

State-of-the-Art: Research Theoretical Framework of Information Systems Implementation Research in the Health Sector in Sub-Saharan Africa

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Abstract. This study is about the state-of-the-art of reference theories and theoretical framework of information systems implementation research in the health industry in the Sub-Saharan countries from a *process perspective*. A process – variance framework, Poole et al, (2000), Markus & Robey, (1988) and Shaw & Jarvenpaa, (1997) is employed to examine reference theories employed in research conducted on information systems implementation in the health sector in the Sub-Saharan region and published between 2000 and 2013. Using a number of key words and searching on a number of databases, EBSCO, CSA, CINAHL, Science Direct and Emerald, we identified 41 published research articles that met our inclusion criteria. The articles were mapped unto the process-variance framework. A significant finding in this critical review is that, a large proportion of the studies were underpinned by variance or factor theories. While variance or factor models are useful and appropriate for the examination of static phenomenon, they are unsuitable for studying implementation, which is conceived as a dynamic and change phenomenon. There is therefore a need to increase research studies that employ the process theoretical framework to enhance our insight into successful information systems implementation in the region.

Keywords: process theory, variance or factor theory, information systems implementation, health industry, Sub-Saharan countries.

1. Introduction and research objectives

In Sub-Saharan Africa, the health industry has been recognised as one of the most valuable and significant industries for economic growth and social progress. Consequentially and of late it has become one of the fastest growing industries in that part of the continent. Besides this development, research in the health sector for Sub-Saharan Africa has also become a salient agenda item for the World Health Organisation (WHO) in recent years. In this regard, van Olmen, et al., (2010 p 18) echoing WHO, offered a clarification of what a health system is, arguing that a health system consists of all *organisations, institutions* and *resources* that interact and managed for the purpose of improving healthcare of countries. They also resonated WHO's definition and noted that “health systems have a responsibility not just to improve people’s health but to protect them against the financial cost of illness and to treat them with dignity”, (van Olmen, et al., 2010). The WHO therefore urged member states in the region through its resolution AFR/RC48/R4 to develop national research

policies and strategies to aid capacity building and strengthen research institutions. Heeding this wake-up call, a number of the countries in the Sub-Saharan region have put in place strategies for administering, managing and conducting research in the health industry in an effort to deliver effective and efficient healthcare and healthcare services. These countries have acknowledged and put emphasis on the health of its citizens as this will contribute to the wealth, growth and development of the countries.

However a large number of the Sub-Saharan countries have no health insurance schemes; there nevertheless are few that have designed health insurance schemes and implemented information and communication technology to support these schemes for sustainable healthcare consumption. The health industry has been acknowledged as characteristically data and information intensive. In order to leverage this data and information to achieve a high performing and cost reduction health system requires an institution of information and communication technology to aid the support of the administration and delivery of healthcare services. The increase in service delivery, productivity, informed decision making, and nation empowerment as a result of the use of information and communication technology has been rehearsed, (Sheikh, 2014). The few studies that have been undertaken examining the administration and management of these limited schemes appear to lack reference theories and theoretical frameworks – a critical sine qua non for rigor and scholarship in research. Additionally, a large number of these countries have no health research policy, no strategic health research plan and no health research program (Kirigia & Wambebe, 2006).

This study is therefore about the state-of-the-art of reference theories and theoretical framework of information systems implementation research in the health industry in the Sub-Saharan countries from a *process perspective*. A process – variance framework, Poole et al, (2000), Markus & Robey, (1988) and Shaw & Jarvenpaa, (1997) is employed to examine research conducted on information systems implementation in the health sector in the Sub-Saharan region and published between 2000 and 2013. Using a number of key words and searching on a number of databases, EBSCO, CSA, CINAHL, Science Direct and Emerald, we identified 41 published research articles that met our inclusion criteria. The articles were mapped unto the process-variance framework. A significant finding in this critical review is that, the state-of-the-art of a large proportion of the studies was underpinned by variance or factor model. While variance or factor models are useful and appropriate for the examination of static phenomenon, they are unsuitable for studying implementation, which is a dynamic and change phenomenon. There is therefore a need to increase research studies that employ the process theoretical framework to enhance our insight into successful information systems implementation in the region.

We contend that a process perspective would be useful in information systems implementation studies as it will help provide amplification on how changes unfold over time; it will also help identify trajectories, path dependencies, co-creation and the influence unleashed by important events over this period of time. Up until the recent times, the large number of studies conducted on information system implementation had been underpinned by variance theories, Mohr (1982) or factor models, (Ginzberg, 1975). While variance or factor-based researches do aid us in the identification of useful factors in system implementation, they do not address how these factors change and unfold over time. Factor-based studies rather focus on and are quick to claim

knowledge and explain the causes of change. They utilise statistical techniques that are inappropriate for such explications. Given this backdrop, a number of research questions emerge; these are posited as follows:

1.1 Research Questions

- What research reference theories or theoretical frameworks have been employed in examining information system (IS) implementation in the health sector in this region?
- How are these research theoretical frameworks operationalized? How are the constructs of the theories operationalized?
- What research theoretical framework can help gain more insight into implementation in the region? What reference theories can offer useful explanation and practical guidance on implementation?

