

Author Details for the Research Article “Towards a Sociological Literature Review on m-Health Applications”

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Abstract

Background: For many trying to understand the sociology of technological artefacts and their influence in establishing human behaviour towards health, the study of m-Health applications becomes critical in the development of health and fitness behaviour among humans. M-Health is a growing field of study under ‘Social Construction of Technology (SCOT)’ wherein progress is witnessed in various categories such as the mobile application, developed to cater to the different needs of the digital health and fitness market.

Methods: Through the scoping review under the broader category of a systematic literature review in the present paper, the aim is to understand the sociological construction and adoption of the health and fitness m-Health applications. For this purpose, the review contains peer-reviewed papers and articles, books, and other literature. These studies have been developed systematically and a comprehensive scope of further research that takes into account the contextual transformation of these m-Health applications has culminated.

Results: To develop better conceptual innovations, the idea of quantified self and research gaps are highlighted. Further, a wider scope for quantifying oneself can be expanded for studies in a developing country like India. The idea of m-Health application has revolved around various categories that take into consideration the formative needs of healthcare in a developing as well as a developed world.

Conclusion: Through this paper, we study the need to broaden the sociological lenses that comprehend the construction of these applications within the social context and how they are reshaping the behavioural patterns of health and fitness among individuals.

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Introduction

The development of modern medicine directly correlates to the technological progress made during the industrial revolution. During this period, the innovations in technological artifacts, scientific discoveries, and the coming up of the institutional systems, all led to the assimilation of scientific and technological

advancements. Apart from this wider biomedical field of technological developments, the social, economic, and political considerations also play a crucial role in the development of healthcare technology. But with the testified scientific closures, biomedicine as a field of medicine gained prominence due to its reliability and rationality. The view of diseases has shifted from the total dysfunction of the body to ‘localized pathology’

i.e., illness and its symptoms caused in and due to one particular part of the body.

Technological Health care innovations have taken society by storm, and we are facing an exponential growth of technologies. With every decade, more and more innovations are cropping up consecutively to replace the superseded technologies in a short period. With the futuristic trends in the expansion of smartphones from 65% connections in 2019 to 80% predicted connections by 2025,¹ the rapid emergence of technological artefacts comes with the enormous responsibility towards more ethical boundaries to be set up by studying the science and art of society rather closely and more reflexively (“Bourdieu and Science and Technology Studies: Toward a Reflexive Sociology” by David J. Hess.). Mobile phones have become the chief tool for social interaction.²⁻⁴ The social sciences, though often awarded the subordinate positions to the natural sciences, have the power to shape up the characteristics of both the producers and the consumers.^{5,6}

Within this inevitable nexus between the social and scientific discourses, a paradigm has emerged in the personalized preventive health care system. Through the use of easily available technologies such as health care apps and healthcare monitoring mechanisms— monitors and wearable devices, the challenges posed by lifestyle diseases can be better managed. These technologies are a step towards making people more aware of their health by helping them quantify themselves as contributed through numerous articles.⁷⁻¹⁰

In such a scenario, the above-mentioned technologies are providing a way to track every facet of our lives, especially that of health and fitness. In line with this, the founders of Quantified Self (QS) Labs, Gary Wolf and Kevin Kelly, editors at the Wired Magazine, are generally credited with coining the term “Quantified Self” when they began a project to trail all the new tracking technologies. Gary Wolf, the co-founder of Quantified Self, describes this as “self-knowledge through self-tracking with technology”. The agenda of the idea of the ‘Quantifiable self’, was to infuse personalized healthcare and lifestyle services in society. Self-identity is a crucial component of social interaction and can be analysed reflexively, making an individual more self-aware and self-responsible.¹¹⁻¹⁴

Objectives of the Study

To provide a comprehensive review of the field of m-Health and Quantified-self research to date. To better understand how the new developments in m-Health applications via smartphones, wearables, and wireless devices have triggered a new generation of healthcare behaviours among individuals. Through this study, we have sought to identify the key themes which have emerged in academic research on m-Health

due to the impact of these technologies on individual healthcare behaviours.

