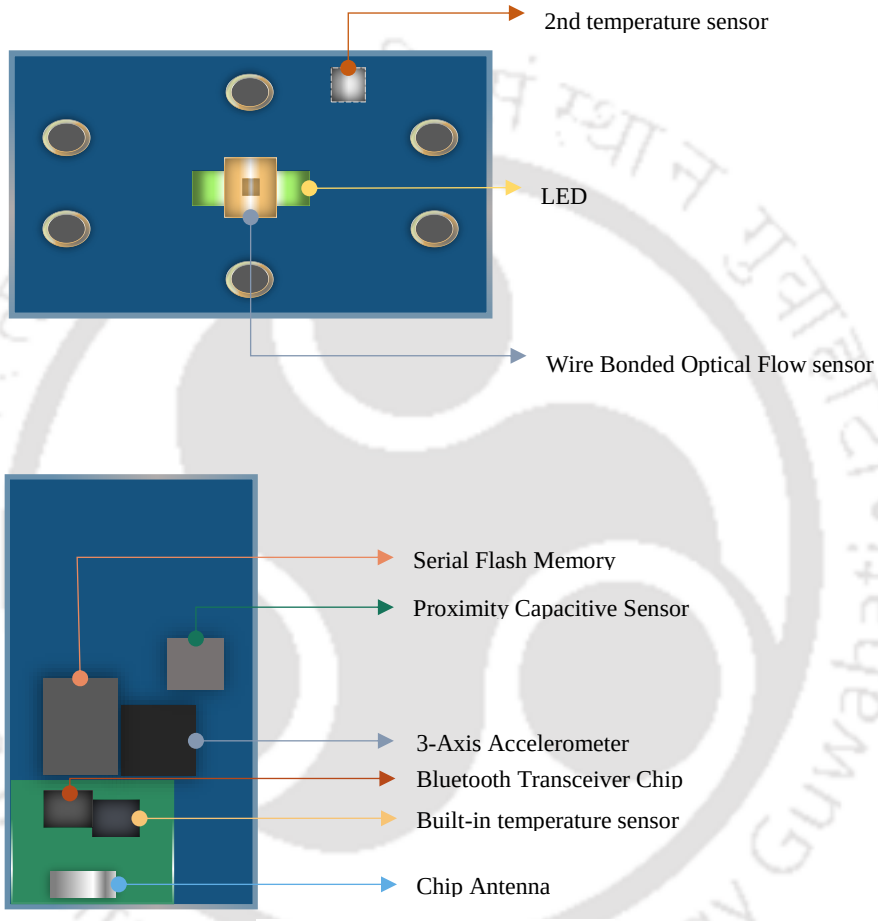
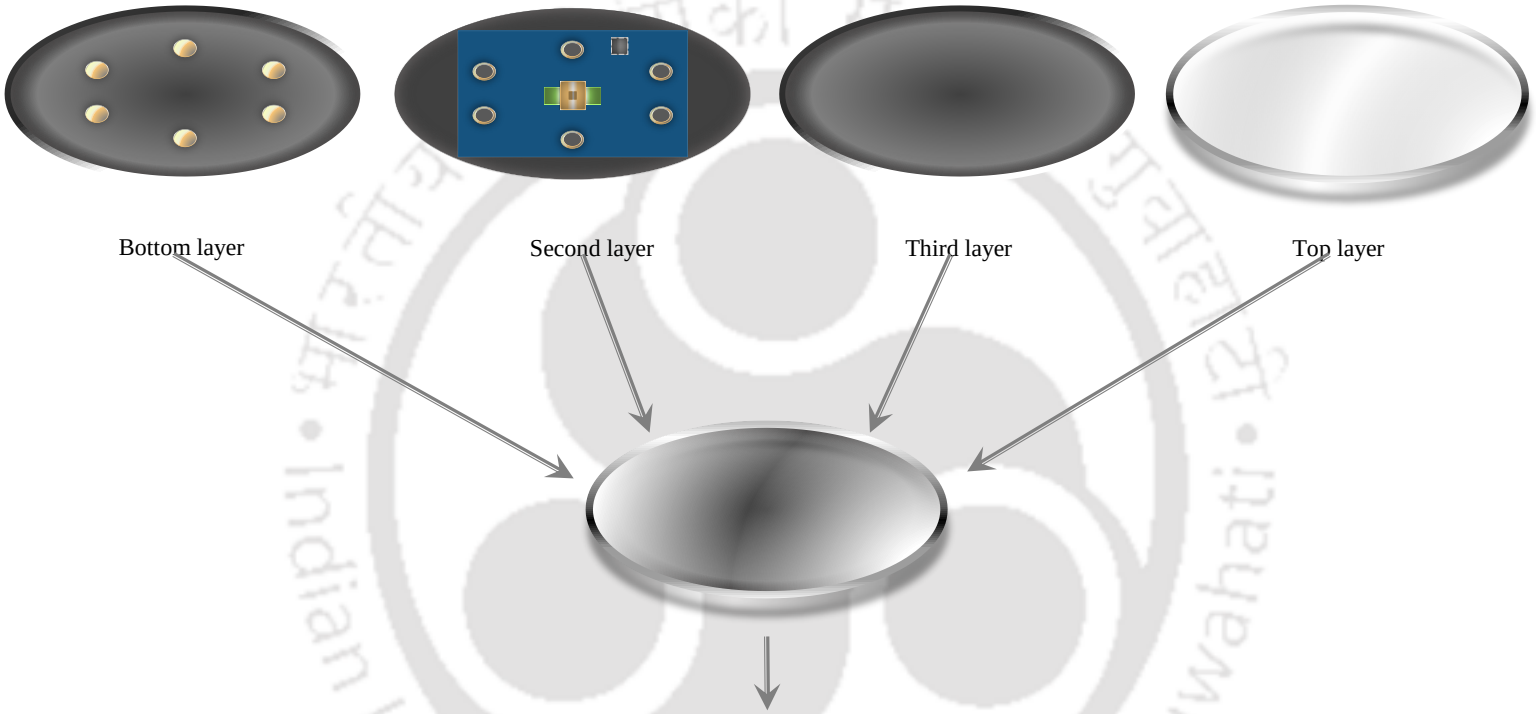