1.2 Research Objectives

- To identify the different reference theories or theoretical framework employed by researchers in examining IS implementation in the health sector in this region
- To gain insight into how the different reference theories or theoretical framework and their constructs are operationalized by researchers in examining and explaining IS implementation in the health sector in this region
- To suggest useful frameworks to provide and improve our understanding and for guidance on implementation the region

1.3. The importance of this study and theory in IS implementation research

This study is important from four perspectives - managerial, practical, theoretical and knowledge. In this forceful and complex 21st Century world, healthcare industry organisational leaders and managers are busy genre and require process-based theories that can help them understand how and why changes take place over time. Though this process-based theory may not provide a precise and definitive recipe cook-book regarding what action to take, it nevertheless will provide an overarching framework that describes and explains processes, sequences and necessary conditions cardinal to the management of change.

Besides, it is important for governments, information systems researchers and practicing managers to have an in-depth understanding of what information systems implementation and strategy is, and what the local meaning of the concept is to the users of the systems, practicing managers and information systems professional in developing countries; and how information systems can be implemented and sustained for the benefit of the people. Another important reason is that this understanding will be vital for promoting confidence in the stakeholders of the healthcare industry of the developing countries. Finally, this study is important as it will make significant contributions to knowledge in the area of information systems implementation in the health sector.

1.4 How the rest of the paper is structured

In the next section, a brief definitional issue, inclusion and exclusion criteria for selecting the literature is addressed; an explanation of the process-variance model is then undertaken; this is followed by the method and the process for identifying the literature for the review; it is then followed by a critical evaluation of the selected literature employing the process-variance model Poole et al (2000) and Shaw & Jarvenpaa, (1997) as the framework for the review; the examination focuses on theories that researchers had employed in their studies to assess and explain information systems implementation in the health sector in the Sub-Saharan Africa; this is tailed by the findings; the discussions and conclusions are contained in the last section.

1.5 Definitional issues, inclusion and exclusion criteria

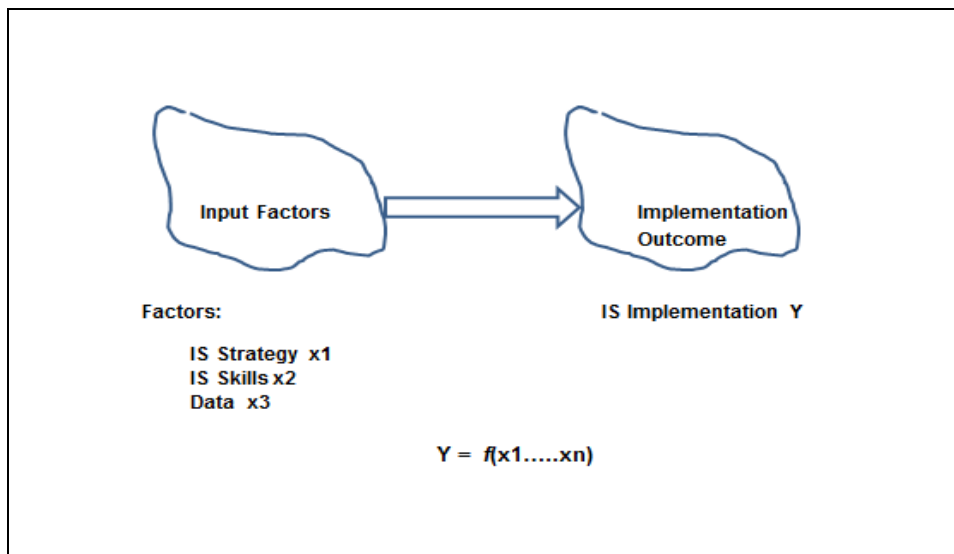
This study, to reiterate is about reference theories and information systems implementation in the health sector, in the Sub-Saharan Africa. While the literature on the industry contains terms and concepts such as medical informatics (Haux, 2010), health informatics, (Coiera, 2003), telemedicine, (Myers et al 2012), health information systems, electronic medical records, eHealth and Patient Information Systems, for the purpose of this study, the terms will be used interchangeably and conceived as meaning the same idea. Similarly the terms information systems (IS), information technology (IT), and information and communication technology (ICT) are used interchangeably. Secondly, and for this study, only research that reported on large information systems or information technology implementation is considered and included in the review. We disregarded research literature that focused on system implementation for healthcare service delivery based on mobile phones and cell phone technologies. The reason for such exclusion is that mobile phones are characteristically simple short message service (SMS) text messaging tools and are incapable to handle complex data types – complex and long text messages, images, animations, videotapes and audios – which today in addition to text, numerical data and figures form the bulk and bases of data that populate healthcare and service databases. In the third place the rationale for the selection of this sub-region – 46 countries is that, developing countries, which include Sub-Saharan African countries, today account for the majority of the world's population; and according to Prasad and Heals (2010), 84% of the world's population resides in developing countries. Additionally, according to Maps of the World (2012), seven of the Top 10 Fastest Growing Economies of the World are in Africa, (www.mapsofworld.com). This region is therefore generating significant interest for researchers and practitioners who are interested in development and growth. A number of commentators have therefore argued that the continent is growing economically, progressing politically and socially being enhanced, that the world can no longer ignore this tour de force. “Africa is ready at last to play an increasingly important role in the affairs of the world”, (Rotberg, 2013). Finally, the motivation for selecting information systems for the study is that information systems, information technology and ICT is conceived as a developmental tool and catalyst for economic growth, (Warr & Ayres, 2012).