Methods

The paper follows the methodology of sequential selective and scoping review analysis, where the study has been conducted sequentially in two phases. In the first phase, the selective review of literature is employed to identify the literature of importance. Whereas, in the second phase the research endeavours into a scoping review analysis, best suited for researches-in-progress.

For the fulfilment of the above objectives, the article aims to follow a tentative methodology of selective literature review on m-Health applications. Such a pilot literature review reveals the need for more inclusive, comprehensive, and contextual m-Health literature.

- First, the purpose and benefits of selectively reviewing the literature on m-Health applications and the sociology of quantifying oneself have been discussed in detail, circumscribing the literature published between 1980 to December 2022.

- Second, the scope and nature of the selective review and scoping review have been defined.

- Six electronic databases were searched: Academia, JSTOR, ResearchGate, Google Scholar, PubMed, and Scopus.

- Subsequently, the literature review is presented thematically, regarding the following three literature categories, namely, Peer-reviewed papers and articles, books, and other literature.

- Finally, the conclusion connects all the key findings, debates, and observations regarding the future scope of research in the area.

The process in terms of research progress is as follows (Figure 1):

Initially, after selectively (Search Engine Optimisation (SEO) was used as the inclusion criteria to select literature based on the following keywords in all six databases: m-Health, m-Health applications, quantified self, preventive health care, lifestyles diseases, Social construction of technology (SCOT), wearable fitness bands, healthy lifestyle applications, calorie counters, self-quantification.) picking the literature from all of the six electronic databases, a total of 150 studies were shortlisted. 139 articles out of 170 were selected based on the title of the studies. Among the 139 studies, 21 were excluded (Exclusion criteria of literature were based on relevance to the field of study i.e., Science, technology and Society (STS) and m-Health. The title, abstract, and objectives of the shortlisted 119 articles were studied to exclude the literature not highlighting sociological aspects and that which were purely technical in nature.) based

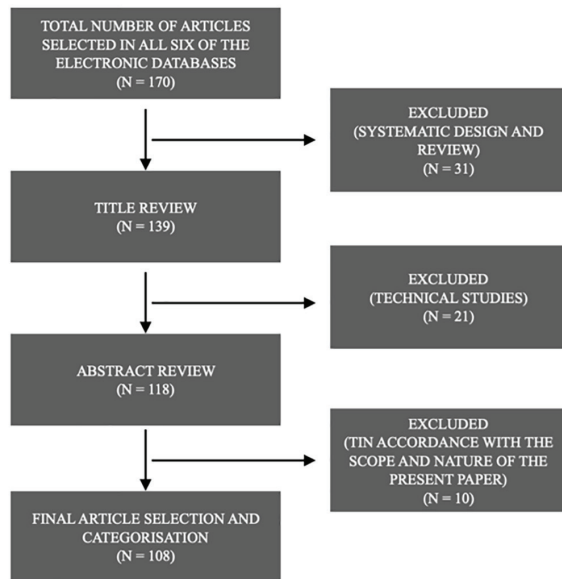


Figure 1: Diagrammatic Representation of the Process of Inclusion or Exclusion of Research Articles

on the technical nature of the enquiry. The articles that provided scope for sociological enquiries into the field of m-Health technologies were selected (n=118). Further, an in-depth study of the retrieved literature was commenced by studying the objective and findings, in line with the objectives and scope of this paper. A total of 10 articles were again excluded through this step, and subsequently, 108 admissible studies were identified. The recognised and collected literature have been studied through the method of scoping review. By examining the relevant data set, conclusions and findings are discussed through a thematic analysis of all the content to deliver the future areas in the field of study of m-Health and QS.

Purpose and Benefits of a Selective Literature Review on M-Health and Quantified Self

Several review types have been identified and analysed with their perceived strengths and weaknesses, with some better-known examples being mapping review, literature review, critical review, scoping review, systematic review, and the likes.¹⁵ Out of which systematic review, has been undertaken in this review of literature as it can combine the strengths of critical review along with a comprehensive search process.