Figure 3-22. Components in WFT



A POSSIBILITY

of

Design Exclusiveness into the domain
of Inclusiveness and Aesthetic
Experiences for Health and Fitness

Features

i. It can be attached to the base of the existing watch.
ii. It can be attached to any bracelet or wrist-worn accessories.
iii. It can be worn as a simple wristband without the device being recognised.
iv. It can be used as a smartwatch with the interface being visible.

3.7. Discussion

After answering all the research questions and testing the hypotheses, it can be concluded that the attitude toward health technology plays a significant role in determining the Behavioural Intention toward Wearable Fitness Trackers. The Positive attitude toward Health Technology influences the Behavioural Intention of WFT. The Aesthetics of Experience Design has a significant role in people's attitude and behaviour toward these devices and affects their usage sustainability.

Various constructs in the existing Acceptance Models and their moderators play a crucial role as a mediator in predicting the Behavioural and Continuous Intention of WFT. In this study, with the established constructs, some other constructs were considered, namely Design Aesthetics, Hedonic Motivation, and Freedom from Perceived Risk associated with the usage of these devices. The issue that people feel while using such technologies where they fear being judged and their privacy being invaded has been addressed in the study. Moreover, after including a few more constructs and determinants that are essential in understanding and satisfying the micro- emotions of the consumers, the sustainability issue in the usage of WFT can be overcome. Hence, the Aesthetics of Experience Design affects the Behavioural Intention and the Continuance Intention of WFT.

Moreover, Self-efficacy can provide some insight into the Behavioural and Continuance Intention of WFT, which reflects the effect of self-belief on people's actions. Also, self-efficacy plays a crucial role in predicting the success of health intervention in both the short- and long term (Windasari, et

al., 2021). Although wearable fitness trackers' sales are large-scale, it faces challenges in their sustainable usage. Reports say that users tend to abandon wearable devices in less than six months. The designers shall put relevant interventions intending the continuous and prolonged use of the WFT, which has already proved its essentiality as a tool in ensuring a healthy life.

The proposed design of the WFT can ensure sustainability in its usage as it can ensure its reduced visibility and recognisability, which in return ensures the privacy and free form being judged. It has the capability of providing cognitive liberty to its users.

Chapter 4

This chapter gives an overview of the study that has been carried out in the research. It also discusses the obtained results and their impact. Furthermore, it also elaborately discusses the issues faced in the acceptance of WFT. Substantially, to achieve solutions toward the sustainable usage of these devices, the chapter provides various insights and interventions.

Chapter 4. **Discussions and Conclusions**

4.1. General Discussion

Physical fitness and psychological well-being can enable healthy life in all age groups. As seen in the present world, the onset of the health declination even before one reaches their thirties is very upsetting. However, with proper health and fitness behaviour, one can make a better life for themselves. Before even hitting the older age, appropriate health care can ensure a healthy ageing process. WFT has shown a significant increase and the indulgence of young people in a healthy lifestyle. However, it is believed to provide a positive intention to people from all groups in pursuing fitness routines with the help of these devices, although the ageing population shows the most extensive resistance towards being motivated in doing physical activity intending fitness. The younger generation is more active in availing the digital care. The older population is left at the periphery of the wearable tracker industry (Kononova, et al., 2019).

