

Towards a Critical Realist Epistemology for M-Health Research

¹Moses Lemayian Nooseli, ²Tonny Kerage Omwansa

¹Maasai Mara University, Kenya

²University of Nairobi, Kenya

ABSTRACT

It has been mentioned in various researches that have been done worldwide that countries tend to gain by adopting m-health. As an object of inquiry within Information Systems (IS), the phenomenon of m-health is pretty new with no clear guidelines as to the appropriate epistemology for conducting research in m-health. The objective of this paper is to discuss the object of m-health in the context of the three predominant research paradigms: positivism, critical theory and interpretive research. The objective of this research is to try and align research in m-health to the main research paradigms. The paper will also aim at proposing the most suitable research paradigm for research in m-health systems. Literature analysis reveals that a number of IS researchers are refocusing on the concept of realism as an alternative for positivistic research. In particular, there has been an advocacy for critical realism. The proposition in this paper is that m-health is better researched using a pragmatic approach involving the use of critical theory and critical realism.

Keywords - *M-health, Critical theory, interpretive, positivism, information Systems*

1. INTRODUCTION

1.1 Background

The study is done under the research paradigms of information systems (IS) research. The field of information system is not clearly defined as ascertained from the early efforts of Mason and Mitroff's [1], "A Program for Research on Management Information Systems." Research in information systems has its roots in information technology research and organizations research that is considered to be in the social science. A natural starting point for any research in IS is information system. [2] Defined information system as "a collection of components that collects, process, stores, analyses and disseminates information for a specific purpose". Preston [3] appealed for MIS to research itself and argued that IS researchers should critically examine what shape our understanding of MIS, the underlying assumptions and theoretical constructs and thus its practice.

Research in IS goes beyond systems. "The core concern of the field can be taken as being the orderly provision of accessible information support for people acting purposefully, often, though not exclusively in the context of an organization." [4]. This definition raises attention to problematic issues of "organization" and "information" that a researcher has to address.

In [5] the cross-disciplinary nature of Information Systems Research has created a multiplicity of theoretical constructs that allow any phenomena to be studied from a number of distinctive perspectives. IS finds its roots partly in the traditional social sciences, engineering and mathematics.

Ahituv and Neumann [6] provide a list of 18 separate fields that intersect in the field of Information Systems. These fields belong to three main disciplines; 1) "Exact" sciences comprised of general system theory, control theory, mathematical economics, decision theory, management science and statistics, 2) Technology in the form of electrical engineering, computer science and information theory and 3) Social Behavioral sciences containing sociology, cognitive psychology, management theory, organization theory, economics, political science, psycholinguistics, organizational behaviour and philosophy.

Turban et al. [2] defined organizations as "Human-designed and human-controlled systems made of people, equipment, inventory, and procedures arranged to interact to accomplish one or more objectives" [2]. A professional organization is an organization consisting of professionals and other supporting personnel.

1.2 m-health

m-health is a new and evolving research discipline. The term *mobile health* or m-health, also written as m-health, describes the use of mobile telecommunication and multimedia technologies as they are integrated within increasingly mobile and wireless health care delivery systems [7]. It can also be described as "mobile computing, medical sensor, and communications technologies for health care" [8]. M-health is a reasonably new term that has been defined as "the application of the emerging field of mobile communications and network technologies in health care systems" [9]. It is now that the term is being clearly defined and frameworks developed for the broader medical and public health communities, as well as for the general public and stakeholders in the mobile phone



industry although to those in biomedicine and informatics it is a familiar term [10].

Developing countries can use the potential of using Information and communication technologies (ICTs) to transform healthcare delivery. The use of ICT in healthcare, especially the mobile technology based health care services (m-health), has already transformed the delivery of healthcare through accessibility and affordability across the developing world [10]. Mobile phones can well be used as an extension and an integral component of eHealth, to be used in health care, and also as m-health, and as a subset of mServices: using mobile devices to deliver services such as banking and health.

The management of health care services delivery requires an important support tool called the Health Management Information Systems (HMISs) [11]. In Kenya decision-making processes were decentralized to the districts in 1983 by the Government of Kenya (GoK), from the Ministry of Health's (MoH) following the World Health Organization (WHO) resolution that all WHO member states to strengthen District Health Systems (DHS) (WHO 1989) [12]. To be effective in decentralization, information systems to support the DHS managers in their planning, implementation and evaluation functions needed to be established as an essential component of the DHS [13]. Studies have shown that no single information system at the district level is computerized and the existing manual system for collection, storage and retrieval does not facilitate timely availability of information for decision-making [14].