This systematic review is further scoped to establish a preliminary assessment of the potential size and scope of available research literature. The major aim hence caters to the nature of the paper being research-in-progress and hence helps in identifying the nature and extent of the research supported by the evidence which is presented. There are several benefits of this selective approach, scoped further in the next section, are highlighted as follows:

a) It helps in establishing m-Health and its

contributions which are of academic significance.

b) It helps in setting key directions and outlining the state of knowledge of m-Health and self-quantification.

c) It highlights a premise for a more comprehensive and systematic literature study on m-Health.

d) Because of the comprehensive understanding of the selective review, it helps in offering an insight into m-Health research based on the premises of quantified self and their academic origin and development. Such a historical awareness of their origin and emergence can contribute to strengthening m-Health applications as a sub-discipline under the aegis of Science, Technology, and Society (STS) studies.

e) It will further help in identifying the research projects, organizations, and institutions developing technology for all by studying the cross-cultural dimensions of well-being.

The Nature and Scope of the Selective Literature Review on m-Health

The articles emphasize the selective along with scoping review of the m-Health and quantified-self review of the literature to justify it as a field of research in progress. For identifying the nature of this review and to further clarify the stand of ‘selective’ and ‘scoping’ reviews, the focus of the article is limited to the following aspects:

a) The literature review predominantly focuses on material that addresses m-Health or quantified-self explicitly, hence making it selective in nature. While the overlapping themes (like technology diffusion, preventive healthcare, and technological innovations in healthcare) are critical to m-health applications and their operation, but providing a review of such articles would distract from the paper’s aim. For this purpose of the paper, m-Health and its constituent concept of Quantified Self (QS), described as “self-knowledge through self-tracking with technology”,¹⁶⁻¹⁹ are studied.

b) The review of literature furthermore is ‘scoping’ in that it purports to be completed with the search field determined by time/scope restrictions and hence feasible for research in progress. The article reflects on peer-reviewed published works in established platforms, namely Scopus and other Journals listed in the UGC care list, in terms of academic work.

c) It should be emphasized that the ‘available literature’ is deemed to work in the public domain, some of which is not freely available and is further deemed as referring works published in the English language.

d) The literature reviewed follows chronological order well defined into various themes of studies in publication adhering to a structural approach.

e) Lastly, the literature review only covers selected contributions published before December 2022.

Results

The present paper in line with the objectives will enumerate the evolution of mobile phones as well as consecutively, m-Health and the genealogy of the term quantified self. To comprehensively yet simplistically provide m-Health's progression as a field of study in academic literature further areas of understanding have been identified, wherein various studies have been analysed thematically. The chronological order is only followed to divide these concurrent areas temporally. The sections determined are as follows:

1. Tracing the historical development of m-Health innovations and Quantified-Self under Science, Technology, and Society (STS) studies (pre-2000)

a) Interactions between man, society and technologies in Healthcare

b) The emergence of mobile phone devices: Global and National discussions

c) The Genealogy of Quantification in Healthcare

2. The emergence of m-Health as a research theme (2000 -2007)

3. The emergence of m-Health technologies and quantified self as research themes (2008 – present)

1. Tracing the Historical Development of m-Health Innovations and Quantified-self under Science, Technology, and Society (STS) Studies (pre-2000)

As far as it can be deduced from the available literature, that the explicit terminologies and concepts surrounding healthcare emerged from the definition given in a World Health Organisation report in 2011.²⁰

²¹ In contrast to the early 2000s, the priority of Health care shifted from an exclusive focus on curing the disease to a personalized preventive healthcare system, which due to the rapid growth and diffusion of mobile phones would be easily accessible to people at their fingertips.

In this regard, Lucivero and Prainsack²¹ talk about the lifestyle products (supported by mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices) emerging out the “Life-stylisation of healthcare” as regulatory alternatives to the generic medical tests, also creating destabilized categories under medical vs. lifestyle-related distinctive paradigms.

Concurrent with the rise and development of the idea of preventive healthcare systems, academic researchers were developed around the growing industry of mobile technologies. Hence a few sporadic articles in the 2000s expounded the key notions of

these mobile technologies with the actual use of the term m-Health. These indicate an integrated public healthcare shift from doctors and process-focused to technology-focused, further developing into more interactive aspects by producing a blend of technologies and humans. At the earliest, the work of Pinch and Bijker²² has given four major components of technological development in society, firstly, ‘interpretive flexibility’ i.e., technology can produce different outcomes depending on different social circumstances in which they are placed. Secondly, relevant social groups, similar social groups attach similar meanings to technological artefacts. Thirdly, ‘closure and stabilization’, since technologies are designed for multi-groups, they can experience various controversies, hence the design only continues if such difficulties are resolved, after which it reaches a point of stability and closure. And fourthly, they opined that there is a larger socio-cultural and political milieu in which the technological products are developed.