Wearable Fitness Technology is a new technology that has already established its benchmark in the world market. Despite the technology being in infancy, it has spread its requirement worldwide to various people from various backgrounds. Many wearable devices are available worldwide and are benefitting users. In the case of the elderly population, it is observed that due to negative self-perception of ageing, they do not indulge in physical activity and are primarily involved in sedentary lifestyles having the negative stereotype of ageing. Nowadays, young people are pretty conscious about health and fitness; the ageing population is the most challenging group to be motivated into the fitness regime. The wearable devices are already positively

encouraging younger users to indulge in fitness regimes and derive health benefits. Many pieces of research have been done on the establishment of wearable devices. Researchers are mainly focussing on the development of fitness devices, focussing on the reliability and accuracy of these devices. Significantly fewer researches have been done on its acceptance and adoption. According to the previous studies, the endorsement and adoption of technology are dependent on the following factors: Perceived ease of use, Perceived usefulness, and Perceived health benefits. People are more towards buying those technologies which fulfil these criteria. The effectiveness and ease of use shall be evident in the devices. Increased usefulness and ease of use ensure the acceptance of a particular technology. The perceived health benefits will ensure its prolonged use in the future. Along with the determinants mentioned earlier, new determinants and constructs are necessary to be incorporated into the acceptance of the wearable fitness trackers, where the target group is middle-aged to the elderly population. In the elderly population, product customization and hedonic motivation shall be beneficial to negate the negative self-perception of ageing.

Although the adoption of WFT is on an enormous scale, it suffers the critical challenge in its sustainable usage. Studies reveal that users are likely to abandon the wearables in less than six months, where the abandonment rate is nearly 30%. A possible explanation for the abandonment of these devices can be the lack of capability to inspire action. Despite the device being useful, perhaps it fails to emboss a meaningful impact on users' behaviours and habits. Determination of such an effective engagement process shall be incorporated in the WFT devices, which can motivate users to continue using devices which is essential in generating sustained value (Windasari, et al., 2021). There is a shifting of the focus of information systems from the mindset of efficiency and instrumentality towards facilitating human life in manifold ways through various mediums, e.g., entertainment, social connections (Hassan, et al., 2019), and health trackers.

To enable user engagement, most of the services and current systems intend to provide affective and social experiences to support both the utility and the self-purposefulness of system use and provide users with accurate information. It

is essential to ensure the longevity of Wearable Fitness Devices through promising design, specifications, and technicalities to ensure adherence to these devices. In addition, sustainability can be enhanced through the assurance the consumers can get from the respective brand companies. If their purchase can be covered under fair warranties and some medical health claim benefits, there can be an enhancement in the acceptance and usage sustainability of these devices, thereby providing tools for a healthy and prosperous lifestyle.

To find answers to the above-concealed questions, the present study has explored various domains. The study included a literature survey to find the existing studies and the gaps that needed to be filled. Further, a survey was conducted among people from different walks of life having different opinions and interests. The data obtained were statistically analysed in SPSS, *version 25*. The obtained results provided a direction to proceed further to understand more about the behaviour and attitude of people towards health and fitness and wearable fitness tracking devices. Significantly, three different structural equation models were developed to express the relationship among the various factors, constructs, and micro-determinants that are so deeply rooted in determining people's behaviour towards a particular product, which is WFT in the present study. The subsequent section explains the contribution and the limitations of this present study.

4.2. Salient findings of the thesis

The study has explored numerous areas to find the link and relationships among various determinants and micro-emotions that might cause differences in people's attitudes, perceptions, and acceptance of WFT from different age groups, backgrounds, and other factors. It looks into the various factors that affect the Behavioural and Continuance Intention of the Wearable Fitness Trackers and provides reliable and essential structural models that can answer the underlying causes of the lack of acceptance and the unsustainability in the usage of Wearable Fitness Devices. Furthermore, it looks into the design approaches incorporated in the design process while ideating and manufacturing these devices. The Aesthetics of Experiences plays a crucial role in accepting such interactive products, which has been considered in the

study. The study has provided three intervention models that look into the micro-determinants that play a significant role in accepting and continuing the wearable fitness trackers. Moreover, the design interventions constructed in this research shall widely benefit the designers and the consumers and benefit from such devices without any perceived risk or burden. It contributes a concept model and design concepts for designing interactive devices. Incorporating such devices into the lives of an individual and with the Aesthetics of Experiences being satisfied shall ensure much better and healthier lives.