2. Change process theoretical framework

2.1 Change Process

Information systems implementation has, in recent years, generated serious debates within the information systems research community. Following a critical review of the literature on implementation studies, information systems implementation has been argued and conceived as an innovation process, a dynamic and change management process, (Ginzberg, 1975; Sabherwal & Robey, 1995; Kim & Pan, 2006). Poole et al note that while a number of implementation studies make claims to implementation as a change process they lack clarity as to what “change” and “process” are. As a result of judicious examination of the literature, Poole et al define three ways the literature appears to conceive process: (i) as a logic used to explain a causal relationship in a variance theory, Mohr, (1982) or Factor Model, (Ginzberg, 1975); (ii) a category of concepts that result from actions of individuals and organisations and (iii) a sequence of events that explains how things unfold over time.

Figure 1: Factor Model

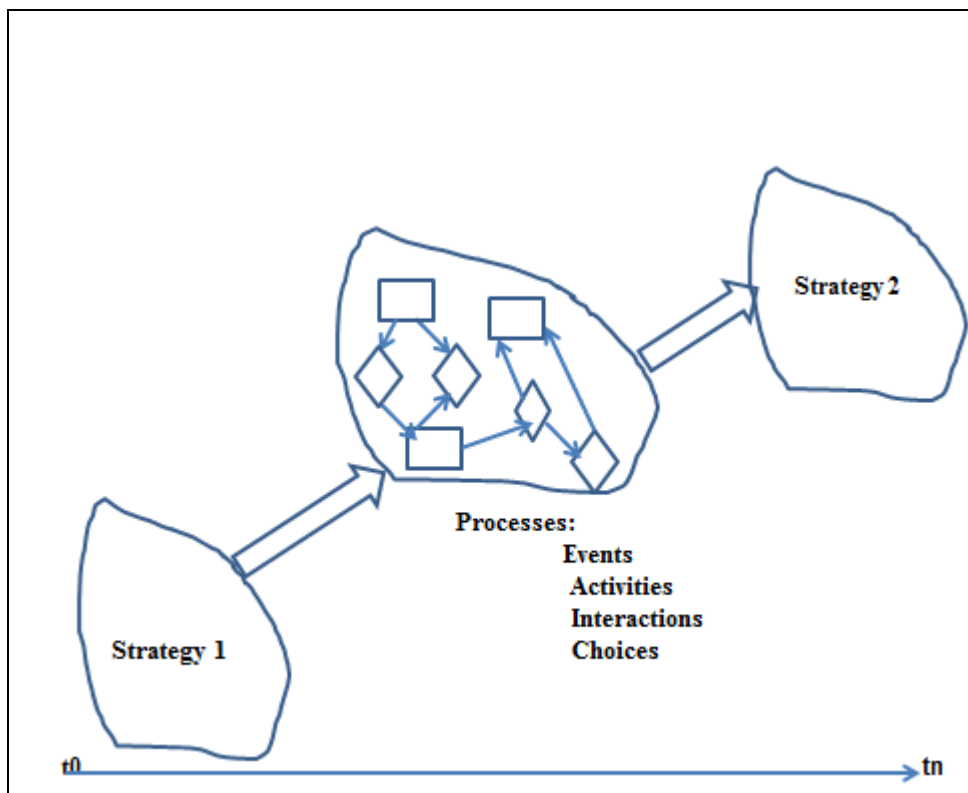


Source: Adapted from Langley (1999)

Poole et al (2000) contended that researchers, who adopt the first definition, explain process by using logic to assert that some input variables, for instance IS Strategy, IS Skills and Data, usually conceived as independent variables have causal relationship with some output variables, for example IS implementation outcome described as dependent variables, Fig 1. They also observed that, for exponents of the second definition, process is taken to mean a category of concepts of individuals and

organisational actions. These concepts are then operationalized as constructs in research and measured. By so doing the second definition also behaves like the first definition as illustrated in Fig 1. The third definition notes that process is about changes in variables over a period of time and focuses on time, the sequence of events and incidents, activities or stages that are displayed over that period of time when the variables change, (Poole et al, 2000), Fig 2.

Figure 2: Process Model



Source: Adapted from Langley (1999)

Poole et al were uncomfortable and critical of the protagonists of first and second definition. The source of the disquiet for Poole et al is that advocates of the first and second definitions do not observe change as it takes flight. If process is a dynamic phenomenon, then the conceptualisation of process based on the first two definitions is weak and limited. Ginzberg (1975) also criticises and labels those studies that are underpinned by the first and second definition as factor-based research because like, Poole et al (2000) researchers in those studies identify only factors but do not observe the factors as they undergo the changes. Thus Poole et al reasoned that implementation

studies that conceive the phenomenon as a process must be underpinned by change process theories. Poole et al therefore claimed that there is a need for a process theory to help explain implementation. Poole et al consequently discuss four such representative change process theories - life cycle theory, teleological theory, dialectical and evolutionary theory, (Poole et al, 2000 p.3-28) – and used to explain processes of change.

2.2 *Change process reference theories*

Poole et al argue that such exemplar process theories - life cycle theory, teleological theory, dialectical and evolutionary theory, are useful for the explication of processes of change. The assumption underpinning life cycle theory is that the entity or the phenomenon that is undergoing change has some intrinsic characteristics such as logic, code or program that shapes the process of change; and as the entity moves from one point to another, it follows a predetermined unitary sequence, i.e. sequence of stages or phases. Hence, the nomenclature “stages of growth” that the literature adopts. These theories of implementation also assert that institutional rules or programs impact and determine implementation activities to progress in a prescriptive sequence. In the second families of theories, i.e. teleological type of theories, change and implementation progress towards a goal or an end state. The entity that is being changed interacts with other elements in context and in so doing constructs the end state it wants to reach. This family of theories sees development or change as a repetitive process of “sequence of goal formulation, implementation, evaluation and modification of goals based on what was learned or intended by the entity”, (Poole et al 2000).