No articles or papers of direct health technology's relevance were found in the consulted literature before 1987 having direct influence over society. Apart from this few crucial work highlighting the social construction of technology, only a few studies were involved in studying mobile technology interventions in healthcare^{23, 24} but various antecedents were set in preventive healthcare which gave way for the development of ideas about prevention rather than treatment of diseases.²⁵

1.1. Interactions between Man, Society and Technologies in Healthcare

Durkheim's interpretation of human experience, whether in respect of religion, morality, law, social relationships generally, or knowledge, is to be found in his idea of duplicity. Durkheim²⁶ (The Elementary Forms of the Religious Life, p. i6-a, a translation by Joseph Ward Swain of Durkheim's last and most extensive work, “Les Formes elementaires de la vie religieuse,” published in i9i2.).

“Man, is double. There are two beings in him: an individual being which has its foundation in the organism and the circle of whose activities is therefore strictly limited, and a social being which represents the highest reality in the intellectual and moral order that we know by observation - I mean society. In so far as he belongs to society, the individual transcends himself, both when he thinks and when he acts”.

The knowledge of Human experience thus, both reflects and affects people's subjective experiences. The ubiquitous presence of mobile devices in this era, and their growth and development into application technology with their basic features of low cost, where individuals can quantify and self-track their behaviours and experiences by monitoring them

following the data which these apps help in collecting.

Human interaction is an essential component of micro-sociology, which deals with how humans act and react to one another with the usage of language, symbols, gestures, and other things alike. But this interaction is not limited and restricted to humans, rather studies have become largely aware of the interactions happening between non-human actors as well. For Weber,²⁷ those who lacked this kind of behaviour were 'reactive' or 'non-social. The intentions attached to such non-humans weren't goal-oriented, thereby not linked to human capacities, and were genetically programmed.²⁸ But slowly and steadily over the period, more researchers have started critically analysing the restrictions placed on social interaction as co-terminus with human-to-human interaction only.

Mead¹¹ argued, "It is possible for inanimate objects, no less than other human organisms to form parts of the generalized other for any given human individual". But these non-human entities provide a service for the development of self-specific capabilities that only humans possessed. Goffman¹² adopted a restricted approach while considering non-human actors and doesn't give them the due credit of being a 'true interaction'. In line with this, Callon²⁹ contends that inanimate objects can also be considered as a source of action as they can define problems, provide solution-oriented strategies and link them to a large number of networks to create a new reality. Drawing from the paper by Jodi Forlizzi and Katja Battarbee³⁰ titled 'Understanding experience in interactive systems, to simplify of our analysis, have used his understanding of the interactions between people and a technological product, and what is the experience gained by such interactions. Arising from these interactions are the experiences which are again described as, "Experience, An experience, and Co-experience".

These devices, to generate the ultimate human experience need to understand and support the everyday practices of the people and should be able to provide a 'holistic user experience'.³¹ The technological developments which are being undertaken have a general notion of trying to enter into the human world and provide an experience and an environment that is more human-like. Pinch³² sums it up best when he states, "The particular way in which society is conceptualized and linked to artifacts is via the notion of relevant social groups". Hence, it is important to understand the role social groups' play in the construction of technology as the interaction between all groups cannot be the same.

Nettleton and Burrows³³ and Nettleton³⁴ have given the term, 'e-scaped medicine' to represent the current shift in the position of medical knowledge

and practice from the medical school and the clinic to dispense digital information technologies such as the Internet and telemedicine devices. Hence, the body is not just viewed differently but also the experiences shared vary from individual to individual. Mobile wireless devices also affect the ways how bodies operate and function, by measuring and monitoring user's behavior and their bodily movements.