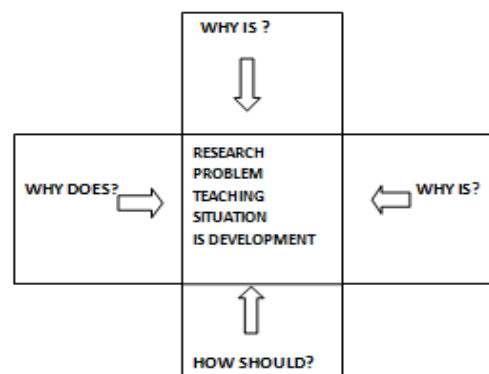
The use of electronic medical record (EMR) applications over time decreases medical errors and enhance safety for the patient [15]. An opportunity emerges from the wide spread use of cell phones in countries like Kenya to provide point-of-care health care application to patients and health care providers. This application can be used to assist patients schedule doses, to announcing a disease outbreak and carrying out a health awareness campaign. Technology factors, such as EMR data availability play a key role in determining the complexity level of mobile applications for patient care. Integration of data and services overcoming issues such as legacy applications, incompatible interfaces, and proprietary limitations are also key factors in providing effective patient care in mobile applications. The security, integrity, and privacy of data, which are also determined by the local and international laws all play important roles in determining the type of applications that can be deployed [16].

The Technology Acceptance Model - TAM [17],[18] adapted from the theory of reasoned action (TRA) [19], [20] posits that adoption of a new IS by a user is determined by the users' intention to use the system, which in turn is determined the beliefs a user has about the system. TAM further suggests the beliefs that perceived usefulness and perceived ease of use are instrumental in explaining the variance in the intention

of users. Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance his or her job performance, and perceived ease of use is defined as the extent to which a person believes that using a particular system will be free of effort. Among the beliefs, perceived ease of use is hypothesized to be a predictor of perceived usefulness. Information system researchers have investigated and replicated the TAM, and agreed that it is valid in predicting an individual's acceptance of various corporate IT [21], [22], [23], [24]. However, the TAM's fundamental constructs do not fully reflect the specific influences of technological and usage-context factors that may alter user acceptance [18]. Thus, prior studies have extended the TAM with constructs such as perceived playfulness [25], compatibility [26], perceived user resources [27], trust [28], trustworthiness [29] and perceived credibility [30].

The settings of the provider/patient play an important role in the adoption and success of mobile applications. For instance, the applications that are successful in one geographical location might not work effectively in another location due to factors such as language limitations, and economic constraints. Geographical location and economic factors also have repercussions on the state of the mobile infrastructure. Questions such as whether the available cell phones are able to support an application deployment platform should be answered before selecting the deployment approach. The laws of the land also play an important role in determining the optimal deployment approach for mobile applications.

The deployment of mobile healthcare applications successfully can be held back by a number of factors [31]. The Users' comfort level with mobile applications and computer knowledge helps in a decisive role in the level of comfort with different applications. Sophisticated applications with complex interfaces are more likely to be accepted by technology savvy users, while less technologically savvy users are more likely to adopt simpler applications with easy to use interfaces. According to Roode, J D. [32] "process-based" model a researcher poses four different questions which do not necessarily follow a linear model.



Generic Research Questions by Roode, JD [32]



Any inquiry into the ontology of m-health may need to look at the following issues based on the model:

- *What are* the challenges that slow down the success of m-health
- *How do* the citizens benefit from m-health
- *how does* m-health help improve health care service provision
- *How should* m-health be implemented

2. PHILOSOPHICAL FOUNDATION

This section focuses on the philosophical underpinnings. Philosophical framework of social researchers effects on their understanding and perception of all social phenomenon and behaviour. For example, philosophy effects on researcher topics, designing and methodology [33]. Assumptions can be made by researchers when choosing their topic and approaches. Cresswell [34] identified four classical main components of a philosophical perspective. The first one is alternative claims about what exists, namely, ontology. This clarifies researchers believe phenomenon they study exists independently or its existence depends on whether human being believe on it. The second one is epistemology, which cannot obtain observation of phenomenon directly. Axiology and methodology are the other two choices of methods.