The third family of theories, dialectical theory, assumes that organisations are made up of “pluralistic world of colliding events, forces of contradictory values” (Poole et al, 2000). According to this theory, the reason for such collusion and opposition is that each force, value or event wants to have control or domination in the organisation. These oppositions may come from the organisations internal and external environment. The theory’s explanation for stability and change is that this is achieved through struggle and accommodation. The final school of thought on change theories is the evolutionary theory. This theory posits that “change proceeds through a continuous cycle of variation, selection and retention”, (Poole et al, 2000). Variation or change comes about as a result of chance. Change just takes place.

2.3 *‘Extension’ of process-variance or hybrid process model*

However Shaw & Jarvenpaa, (1997) discussed that while the process-variance/factor typology is valuable, for instance it helps IS researchers identify the key dimensions along which process and variance model differ, it is nevertheless a pure form; it is nominal and ideal. Following their extensive study of information system implementation literature, they concluded that the kind of models that researchers build and study lie somewhere in between process model and variance models. Thus they contended, developed and argued for an ‘extension’ of process-variance model or what they called a “hybrid model” that combines the features of both process and variance models. The hybrid model, they noted will provide us with better understanding of IS implementation issues, (Shaw & Jarvenpaa, 1997).

These process theories Poole et al (2000) and Shaw & Jarvenpaa (1997) therefore formed the “tool” or analytical framework employed to scrutinise the information systems implementation studies reference theories in the health industry in the Sub-Saharan region.

3. Research method for literature search and inclusion

Having delineated the boundary for the inclusion and the exclusion of the literature, we followed Webster and Watson guidelines (2002) on literature review to start the process of identifying and searching the sources and databases for the literature. The search was based on keyword searches and resulted in a wide range of journals that had international information systems, businesses and not-for-profit organisation academic journals. We used the string “(Info* OR IT OR IS) AND implementation*” in keywords to search the following resources: EBSCO/Business Source Premier, Proquest/ABI Inform and Science Direct. We also used the Boolean expression [national OR health] AND [information systems OR information technology] AND [Africa OR Sub-Saharan Africa], “Health ICT in Sub-Saharan Africa”, “Health IT in Sub-Saharan Africa” and “Health IS in Sub-Saharan Africa” to carry out searches on PubMed, Embase and EconLit. Manual searches were carried on other databases such as ISI Science, Emerald, CSA, CINAHL, BMC Medical Informatics and Decision Making, Journal of Telemedicine and Telecare and MEDLINE. Finally some literature was found by chance. This resulted in about 432 articles.

We then started to read the titles, abstracts and introductions of these articles. This process finally yielded the forty-one (41) items that met our inclusion criteria and underpinned this study. To reiterate, the literature selected for this reviewed covered the following period: 2000 – 2013 in view of the fact that there were very little or no studies published prior to this period that met our criteria. Given the youthful nature of the phenomenon in the developing countries (including Sub-Saharan Africa), there are very little studies and paltry research on IS implementation published in the leading journals according to IS World ranking, (Heeks, 2002; Walsham, Robey, & Sahay, 2007 and Prasad & Heales, 2010). However, by 2007 information system researchers had started contributing research articles to the top international journal. Saunders (2007) observed that the gap in the top international literature on developing countries was being addressed. Despite the many reasons that have been put forward to explain this puerile situation, there is no gain-saying that theory-driven research and publications on Africa was rare, (Mbarika & Meso, 2008).

3.1 Data collection

The data extracted from each of the studies examined are as follows: the sources of the literature, the authors, specific Sub-Saharan country of the study, the setting, the reference theory or theoretical framework or model used, see Table 1. Though data was collected on the research design and methodology employed and summary of results and findings, the research setting and the theoretical framework/reference theories were underscored in this review.

4. Critical review and data analysis - application of process-variance framework

In this review, our focus is on *reference theories* or theoretical frameworks that underpinned studies on information systems implementation that attempted to illustrate the determinants of implementation results in the health sector in the Sub-Saharan Africa. In our discussion, we also take into consideration the *setting of the study*, the *focus or the target phenomenon* of the implementation; the context of the implementation i.e. national level, regional level, district level was also considered; *theoretical* issues addressed by the researchers, and finally the *results or impact*, of the implementation identified in the research being reviewed here. This is summarised in Table 1.

Our motivation for the concentration on theories is driven by our conceptualisation of the utility of theories in research. The usefulness of theories in research has been rehearsed in the literature. For information systems researchers in developing countries, the concern has been raised that their studies tend to be skewed towards action, and therefore seem to lack theoretical grounding. These studies according to Heeks have not provided the solidity of a true theoretical foundation. Even where researchers have made use of theories in their studies, the theory is briefly explained at the expense of the application of the theory, (Heeks, 2006). Theories help us develop an explanation of a phenomenon, an event or an occurrence; they also help us make decisions and take actions. So theories guide us in our directions; indeed theories are part and parcel of our social and daily lives. In the context of organizations and management, one can argue that if theories are rooted in the daily lives of managers, then theories will be inextricably linked with practices and actions. Therefore the world of theories engages with the world of action and vice versa. There is thus a cyclical relationship between theory and practice. Theory and practice are linked recursively and inextricably. In the same vein, the researcher who uses theories will get help and direction from the theories employed in the study; a study whose conclusion and recommendations is enlightened by theories will be translated into consequential practice. Theories also inform the research process. In fact the use of theory is the hallmark of quality of research, (Burrell & Toyama, 2009).