Other than the above given four key components, we must also consider the 'technological frame' as an important key concept. Technology encompasses products that are the representation and the social interaction of the participants using that technology and hence, technology is used, perceived, and accepted socially.³⁵ Lupton³⁶ opines, with the prompt rise of wearable technologies and mobile social media, new models of healthcare are being discovered and anticipated, such as m-Health and e-Health, all of which trust on web instruments, electronic forms of interaction, social networking, mobile devices, and data-driven and user-centric technologies to increase the facility of healthcare. Such healthcare models also accentuate the significance of individual responsibility and initiative for health supervision as well as the prominence of 'Big Data' produced through private use of digital self-tracking devices.

Rich & Miah,^{10,37} have studied public pedagogy that helps in offering a more 'contextualized, socio-political perspective of m-health'. There is an increased digital penetration and society is becoming increasingly dependent on digital technologies like mobile phones to track and regulate their daily activities. A share of influence has been witnessed on the health and fitness dimensions. Mobile devices specifically mobile applications (apps) are being directly accessed by the user through mobile application stores like Apple App Store and Google Play store to engage their health and fitness to mobile phones. "m-Health" technology is paving the road to inculcate in user a sense of self-responsibility towards their health by providing them the experience of directly engaging them in keeping track of their health as well as to provide solutions for them through sousveillance (Sousveillance is the recording of an activity by a participant in the activity, typically by way of small wearable or portable personal technologies). Changes in m-Health promotion focused on "lifestyle" developments in digital health technologies.³⁸⁻⁴²

1.2. The emergence of mobile phone devices: Global and National discussions

Following an irregular breakout in the foundational phases of the launch of the first digital mobile phones around 1994 to 2002, smartphones have become the most important technology which holds great potential for health care applications through their accessibility and affordability. Since then, mobile phones have

become the chief tool of social interaction.⁴³⁻⁴⁵ The social and technical in the modern world are actively intermingling with one another, thereby mutually affecting each other. The interaction with these technologies is similar to those with humans as these technologies strive because of the usage of interface which is similar to human experience, making them legitimate partners in social interaction. These technologies are given human-like characteristics or resemblance to increase the degree of interaction and make them more relatable. Technologies should not be seen as passive tools which are just making the lives of human simpler, but rather as tools that are shaping the very “life-world” (The term “Lifeworld” was coined by Edmund Husserl who believed it to be the fundamental premise for all epistemological enquiries, conceived as a world where its subjects may experience together.) of the individual. These technologies have a highly networked character which helps generate big data which can be used for studies at the macro level of a sociological understanding of any problem. One particular technological artifact which is increasingly used in our society is mobile phones. According to a new report by Global System of Mobile Communication,⁴⁶ a London-based global trade body representing 750 operators with over 350 companies, 80% of males and 59% of females own a mobile phone in India, with the percentage of mobile internet male and female users being 36% and 16% respectively.

1.3. *The Genealogy of Quantification in Healthcare*

The history of Quantified Self (QS) is not at all contemporary and people have associated its origins to Stoicism, the practice of moral perfection which can be traced back to 3 century BC. Self-quantification mainly relies on the ideals of tracking the physical and behavioral aspects of an individual’s life. Stoicism originated as one of the most influential schools of philosophy in the Hellenistic period, in Greece and was founded by Zeno born in 330 BC. The modern conception of Stoicism is equivalent to the lack of emotional involvement and was to remain indifferent to both pain and pleasure. This practice of moral perfection can be linked to self-quantification as individuals gain more self-awareness and self-responsibility.

An Italian physiologist, professor, and physician, Santorio Santorio also called Sanctorious of Padua (1561-1636), invented various medical instruments and is said to have introduced the quantitative approach to medicine. He tracked his weight and bodily functions every day for 30 years, as well as his ingestion, eating, and dietary habits, and excretion, thus known for his discoveries regarding metabolism and invention of technical tools. In 1711, a reader defined his technique of using the “Sanctorian chair”, of the English

publication *The Spectator*:

“Having provided myself with this Chair, I used to Study, Eat, Drink, and Sleep in it; insomuch that I may be said, for these three last Years, to have lived in a Pair of Scales. [...] As soon as I find myself duly poised after Dinner, I walk till I have perspired five Ounces and four Scruples; and when I discover, by my Chair, that I am so far reduced, I fall to my Books, and Study away three Ounces more (Bond, Donald F. (ed.) (1987): *The Spectator*, Vol. 1. Oxford: Oxford University Press, p. 106. First published in 1711. (SOURCE: Website of Max Planck Institute for History Of Science, Featured story – ‘Sanctorious Sanctorious: The beginning of self-quantification’)).”