4.3. General conclusions

Life expectancy has grown high with the years, which eventually demands an excellent healthcare system as with age, there follows a decline in the health index. It has been established from various longitudinal studies that physical activity benefits people from all generations, and the collaboration of ergonomics, technology, and design shall better the new age requirements and necessities. The amalgamation of Ergonomic considerations during the design process into the technology shall play an essential role in addressing these issues. It is believed to act as the 'no man's land between architecture and health and safety, computer science and consumer product design, engineering and medicine (Bridgers, 2003). Likewise, it shall ensure a better bridging between the technology and human factors, thereby positively influencing consumer behaviour toward the sustainable adherence to such products. It concludes by mentioning that WFT shall become an essential tool in achieving desired and positive results in health and fitness. However, essential trust with self-control needs to be ensured in devices capable of motivating the growing aged population.

With the older adult population's growth, this study specifically addressed the Indian context, focusing on their perceived need. It highlighted the behavioural issues in the growing aged population and tried to understand their motivational issues that may lead to a design specification for devices and systems. The proposed model shown in the following figure suggests and aims to reduce health declination using the concerned devices.

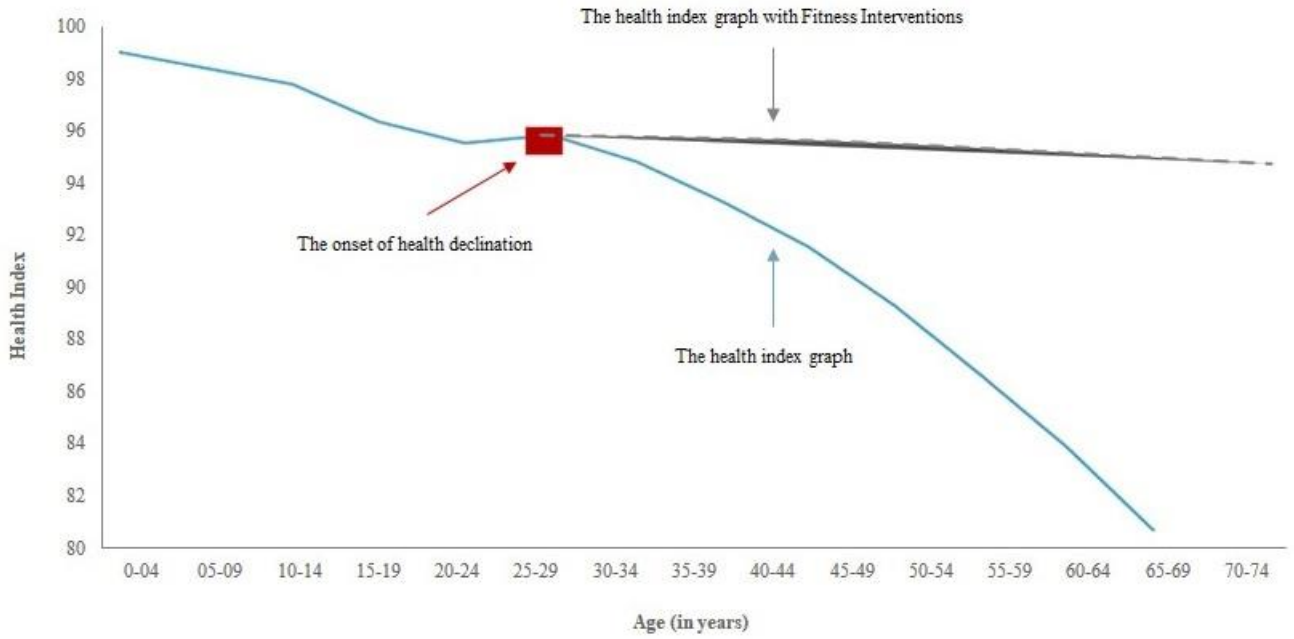


Figure 4-1. Proposed Health Index vs Age Graph

4.4. Limitations of the study

This study has reviewed the need approach to the issues of aging. Here, the specific devices were not tested for their specific efficacy. The study is in the general assessment of health-related issues and interventions. The following figure gives the overall layout of the demographics of the study participants (N=39).