As we illustrate in Table 1, column 5, headed **Theory/Concept**, a significant number, about 20% of the studies on implementation were not underpinned by any theory or theoretical framework. Though these studies Nucita, et al., (2009), Fraser et al, (2005), Bagayoko et al (2011), Shivute et al, (2008), Spero et al, (2011), Castelnovo et al., (2012), Shiferaw & Zolfo, (2012) and Omona & Ikoja-Odongo, (2006) are descriptive and make some interesting points, they lack significant rigor to make its findings and conclusions credible. While the results of these studies seem to provide some insight into the implementation examined, the dearth of reference theories raises issues about the soundness of the studies.

As can be seen from Table 1, we note that one of the theories that seem to have underpinned the cited references is *institutional theory*. Only three (3) studies, Piotti et al (2006), Damtew et al, (2010) and Kimaro & Sahay, (2007) utilised this theory. Institutional theories have been employed in research studies in developed countries and economies and have been known to have powerful and predictive capability, for example, summit as an institution, (Klein, 2004). In the study by Piotti et al (2006) we

Table 1: Reference Theory and Methodological Approach							
Unit of Analysis	Org/National level	Group/Regional Level	Individual/District Level				
Article	Setting			Theory/Concept	Category of Theory Factor, F: Hybrid, H; Process, P)	Research Design and Methodology	Impact
Baker et al (2012)	Ministry of Health, Health Sector, Zanzibar (N)			Open Source Software, OSS Integration	P	Participation Action Research	cost reduction, increase data quality
Kimaro & Nhampossa (2007)	Ministry of Health, Hospital Information System, Mozambique, Tanzania			Sustainability	F	Longitudinal Action Research	Defective system functionality
Piotti et al (2006)	Health Sector Reforms, Health Information Systems, Mozambique (N)	Health Sector Reforms, Health Information Systems, Mozambique R	Health Sector Reforms, Health Information Systems, Mozambique (D)	Institutional Theory	F	Longitudinal Interpretive	multiplicity of HIS; slow data flow; poor coordination and quality data
Jimoh et al (2012)	National Primary Health Care Development Agency, Nigeria			Technology Acceptance Model (TAM)	F	Survey	significant variation in system adoption due to local factors
Cline & Luiz (2013)	Health Sector, Hospital Information Systems, South Africa				F	Participation	system was easier to work with,
Mengiste (2010)	Public Health System, Health Information Systems, Ethiopia			Cultivation and installed base from Information Infrastructure II	F	Interpretive	fragmented system; data compilation

Lungo & Igira (2008)	Zanzibar Health Sector, Health Information System, Zanzibar			Actor Network Theory (ANT)	P	Interpretive	sense of ownership created; integrated system;
Gatero (2011)	Health Information, Kenya			N/A	F	Interpretive	inf accessibility difficult; lack of ICT skills; lack of data;
Nyella (2011)	Health Information Systems (HIS); Primary health Care Sector, Zanzibar			Concept of "Integration"	F		limited use of the HIS; tension between HIS and vertical programs;
Isabaliya et al (2011)	Telemedicine Information Systems, Uganda			Diffusion of Technology Acceptance Theory (Rogers & Shoemaker 1973)	F	Triangulation	lack of telemedicine skilled staff; resistance to change;
Whittaker et al (2011)	Hospital, South Africa (N)			Point-of-Care model	F	Triangulation	improved costing; poor connection to back-end system; incorrect inventory.
Damtew et al (2010)	Program on Health Information systems in Ethiopia, Botswana, Gujarat, kerala (India)			Institutional theory	F	Action Research	institutional settings influenced functions of HIS; data duplication minimized; data quality improved;
Kimaro & Sahay (2007)	Ministry of Health; Health Information Systems (HIS), Tanzania	R		Institutional theory	F	Interpretive	lack of vertical and horizontal alignment of formal and informal constraints;
Mosse & Byrne (2005)	Health Information System Program (HISP), Niassa Province (Rural District), Mozambique				F		

Braa & Hedberg (2002)	Health Information System, South Africa				F	Action research	
Jacucci et al (2006)	Standardization of Health Information Systems, South Africa				F		
Mosse & Sahay (2005)	Health Information System (HIS), Primary Health Care, Mozambique				F		
Braa et al (2007)	Health Information Systems (HIS); South Africa, Ethiopia, Thailand (N)		D	Complex Adaptive System	F	Action research	Fragmentation; multiple data sources; lack of standards
Barjis et al (2013)	Decision Support System, Rural Healthcare Delivery, South Africa		D		F		
Nchise et al (2012)	Telemedicine, Rwanda	R		Technology, organization and Government readiness	F	Exploratory Case study design	mixed impact; lack of real time data transfer; lack of specialised technology
Williams & Boren (2008)	Electronic Medical Record, Ghana	R			F		
Kotzé & McDonald (2010)	Management of antiretroviral treatment programme, South Africa	R			F	Action Research	customization data quality
Braa et al (2010)	Health Inf. System, Sierra Leone				F		
Leon et al (2012)	mHealth decision-making			Health System Framework	F	participatory	increase productivity
Nucita et al (2009)	DREAM, Tanzania, Angola, Congo RDC, Kenya and Malawi	R		N/A	N/A		effective diagnostic and data management tool