This clearly shows how the use of quantifying tools helped in altering the user’s behavior to an extent that he managed himself and his lifestyle in accordance with the device. Thereby it can be said that such instruments have a direct compulsive influence on the consumer’s lifestyle. Thus, Santorio Sanctorious was also considered the founding father of metabolic balance studies.

Later in the 1700s, Benjamin Franklin (1706-1790) who was also one of the founding fathers of the United States of America formed “13 virtues”, where he morally optimized his behavior and values daily by tracking. Over time he noticed that the tracking of these virtues allowed him to prosper and cultivate a better lifestyle.

Weighing scales may have become easily available and high-tech devices but they were born out of necessities of the merchant in ancient times. The most ancient weighing scale has been discovered in the Indus Valley Civilisation around 2000 B.C., which was a part of the Indian subcontinent before the independence of India in 1947. It was in the 1800s that the world witnessed the invention of a penny scale, which was coin-operated. The penny scale was a device used by people to watch their weight without having to go to the doctor’s office. This machine reminded everyone to keep a watch on their weight. Apart from this, they were a new kind of ‘silent salesman’ in the public space was one of a kind public weighing machine, which not only motivated people to stay healthy and fit but also kept the pennies in circulation. Later on, in the 20th century, these devices were made compact, and weighing scales became a common object in every household, and allowed people to quantify their weight without having to step outside of their houses. The QS movement promotes individual responsibility through self-tracking actions.^{47, 48}

Ajana⁴⁹ opines that the history of self-monitoring is not a new concept. And over time, everyday metering has a long history the idea of the first Pedometer was designed by Leonardo Da Vinci, which was a wheel

designed to count the daily steps. Thomas Jefferson initiated pedometer to the American public and some even named them “Tomish Meters”. Recognition of the pedometer did not take off until the 1930s and even then, it was most popular with hikers which eventually gave way to it being advertised as a “Hike-o-meter”. Later in the 1960s the first user-centric pedometer named, ‘Manpo-kei’, was produced and advertised in Japan. This device was the first in a line of many more wearable devices to come that helped to monitor the aspects of health and motivate its users to stay fit. In recent years tracking devices in form of applications embedded in mobile phones or wearable sensors have become a popular element of health tracking cultures. Various apps are available to quantify the user’s activities as per their needs to promote a sense of individual responsibility towards a healthier lifestyle.

2. The Emergence of m-Health as a Research Theme (2000-2007)

Detailed mapping of m-Health has been addressed by studying the research evolution of the discipline.⁵⁰ Hence, such a repetition of such an enquiry would prove futile. This section aims to follow a structured approach while briefly explaining the development and rise of academic research from a sociological vantage point. With the rise of ICT and the growth of the Internet, various researches were being carried on to study the interventions of the internet in different behavioural studies including m-Health under e-Health systems.⁵¹⁻⁵⁴ Among which a few studies were undertaking the question about privacy and other challenges of these health care interventions which were being carried forward with the help of the internet.^{55, 56}

Robert Istepanian⁵⁷ introduced the term m-Health and defined it as ‘emerging mobile communications and network technologies for healthcare. He opines that the amplified accessibility, portability, high performance, and enhanced data rates of future mobile communications systems will influence and

fast-track the effectiveness of m-Health systems. Other researchers were consistently developing the sociological aspects of science and the potential applications that can set the trends for m-Health in the future.^{58, 59} Other major works hence started studying these developments in the health informatics to redefine the concept under the works in the sociology of science⁶⁰ which finally were developing into other concepts like ‘e-scaped medicines’.³³ The conflicts became even apparent with the differential development and further cultural and internet divide becomes apparent when talking about the development of health informatics.^{61, 62} Understanding how people experience personal health and fitness through the usage of these apps can help us in understanding their usefulness in the wider society as well as individual context.³⁷

To understand how m-health is being constructed socially, we need to understand the history of individual’s role in healthcare systems. Cultural customs should be taken into consideration and how ‘illnesses’ were looked at as punishments by the divine and traditional ways of healing and rituals were the norm of the day. At such a time, people didn’t discuss their illnesses and kept them secret because of the stigma attached to diseases.