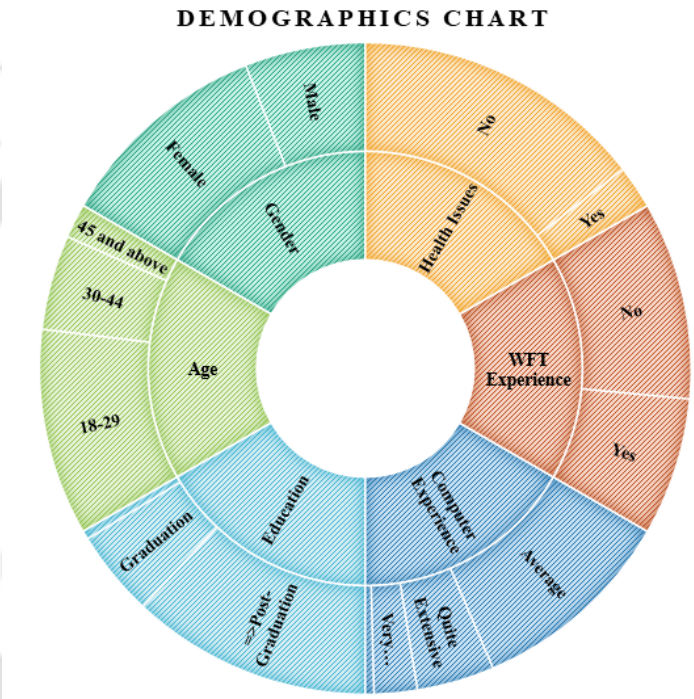


Figure 4-2. Demographics of Study Participant

From the figure, we can analyse the fraction of the study participants considered in this study and their overall experiences with the health technology and their perception towards the WFT, where the study population were from different age groups with varied life experiences from different walks of life, but with a limited number. In the study, purposive sampling has been done to ensure and obtain coherent and genuine data for analysis. In-depth studies with specific references can be conducted for more insight on the topic.

The devices tried out here in the final product are a concept model which can be seen as a contribution to the design development ideation and is yet to

include the actual manufacturing of the product. The limitations in this study can be carried forward as the future scope for the fabrication of the conceptualised design to cross-check the issues covered in the thesis.

4.5. Future Scope

The study explored various areas and considered significant micro-emotions and determinants influencing the perception and sustainability of wearable healthcare fitness tracker devices. In addition, it developed the conceptualised design model for enhancing adherence to such devices. As a future scope, the specific design development and the manufacturing of the concept model can be considered. Furthermore, certain studies can contribute significantly to these fields of study. The gender-specific behavioural studies of the conceptualised model design can provide insight into how the males and females respond to such devices individually. In addition, the exclusive need within the scope of inclusive design can be studied, which may answer and ensure a wide range of consumers towards these devices. Furthermore, it can be said that technology is fast changing, and today's young people are tomorrow's older adults, and it is essential to design such devices that can mold themselves following the skills and efficacies of the individual to ensure the preservation of the aesthetics of emotions and experiences through these interactive devices.

4.6. Thesis Novelty

The thesis approaches in a qualitative direction to assess the means and methods to address the current health-related motivational issues and specifically address the Indian context. It highlights behavioural issues and tries to understand the growing age needs and factors that may lead to design specifications for devices and systems that can enhance the prolonged use of such devices to provide a healthy lifestyle, including the exclusiveness within the scope of inclusiveness to ensure the customer engagement that too on a wide range of people.

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Workshops, Conferences and Courses Attended

1. Workshop on **"Statistical Methodologies for Research in Design (SPSS)"** organized by the Department of Design from November 7th – 12th, 2016.
2. Workshop on **"Systematic Innovation for Design, Engineering and Management"** organized by the Department of Design during November 4th – 9th, 2017.
3. The Certificate Course on **"Comprehensive Online Patent Information Course"** organized by Turnip Innovations from February 12th – 28th, 2021.

APPENDICES

Appendix A: Research/ Survey Consent Form

_____

(Name of the researcher/surveyor)

I _____ freely agree
(Name of the participant)

to participate in research project entitled :

_____

_____

_____

My participation is voluntary. The project has been satisfactorily explained, and all my questions have been satisfactorily answered.

_____ _____

(Signature of the Participant) (Date)

Appendix B: Personal Details

Email ID	-					
Age	-					
Gender	-					
Height	-					
Weight	-					
Occupation	-					
State of Origin	-					
Educational Qualification (Please highlight/ tick)	-	High School		Graduation	Post-Graduation	
		PhD		Other		
Computer Experience (Please highlight/ tick)	-	None	Very Little	Average	Quite Extensive	Very Extensive

Appendix C: Research Instruments

Questionnaire 1

Wearable Fitness Tracker (wrist-worn) Usage General Enquiry

Note: Write Not Applicable (NA) if you do not own a wearable fitness tracker.

Q-1. Have you heard about Wearable Fitness Tracker? If yes, then from where you have learned about Wearable Fitness Trackers?

Q-2. Do you have a Wearable Fitness Tracker?

Q-3. Are you aware of the mechanisms and the principles used in the sensors of the Wearable Fitness Tracker?

Q-4. What is the brand of your Wearable Fitness Tracker? Write Not Applicable (NA) if you do not own a wearable fitness tracker.

Q-5. Are you using the Wearable Fitness Tracker presently?