Peso et al (2009)	Telemedicine, Sub-Saharan Africa			Telemedicine Conceptual Framework	F	N/A	N/A
Kifle, (2006)	Telemedicine, SSA, Ethiopia and Tanzania			National cultural, social and value infrastructure	F	Survey and quantitative method	positive effect
Fraser et al (2005)	Medical Record System, Kenya, Malawi, Uganda	R		N/A	N/A		benefits and challenges
Kanter et al (2012)	eHealth Prog; 14 countries			Open-source; standards	F	documentation; databases	flexibility; collaboration
Gladwin & Wilson (2000)	HMIS East African Country			DoI & dynamic equilibrium	F	ethnography	partial adoption
Bagayoko et al (2011)	Telemedicine, HIS - Mali			N/A	F	Case study	improved quality care
Shivute et al (2008)	Health service delivery, Namibia	R			F	survey and questionnaire	important for medical nursing; clinical services
Spero et al (2011)	HRIS, monitoring health workforce, Uganda	R		N/A	F	documentation, quantitative data	effective planning
Castelnuovo et al (2012)	Provider-based EMR, Uganda	R			F	Questionnaire, Interviews	reduction of rates of error
Shiferaw & Zolfo (2012)	Telemedicine, Ethiopia (N)			N/A	F	docs and survey	lack of connectivity, poor organisation
Shah et al (2012)	Science-based Health System, strengthening health system, Tanzania			Science-based Health Innovation System Framework	F	docs and interview	building capabilities
Al-Bader et al (2010)	Science-based Health System, improving health innovation, Ghana (N)			Science-based Health Innovation System Framework	F	docs and interview	weak policy implementation

Were et al (2010)	Elec Health Records, Uganda			Scalable Model	F	Survey	successful implementation
Spiegel et al (2012)	Occupational Health IS; South Africa (N)			Structuration Theory	F	docs, survey, participant- observation	attention to power relations
Omona & Ikoja-Odongo (2006)	Health information access, Uganda (N)			N/A	F	Questionnaire, Interviews	high rate of illiteracy, underdeveloped ICT infrastructure

Legend: Column A= Reference of research article; Column B,C,D=Research country setting/level and functional area of implementation; column E=reference theory or theoretical framework used in the article; column F= theory or theoretical framework used, F=Type of theory

learn how with the explanatory power of *institutional theory*, the implementation of the Health Information System impacted the provision and delivery of healthcare in Mozambique. Piotti et al (2006) however noted regrettably fragmentation, poor coordination and poor data quality that characterised the Health Information System. The people who were supposed to benefit from the new “institution” i.e. the Health Information System, had created alternative “institution” - new informal rules and structures that inadvertently contributed to the system failure.

Damtew et al (2010) research however demonstrated that the implementation of the Program on Health Information System resulted in cost reduction. There were nevertheless problems with data quality, inconsistency and integrity. Thus institutional theory may be conceived as offering an explanatory tool for examining change and predicting change which is consistent with the theme of the current study.

Despite the usefulness of institutional theory in providing us with insights on the impact of institutions (factors) on actions, it does not clearly discuss the process of the change. Indeed the three studies discussed here failed to offer any discussion of the process of change, which raises questions about the rigorous application of the theory. Proponents of institutional theory tend to put high premium on the outcome or the effects of institutionalization rather than on the process through which organizations become institutionalized. Consequently researchers who fail to clearly show how the theory explains the dynamics of the change are criticised as conceiving organizations merely as “black boxes” with nothing of value inside, (Miles, 2012, pp. 145-150).

In Table 1, two (about 5% of the) studies are noted as employing *actor-network theory (ANT)* to examine the information systems implementation, (Braa & Hedberg, 2002; Lungo & Igira, 2008). The actor network theory is considered as a process theory and takes the view that elements in an organisation consists of human and non-human entities that take form and acquire their characteristics through the interaction and relationships with other entities in the context in which they find themselves. According to the theory when entities or actants interact and form social relationships, these social relationships (existing and new networks, stakeholder relationships and communication patterns) should be explained and not assumed away. A thrust of the theory is that the process through which actants coordinate their efforts and actions among each other must be emphasised. It is therefore incumbent on researchers who employ this theoretical framework in their studies to learn from actants about their behaviour, what they do, how they do it and why they do it. In reporting this knowledge, the researchers are required to use narrative and descriptive format for observing actors in their natural context. In the spirit of the actor network theory, it is not in the place for researchers to impose any spurious and artificially constructed categories of constructs unto the life-world behaviours of actants.

When we examine the research by Lungo and Igira (2008), it provides a useful explanation of the processes and impact of the implementation of Health Information in Zanzibar. In the study, the researchers observed the phenomenon in its natural setting. The sequence of events is noted. The researchers observed the actors in their participation in different Health Information System design, software development, training workshops and implementation. The researchers observed and focused on the

actants' interactions, the processes of negotiations and alignment of interests. They noted that in conducting interviews, pre-fixed set of questions were not used; rather the questions emerged following the actant interactions to shape the design and implementation of the Health Information System. In this regard Lungo and Igira (2008) were able to use narratives and descriptions to describe and explain the processes of building the network, connections and how they aided the implementation of a successful Health Information System in Zanzibar. One can therefore claim that the resultant successful implementation can be explained using the process theory. The impact in the Zanzibar study was that the actors demonstrated a strong sense of ownership of the system implemented; the Health Information System was streamlined, data collection and report generation was easier. The study by Lungo and Igira (2008) an excellent illustration of the function of process perspective, is in sharp contrast to the research of Braa and Hedberg (2002). In the Braa and Hedberg study, the dynamic processes that the actors were engaged in are not observed and described. The study therefore lacks appropriate application of the theory. Nevertheless, Braa and Hedberg concluded that the implementation of the Health Information System was to a large extent unsuccessful because a large amount of data was collected but not used by system users; there was also difficulty with system integration. Actor network theory, as illustrated in these two studies Lungo and Igira (2008) and Braa and Hedberg, (2002) have shown how the theory can be used to explain the dynamic and changing relationship between actants and their outputs – in this instance implementation of Health Information Systems. However, the researchers who employ this theoretical framework have been criticised for the over emphasis of description at the expense of other research methodologies and theories. Miles noted that when researchers put high premium on description, a great deal of the dynamics is lost and as a consequence the validity and reliability of the research may be weakened. The entire world therefore cannot be reduced to responsible description, (Miles, 2012).