3. The Emergence of m-Health Technologies and the Quantified-Self as Research Themes (2008–Present)

From 2007, a consistent stream of peer-reviewed papers and articles pointed towards the emergence of m-Health technologies as an academic area of research with numerous contributions from a sociological researcher in the English language. The research on m-Health cuts across different fields of enquiry (Figure 2).⁶³

Self-identity became an important component of social interaction and could be seen within its reflexivity, making an individual more self-aware and self-responsible. Theorists like Mead¹¹ and Goffman¹² have detached the concept of self-identity from the

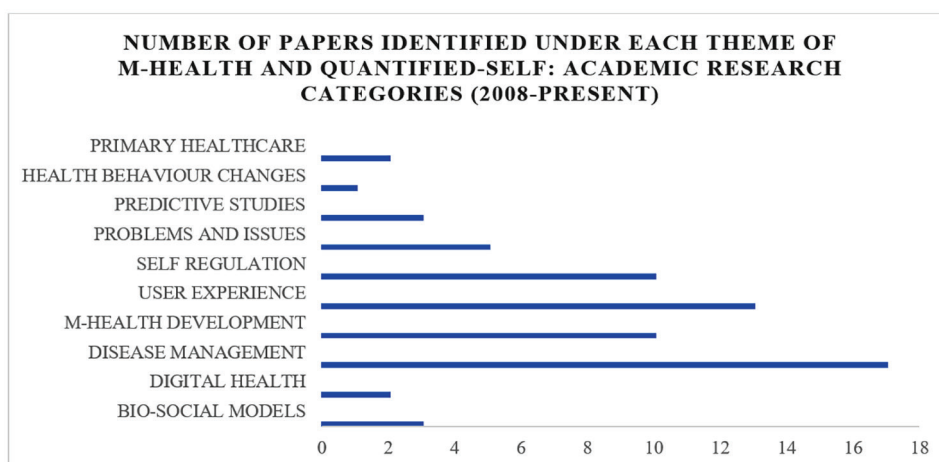


Figure 2: Themes Identified in Research Articles

non-humans as they believed they lacked the internal consciousness for the development of that 'I', due to their more cognitive as well as affective capabilities.¹³

In the formative years, the bulk of Academic contributions stemmed from various institutes in the U.S. but one of the major developments was the WHO report⁶⁴ highlighting m-Health systems, as to have seen a fillip with the growth of mobile devices and digital communication systems, incorporating all the apps and add-ons for the mobile devices and systems, to enable participatory health and communication-based health systems. The report further classified m-Health in various categories ("m-Health: New Horizons for Health through Mobile Technologies", based on the Findings of the Second Global Survey on eHealth (Global Observatory for eHealth Series, Volume 3) by the World Health Organisation (WHO)) per their usage, purpose, and practice. Since then contributions have flowed from various researches being carried out in the field. It suffices to say that the WHO report set a standard and tone for all the work that was being done under m-Health systems and how can we better understand the interactions which were taking place between man and technology in Healthcare. Understanding how people experience personal health and fitness through the usage of these apps can help us in understanding their usefulness in the wider society as well as individual context.³⁷

Since then, the researches can be divided into several themes wherein m-Health applications and their different nuances were studied to examine the kind of effect and parleys surrounding their growth in biotechnical and socio-cultural milieus. With the increase in the number of smartphone users, m-Health applications are becoming more accessible, embedded with unique features of personalized interactions, quick intervention delivery systems, and contextual details. The functions of health and wellness apps can be categorized into lifestyle-oriented apps, clinical apps, disease management systems, telemedicine, and other m-Health management systems.⁶⁵

The most significant of all the themes recognized is the bio-social model which has been developed as a result of the influence that the social applies on the current growing technological fields. M-Health has become crucial in bridging the gap between the biomedical and social understanding of healthcare systems and social innovations under public health.^{66, 67} A deeper analysis can also help us to develop theoretical and methodological shifts happening because of the interdisciplinary nature of the study.⁶⁸