According to Bryman and Bell [35] epistemological and ontological considerations and their associated methods are the most essential issues for social research. Two main epistemological positions that advocate the application of methods in the study of social reality are positivism and interpretivism [36]. On the contrary Bryman and Bell [35] posit that objectivism and constructionism are two important ontological positions that asserts social phenomena and their meanings have an existence, which is independent of social actors.

Early IS research was dominated by positivist, or more generally empirist epistemology, which sees science as explaining events that can be empirically observed. In the 80's and 90's another strata of research appeared beside the "hard" positivist approaches. The main one of these competing approaches is interpretivism [37]. Positivism and interpretivism perspectives will be critically reviewed.

2.1 Positivism Reflection

Behaviour of humans can be objectively measured going by the positivist sociologist [38]. When studying the behaviour and actions of humans, people cannot be "positive" about claims of knowledge [39]. According to Bryman and Bell, [35] positivism is the most often treated as a supporting quantitative method. As opposed

to qualitative research methods that are seldom used in positivism.

Bryman and Bell, [35] asserts that positivism is only concerned with phenomena that can be observed and measured although to understand the underlying casual mechanism it require the researcher to know how to grasp the underlying value.

2.2 Interpretativism Reflection

Interpretativism proves the world is constructed by individuals who explore the world where they live and work. They develop subjective meanings of their experiences within certain objects. This has an early formulation mentioned by Mannheim [40], which was largely reinvented and applied to living life in 1960s [41]. Later on, [42] enriched this research. It has been become more and more popular to support the qualitative methods with understanding of human society. Interpretativism is appropriate as social facts, where this prevailing view is held by the majority of society.

The disadvantage of interpretativism is relying heavily on subjective explanation. This flaw resulting in bias and simplification has to be aware. Otherwise, it would lead to relativism since there are multiple perspectives leading to conflicting views as to what is "really" happening [35]. Positivism and interpretivism can be distinguished in numbers of different ways [38].

2.3 Critical Realism Reflection

The debate between the representatives of the competing research traditions has been based on the idea of two or more research paradigms being incompatible. However, each paradigm has strengths and weaknesses and these can be combined meaningfully, creating a research strategy called pluralism. This would allow for different paradigms to be applied in a research situation [44]. This pluralist approach is consistent with the critical realist paradigm that does not reject either of the epistemological standpoints.

Philosophical perspective and a possible research designs is Critical realism, which is a realistic approach to social research but adopting a critical or activist principle. The critical realists accept an ontology which includes observable entities and underlying structures, which are similar to positivists and interpretativists [45]. It encourages a priori approach to social research and leaves open the choice of methodology to the practitioner. This, however, does not often insist upon any particular methodological approach [46]. Either the quantitative approach or the qualitative approach might be suitable depending on research topics.

2.4 Adopted perspective

In research, as in practice, information systems (IS) researchers use specific approaches to generate knowledge in response to particular questions and problems. In doing so, they are confronted with a series of choices and information about particular approaches, and the knowledge that could arise from each. As a result, researchers may start with one approach, and while accepting the partial results it provides, run other research approaches sequentially, in parallel, and at different levels of analysis, in order to increase the understanding of a phenomenon [38].

A pluralist approach is advocated in this paper due to the context, aims and aspects of the m-health system such as actual usage and usage situations that are clearly demonstrable in a positivist sense, but the exploratory research nature that sets to explore the opportunity and challenges of m-health demand a more interpretive approach. According to Weber's note [38], "Interpretivism can be seen researcher and reality are inseparable and knowledge of the world is intentionally constituted through authors' experience in terms of ontology and epistemology." Interpretivism enables researchers providing interpretations for support research views based on the behavior of people.

The philosophy of critical realism is adapted in order to maintain a solid ontological ground for this research and to establish the existence of a reality independent of observation while accepting the relativism of knowledge as socially and historically conditioned in the epistemological domain [37]. A more thorough discussion on critical realism in IS research can be found in Mingers [37], Carlsson [40] and Monod [41]. In this study the existence of the systems and the structures of reality are accepted as such but the attitudes and perceptions of the systems users are considered to be relative and subject to influence from their social environment.

3. CONCLUSION

Different research philosophy and methodology have different strengths and weaknesses from points of view. The positivist approach is suitable when the subject matter involves less subjectivity. The interpretivist approach is suitable when there is a "shared reality". Hence, the chosen perspective also relies on the research objectives, research questions and expected outcomes. The choice of subject, how it is investigated and the way in which the results are presented are all matters in which value judgments are made as the case with this paper which explores the opportunities and challenges of m-health in Kenya.

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