The research by Jimoh et al (2012) is buttressed by *Technology Acceptance Model* as displayed in Table 1, column 3, (Davis, 1985; Davis, 1989). This model's power lies in its ability to explain and predict adoption of information systems in organisations. Since its initial inception, a number of empirical studies have been conducted where researchers have modified the original model to include additional factors, creating extensions to the original model to offer rigorous explanation and predictability for phenomena being examined, (Chow, Herold, Choo, & Chan, 2012; Chen, Li, & Li, 2011). For a considerable period of time now, the model has been one of the most frequently used theoretical frameworks employed for explanation or rejection of information systems in profit oriented business. The model has exerted significant influence in studies that have attempted to understand, explain, and predict why organisations implement, adopt and use information technology. The model has been tested in a number of empirical studies and has been proven to be useful, (Chen, Li, & Li, 2011; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Legris, Ingham, & Colletette, 2003).

In the health sector, very little research had been conducted underpinned by this model, (Yarbrough & Smith, 2007). However in the last decade or so, researchers have started to use the model to gauge information systems acceptance in the health sector in the developed countries, (Chow, Herold, Choo, & Chan, 2012). It was therefore interesting and refreshing to note the attempt of Jimoh et al (2012) to explain and

predict the acceptance of the National Primary Health Care System in Nigeria. The implementation highlighted the fact that as a result of differing local factors, there was significant variation in adoption of the system. For instance, there were significant differences on three constructs (factors) i.e. perceived ease of use, perceived usefulness and endemic barriers to technology among respondents from the five states where data was collected. Older members of staff who scored highly on perceived ease of use did not do well on a factor such as knowledge and attitude. The predictive and explanatory power of the model in information systems acceptance and usage is acknowledged in the information systems research community.

While the model has provided useful evidence on some of the contextual factors necessary for successful implementation, it lacks explanatory power to demonstrate information systems implementation as a change process. Implementation as a change process is much more irregular and complex. Process entails changes that unfold over time and made up of path dependencies and co-creation. Unfortunately, technology acceptance model as used in the studies discussed here does not address this proposition and therefore makes it problematic to accentuate the predictive capacity of the model.

Another theory that has been often employed in the information systems research is the *innovation diffusion theory*, an exemplar of process theory. The theory examines the processes through which new ideas and information are put across to organisational members over a period of time that can result in the implementation of an innovation; and an innovation can take the form of a service, product or goods, service or an idea, (Rogers, 1983; Rogers, 2004).

It is with this backdrop that we assess another 2 (5% of) studies - Gladwin et al (2000) and Isabalija et al, (2011) listed in Table 1. These studies use the *diffusion of technology theory* to examine the Telemedicine Information Systems implementation in Uganda. The overarching objective in these papers is to identify factors that positively affected the adoption, implementation and sustainability of the system. In terms of this objective, the researchers, Isabalija et al (2011) claim the research objective was achieved as the innovation diffusion theory aided them to identify and explain those factors that impacted the implementation. For instance, respondents were unequivocal about lack of telemedicine skilled staff, lack staff training in telemedicine and lack of policy and guidelines in using telemedicine. Members of staff also resisted the changes brought about by the implementation.

While innovation diffusion theory in these studies greatly aided identification of factors necessary for successful implementation, Gladwin et al (2000) and Isabalija et al, (2011) did not help explain the process of change during the implementation. Information system implementation is not a static phenomenon; it is a dynamic social and organisation process. The dynamics therefore need to be captured for explanation. Another criticism of the framework is the assumption that all implementations are useful and have practical utility and therefore should be embraced. In many organisations and social contexts, the implementation may appear to the supposed beneficiaries as an imposition. The implementation may be an “organisational and cultural mis-fit” and therefore raise concerns about resistance. And as a result the information system may not be adopted.

In this review we also note that 5% i.e. two studies, Bakar et al (2012) and Kanter, et al., (2012) Table 3 were anchored in *Open Source Software (OSS) Integration* model. Integration in this model and as a theoretical framework focuses on technical factors rather than processes. Baker et al (2012) study employed qualitative participatory action research and noted that the impact of the implementation helped reduce cost and increase data quality and quality health care delivery. Unfortunately, like the other factor studies, the factors identified in these studies – cost, data quality and care delivery changed and their interplay over time as a consequence of the implementation are not observed and explained. Nevertheless, a merit of this model is that adoption of this approach makes it easy to access source codes and executable programs. Adoption of open source is also conceived as a cooperative effort between system users and developers to aid product development and hence technology driven rather than a business model. Again the cooperative process, albeit a useful and valuable construct is not explained. Goode, (2005) has also decried open source as lacking ongoing support, lacking resources and process compatibility.