Q-6. Since when have you started using a Wearable Fitness Tracker?

Q-7. Do you think you should wear a Wearable Fitness Tracker? Why?

Q-8. Do you wear Wearable Fitness Tracker regularly?

Q-9. Have you engaged yourself in any fitness regime?

Q-10. Had you engaged yourself in any fitness regime before using Wearable Fitness Tracker?

Q-11. What motivates you to wear a Fitness Tracker?

Q-12. Which features do you like in a Fitness Tracker?

Q-13. Are you still using Wearable Fitness Tracker? If not, why have you stopped wearing it?

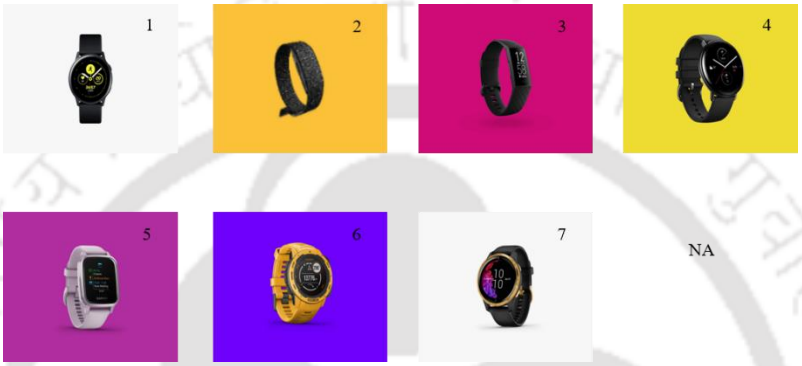
Q-14. Which features do you dislike in a Fitness Tracker?

Q-15. What features do you seek in a Wearable Fitness Tracker?

Q-16. How many members in your family are presently using a Wearable Fitness Tracker regularly?

Q-17. Are they engaging themselves in a fitness regime?

Q-18. Select from below the style closely resembling your Wearable Fitness Tracker (please tick/highlight the No. provided below the image or NA for not applicable.



Q-19. Do you like the texture of our wearable fitness tracker? Explain.

Q-20. Do you like the interface of your wearable fitness tracker? Explain.

Q-21. Do you like the shape interface of your wearable fitness tracker? Explain.

Q-22. Do you like the material used in your wearable fitness tracker? Explain.

Questionnaire 2

Behavioural Intention Towards Questionnaire

Based on your knowledge and/or experience with the Wearable Fitness Tracker, please read the following sentences and rate on a scale of 1-5 how much you disagree/agree. '1' being strongly disagreed, and '5' being strongly agreed.

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neither Agree nor Disagree
- 2 – Disagree
- 1 – Strongly Disagree

Survey Items		1	2	3	4	5
Performance Expectancy						
PE1	I believe I would find Wearable Fitness Tracker helpful in my daily life.					
PE2	Using Wearable Fitness Tracker will increase my chances of achieving overall well-being.					
PE3	Using a Wearable Fitness Tracker will help me achieve my fitness goals.					
PE4	Using Wearable Fitness Tracker will increase my productivity.					
Effort Expectancy						
EE1	I believe learning how to use Wearable Fitness Tracker is easy.					
EE2	I believe my interaction with Wearable Fitness Tracker be simple and clear					
EE3	I believe Wearable Fitness Tracker is easy to use.					
Social Influence						
SI1	People who are important to me may think that I should use Wearable Fitness Tracker.					
SI2	People who influence my behaviour may think that I should use Wearable Fitness Tracker.					

SI3	People whose opinions that I value may prefer that I shall use wearable Fitness Tracker.	
Facilitating Conditions		
FC1	I have the resources (accessories or gadgets) necessary to use Wearable Fitness Tracker.	
FC2	I have the knowledge necessary to use Wearable Fitness Tracker.	
FC3	Wearable Fitness Tracker is compatible with other technologies.	
Price Value		
PV1	Wearable Fitness Tracker is reasonably priced.	
PV2	Wearable Fitness Tracker is affordable.	
PV3	At the current price, Wearable Fitness Tracker provides a good value.	
Attitude towards Using		
ATU1	Using a Wearable Fitness Tracker would be a positive decision.	
ATU2	Using a Wearable Fitness Tracker would be a smart decision to make.	
ATU3	I like the idea of using a Wearable Fitness Tracker.	
ATU4	I have a positive attitude towards Wearable Fitness Technology.	
Purchase Intention		
PI	I intend to buy Wearable Fitness Tracker in the future.	
PI2	I intend to pay for buying a Wearable Fitness Tracker in the near future.	
PI3	I am likely to buy a Wearable Fitness Tracker in the near future.	
Behavioural Intention		
BI	I intend to use Wearable Fitness Tracker in the future.	
BI2	I will always try to use Wearable Fitness Tracker in my daily life.	
BI3	I plan to use Wearable Fitness Tracker frequently	

Questionnaire 3

Continuance Intention Towards WFT

Based on your knowledge and/or experience with the Wearable Fitness Tracker, please read the following sentences and rate on a scale of 1-5 how much you disagree/agree. '1' being strongly disagreed, and '5' being strongly agreed.