Several studies on m-Health development are focused on the research hotspots in the technological field of studies⁶⁹ but the majority of the literature is still focused on disease management, increasing subsequently in the past few years, being undertaken

with the help of m-Health technologies.⁷⁰⁻⁷⁴ Subsequently m-Health applications are being used for managing a number of lifestyle diseases like diabetes,⁷⁵ cardiac arrest,⁷⁶ postpartum depression⁷⁷ and hypertension.⁷⁸

A number of these studies were conducted in developing countries making m-Health technologies a feasible option even in countries that suffer from problems like lack of resources and overpopulation.⁷⁹⁻⁸²

With the development of m-Health technologies, the focus has shifted to digital health infrastructures and building them to establish better healthcare facilities. A lot of academic literature today is based around these digital dynamics in social and Healthcare systems in the past few years, taking into consideration sociological as well as technological enquiries.^{83, 84}

Adhering to one of the major themes of m-Health applications, self-quantification, various reviews of articles were taken up on the themes of self-regulation and user experiences as well as the changes in their healthcare behaviour. From testing the design of these applications, promoting lifestyle choices in healthcare to calorie-counting apps empowering individuals of different age groups to take ownership of their health. It is witnessed that there is an enhanced sense of self-responsibility and sousveillance observed in studies that have largely focused on aspects of the quantified self.⁸⁵⁻⁹²

Another crucial dimension of m-Health research in nexus with QS showcases the deep-seated nature of academic research trying to analyse the user experiences shaped under the digitalisation of healthcare through m-Health applications. The research literature is based on the knowledge systems and user experience,⁹³⁻⁹⁵ customer satisfaction and loyalty,⁹⁶ affordability of these m-Health applications,⁹⁷ accessibility of these applications especially for the specially-abled people,⁹⁸ and to understand the performance seeking wellness.⁹⁹ Other studies and literature have also tried to focus on public spaces and the professional sphere to understand how m-Health can be utilised for working individuals.¹⁰⁰ The goal of the kinds of literature is to understand the experiences of all the users of such applications, be it individually at a personal level or by medical professional's awareness regarding such healthcare technologies.¹⁰¹

Apart from the previously mentioned interdisciplinary models of development and innovation, certain predictive studies have helped in identifying the futuristic models to analyse the impact of digital health care on society in general and individuals in particular.¹⁰²⁻¹⁰⁸ The researches which can be developed in the time ahead can benefit a lot by learning from the problems and issues of m-Health technologies in hand,¹⁰⁹ especially in the developing world (Ginige, Maeder, & Long, 2014).¹¹⁰

Limitations of the Study

A limitation of the present study is most common to any systematic and scoping literature reviews, residing in the fact that much of the literature selected has been to study the objectives at hand. In this constantly growing field of study, this selective study provides a narrow account of the process of self-quantification through m-Health technologies.

Hence, the selected database, which can be explained as the second limitation, the focus was more on the socio-cultural of health and medicine database. A preliminary search, however, conducted on a more m-Health technology-oriented database showed results in form of a long list of peer-reviewed articles mainly focused on system design and technological insights, and not much on the social dynamics. Lastly, a comprehensive literature review, much broader than the scope of this article is invaluable for covering all studies conducted in different languages and not only English.

Conclusion

With a systematic review, we have pursued to map out the connection between m-Health technologies and their influence on health behaviour among individuals, specifically the concept of quantified-self. The literature review is crucial for understanding the strengths and limitations of such academic and practical debates.

Although m-Health studies are gaining international traction, this literature review highlights the academic infancy at the national fronts, thus, offers various exciting research opportunities. Some gaps and questions remain about the contextual framework under which these technologies are created and adopted due to lack of information. There is a much wider need to rethink and redesign m-health technologies to fit the culture and context in which they are to be used. Then there is a potent question of whether the social researches under the STS field of study have been capable of exploring the market evolution and technological changes among the 'lifeworld' we are creating in this digital age. Another important aspect that can be developed and studied is the knowledge creations within technological systems especially the contextual understanding of designing m-Health applications. Further research can not only help us in answering these questions but also guide us to develop a policy framework for m-Health interventions.

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