The study by Kimaro & Nhampossa, (2007) employed the concept of *sustainability* to examine Hospital Information Systems. While the study followed qualitative research tradition, the study's conclusion noted that impact of the implementation was a failure and did not meet the expectations. The study's conclusion would have been more interesting and convincing if the authors had discussed the sequence of events and how the failure came about.

The rest of the studies, - Spiegel et al, (2012) *structuration theory*, Shah et al, (2010) *Science-based Health Innovation System Framework*, Al-Bader et al, (2010) *Science-based Innovation System Framework*; Were, et al., (2010) *scalable model*; Whittaker et al,(2011) *point-of-care model*; Mengiste, (2010) *cultivation and installed base* from information infrastructure; Braa et al, (2007) *complex adaptive system*; Nchise et al, (2012), *technology, organization and government readiness*; Barjis et al, (2013) *decision science approach*; Braa, et al., (2010), *health metrics network* – though claiming to be implementation studies had only identified and focused on interesting factors that are conceived as impacting the various implementation outcomes.

5. Research findings and discussions

We now remark on the lessons learnt from this review. With regard to theories, we find that almost 20% of the studies examined here are not underpinned by any theory. The lack of theory nonetheless raised anxiety about the scholarship of the studies. Nevertheless, they provided some interesting results. They seem to provide practical suggestions as to how implementation may be improved. Though they lacked theories, the researchers in these studies tried to address their research questions and discover something novel after considerable search and effort. Thus atheoretical studies may have some salutary effect and that we should take care not to crowd them out from our discipline due to our obsession with theory-building or theory-testing, (Miller, (2007).

In the second place, we also note that 97% of the studies that were theory driven were predominantly factor or variance paradigm based. Undoubtedly, factor-based studies as demonstrated above have shown us that there are possible myriad of factors that can and sometimes affect successful system implementation and usage. They can also highlight or alert us to missing factors that may contribute to system implementation failures. However factor-premised approaches are flawed and have a number of limitations – they have little or no theory to guide them in their selection of the input factors necessary for implementation; the researchers who conduct this type of research tend to arbitrarily choose those factors that are most readily accessible for inclusion in their equation, Fig. 1 (Franz & Robey, 1987); they take a static view of an inherently dynamic phenomenon; they measure factors at a single point in time and suffer from ‘methodological determinism’ (Monge, 1995); they fail to focus on the management of the implementation process, (Ginzberg, 1975). Poole et al (2000) also noted that the research methods used by the factor paradigm-based researchers are not well suited for research on change and development; they tend to ignore organisational processes (Bai & Lee, 2003). In view of the limitations of the factor paradigm, there is a call for a paradigm shift (Ginzberg 1975, Poole et al 2000); a shift from factor to process paradigms. In the third place, there is only one study Lungo & Igira, (2008) that seems to have been driven by the process theory and provides a clear understanding, explanation and path dependencies of the implementation. In the fourth place, we do not appear to have any evidence of studies anchored in the hybrid model as discussed, (Shaw & Jarvenpaa, 1997). It will therefore be interesting to see future studies underpinned by the hybrid model in the health sector in the region.

On aspects of implementation, as summarised in Table 1, we observe that all the studies focused on information systems implementation that are well located within an area of the health industry e.g. hospital information system, telemedicine, electronic medical record, decision support system, human resource information system and occupational health. However there is no study on the implementation of information systems to support Health Insurance Schemes (NHIS) in any of the 46 Sub-Saharan countries. The region as noted is made up of 46 countries and about 45% of these countries have implemented national health insurance scheme in one form or another while the 55% have no known schemes. However, there is little study conducted to learn about how information and communication technologies have been implemented to support the administration and management of these schemes in the 45% of the countries that have implemented health insurance schemes in one form or the other. While the literature has rehearsed the leverage provided by the technologies in the delivery of healthcare and health services there is insignificant study on information systems implementation supporting these schemes. There is therefore a need for research to gain insight into effective and efficient implementation of information and communication technology to aid the administration and management of health insurance schemes in the region.

While the spotlight in this study was on Sub-Saharan Africa, it is our conviction that the findings will be interesting and useful for other developing countries outside the Sub-Saharan region because they share similar hostile environment, economic, social and developmental challenges, such as lack of IT infrastructure and external technical support, (Lucas, 2008). We believe the conclusions in this critical review – lack of theory driven studies and the need for process-based research – will incentivise

and motivate researchers to re-visit and examine information system implementation in the health industry in developing countries in Asia and South America.

6. Conclusions

In this study, we examined reference theories and theoretical frameworks in the literature on information systems implementation in the health sector that support the administration, management and delivery of healthcare in Sub-Saharan Africa. We noted that about 20% of the studies lacked any theories and theoretical framework; that 95% of the studies had focused on identification of factors to explain implementation, i.e. factor-based research. It was argued that implementation is more than just factors; implementation is a process; it is a dynamic social change process. The factor-based studies, though useful fail to explain how changes, for that matter how implementation takes place. The factor studies are weak in capturing change as it takes flight. The factor-based studies do not have theories to help offer explanations of change and processes of implementation. Nevertheless they have salutary power. We argued that given the power of the process approach, it will be fruitful to see future research in the industry conducted from this perspective. We also observed that on one important area in the health industry, the national health insurance scheme no study had been conducted on information systems to aid administration and management of the scheme in any of the forty-six (46) countries in the whole Sub-Saharan Africa. While a number of studies have been conducted on aspects of the health industry there was no study on information systems implementation that supports National Health Insurance Scheme in the region. We therefore need rigorous and sustainable research in the region underpinned by process theory to provide us the deeper understanding required for delivering healthcare and services.

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