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neither Agree nor Disagree
- 2 – Disagree
- 1 – Strongly Disagree

Survey Items		1	2	3	4	5
Perceived Ease of Use						
PEOU1	The understanding and operation of Wearable Fitness Tracker are very simple.					
PEOU2	I believe I can use Wearable Fitness Tracker flexibly.					
PEOU3	I believe Wearable Fitness Tracker using process is easy to learn.					
PEOU4	I believe it is easy to use Wearable Fitness Tracker.					
Perceived Usefulness						
PU1	Wearable Fitness Tracker will enable me to track my health status					
PU2	Wearable Fitness Tracker gives me more feature options					
PU3	I think Wearable Fitness Tracker can improve my health and enhance the quality of my life.					
Satisfaction (SA)						
SA1	I believe the decision to use Wearable Fitness Tracker is right and wise.					
SA2	I believe the experience of using Wearable Fitness Tracker makes me feel happy.					
SA3	I believe using the Wearable Fitness Tracker makes me feel very pleased.					

SA4	I believe Using the Wearable Fitness Tracker makes me feel delighted.	
SA5	Overall, I am satisfied with Wearable Fitness Tracker.	
Expectation Confirmation (EC)		
EC1	I believe the experience of using the Wearable Fitness Tracker was better than I expected.	
EC2	I believe Wearable Fitness Tracker provides better service than I expected.	
EC3	Most of my expectations from Wearable Fitness Tracker have been fulfilled.	
Continuance Intention (CI)		
CI1	I am interested in Wearable Fitness Tracker.	
CI2	I intend to use Wearable Fitness Tracker in the future.	
CI3	I would recommend Wearable Fitness Tracker to my family and friends.	

Questionnaire 4

Perceived Associated Risk Towards WFT

*Based on your knowledge and/or experience with the Wearable Fitness Tracker, please read the following sentences and rate on a scale of 1-5 how much you disagree/agree. '**1**' being **strongly disagreed**, and '**5**' being **strongly agreed**.*

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neither Agree nor Disagree
- 2 – Disagree
- 1 – Strongly Disagree

Survey Items		1	2	3	4	5
Perceived Economic Risk						
PER1	I am insecure about the unreasonable charge of the Wearable Fitness Tracker					
PER2	I am insecure about the extra maintenance cost of Wearable Fitness Tracker					
Perceived Physical Risk						
PPRa1	I am worried about my safety while using Wearable Fitness Tracker.					
PPRa2	I am worried using Wearable Fitness Tracker can cause medical accidents.					
PPRa3	I am worried using Wearable Fitness Tracker can cause harmful consequences to my health.					
Perceived Social Risk						
PSR1	I am afraid my relatives will not support me in choosing Wearable Fitness Tracker.					
PSR2	I am afraid my friends will not support me for using Wearable Fitness Tracker.					
PSR3	I am afraid that people around me will have prejudices about my decision to use Wearable Fitness Tracker.					
Perceived Privacy Risk						
PPRb1	I am worried about my privacy being revealed.					

PPRb2	I am worried that Wearable Fitness Tracker cannot keep my health information confidential.	
PPRb3	I worry that Wearable Fitness Tracker will use my privacy for other purposes without my approval.	
Perceived Functional Risk		
PFR1	I am worried about the quality of service provided by Wearable Fitness Tracker.	
PFR2	I am worried that Wearable Fitness Tracker cannot solve my health problems effectively.	
PFR3	I am worried that the services I get through Wearable Fitness Tracker cannot meet my expectations.	
Perceived Psychological Risk		
PPRc1	If using Wearable Fitness Tracker cannot get satisfactory results, it will affect my mood.	
PPRc2	If the quality of the service provided by Wearable Fitness Tracker is not high and the data regarding heart rate, calories burned, or any other feature does not provide accurate results, I will be anxious.	
PPRc3	If there is a loss of money and time in Wearable Fitness Tracker, I will have a psychological imbalance.	
PPRc4	Due to the technology's various uncertainties, I am worried that using Wearable Fitness Tracker will cause me a psychological burden.	

Questionnaire 5

Determination of Healthcare Technology Self Efficacy

*Based on your knowledge and/or experience with the Technology, please read the following sentences and rate on a scale of 1-5 how much you disagree/agree. '**1**' being **strongly disagreed**, and '**5**' **being strongly agreed**.*

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neither Agree nor Disagree
- 2 – Disagree
- 1 – Strongly Disagree

Survey Items		1	2	3	4	5
General Self Efficacy						
GSE1	I can solve most of my problems if I invest the necessary effort.					
GSE2	I believe I can succeed at most any endeavour to which I set my mind.					
GSE3	I will be able to overcome many challenges successfully.					
GSE4	When facing difficult tasks, I am certain that I will accomplish them.					
GSE5	I am confident that I can perform effectively on many different tasks.					
GSE6	I feel insecure about my ability to do things. (R)					
GSE7	I give up easily. (R)					
Computer Self Efficacy						
CSE1	I have the ability to understand common operational problems with a computer.					
CSE2	I am very unsure of my abilities to use computers. (R)					
CSE3	I rely heavily on instructions and manual to help me use a computer. (R)					
CSE5	I find it difficult to get computers to do what I want them to. (R)					

CSE6	At times I find working with computers very confusing. (R)	
Health Technology Self Efficacy		
HTSE1	It is easy for me to use health technology.	
HTSE2	I have the capability to use health technology.	
HTSE3	I do not feel comfortable using the health technology. (R)	
HTSE4	When using health technology, I worry I might press the wrong button and risk my health. (R)	
Attitude Towards Health Technology		
ATHT1	Using health technology is a good idea.	
ATHT2	Using health technology may improve the quality of my health.	
ATHT3	I believe that health technology is responsible for improving the quality of healthcare.	
ATHT5	Using health technology is risky. (R)	

Questionnaire 6

Aesthetics of Experience

*Based on your knowledge and/or experience with the Wearable Fitness Tracker, please read the following sentences and rate on a scale of 1-5 how much you disagree/agree. '**1**' being **strongly disagreed**, and '**5**' being **strongly agreed**.*

- 5 – Strongly Agree
- 4 – Agree
- 3 – Neither Agree nor Disagree
- 2 – Disagree
- 1 – Strongly Disagree

Survey Items		1	2	3	4	5
Hedonic Motivation						
HM1	I believe using Wearable Fitness Tracker is fun.					
HM2	I believe using Wearable Fitness Tracker is enjoyable.					
HM3	I believe using Wearable Fitness Tracker is very entertaining.					
Design Aesthetics						
DA1	The overall design of the Wearable Fitness Tracker is attractive.					
DA2	The design of the interface of the Wearable Fitness Tracker is attractive.					
DA4	The materials used in the Wearable Fitness Tracker are attractive.					
Perceived Economic Risk						
PER1	I am insecure about the unreasonable charge of the Wearable Fitness Tracker. (R)					
PER2	I am insecure about the extra maintenance cost of Wearable Fitness Tracker. (R)					
Perceived Physical Risk						
PPRa1	I am worried about my safety while using Wearable Fitness Tracker. (R)					

PPRa2	I am worried using Wearable Fitness Tracker can cause medical accidents. (R)	
PPRa3	I am worried using Wearable Fitness Tracker can cause harmful consequences to my health. (R)	
Perceived Social Risk		
PSR1	I am afraid my relatives will not support me in choosing Wearable Fitness Tracker. (R)	
PSR2	I am afraid my friends will not support me for using Wearable Fitness Tracker. (R)	
PSR3	I am afraid that people around me will have prejudices about my decision to use Wearable Fitness Tracker. (R)	
Perceived Privacy Risk		
PPRb1	I am worried about my privacy being revealed. (R)	
PPRb2	I am worried that Wearable Fitness Tracker cannot keep my health information confidential. (R)	
PPRb3	I worry that Wearable Fitness Tracker will use my privacy for other purposes without my approval. (R)	
Perceived Functional Risk		
PFR1	I am worried about the quality of service provided by Wearable Fitness Tracker. (R)	
PFR2	I am worried that Wearable Fitness Tracker cannot solve my health problems effectively. (R)	
PFR3	I am worried that the services I get through Wearable Fitness Tracker cannot meet my expectations. (R)	
Perceived Psychological Risk		
PPRc1	If using Wearable Fitness Tracker cannot get satisfactory results, it will affect my mood. (R)	
PPRc2	If the quality of the service provided by Wearable Fitness Tracker is not high and the data regarding heart rate, calories burned, or any other feature does not provide accurate results, I will be anxious. (R)	
PPRc3	If there is a loss of money and time in Wearable Fitness Tracker, I will have a psychological imbalance. (R)	
PPRc4	Due to the technology's various uncertainties, I am worried that using Wearable Fitness Tracker will cause me a psychological burden. (R)	