

## Activity Theory Framework: A Basis for E-Health Readiness Assessment in Health Institutions

Alfred Coleman<sup>1</sup> and Mary F. Coleman<sup>2</sup>

<sup>1</sup>*School of Computing, University of South Africa, South Africa  
Telephone/Mobile: 0027731370859, E-mail: colema@unisa.ac.za*  
<sup>2</sup>*University of Limpopo, Medical University of South Africa Campus  
Telephone/Mobile: 0027827868528, E-mail: Mary.coleman@ul.ac.za*

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**ABSTRACT** E-health readiness assessment has become the basis upon which ICT investments are deployed in health institutions. However different e-health readiness assessment models are applied to achieve different goal without any theoretical framework to support the choice of these models. This paper therefore investigated the different e-health readiness assessment models applied in health institutions of the north-west province of South Africa and mapped the outcome onto the constructs of activity theory framework to ascertain alignment between the two (e-health readiness assessment models and activity theory constructs) for possible adoption of Activity theory as a framework for e-health readiness assessment. A case study approach was used. Participants were selected from a population group of doctors and hospital administrators. Semi-structured, open-ended interview questions were used to gather evidence from the participants regarding the different e-health readiness assessment models applied in their hospital and how they evaluate the hospitals readiness to use e-health applications. The interviews were recorded, transcribed and coded. The findings revealed that “need-change readiness, engagement readiness, technological readiness and societal readiness “models are used for evaluation. The results from this study led to a direct mapping of the components of the e-health readiness assessment onto the constructs of activity theory. The mapping led to the proposal of Activity Theory being adopted as a framework which underpins e-health readiness assessment in hospitals and other healthcare institutions.

### INTRODUCTION

The White Paper on transformation for the public healthcare system in South Africa (SA) reveals that majority of the population has inadequate access to basic healthcare services and that the greater percentage of this population live in rural communities (Department of Health 2005). The White Paper further indicates that majority of South Africans receive their medical care from government-run clinics and hospitals. The North West Province Health Department (NWPHD), which is one of the provinces in South Africa, has invested substantial sums of money in the district and provincial health services, health facilities management and healthcare support services, including ICT, in an effort to improve the work processes of healthcare professionals to deliver efficient healthcare services. Despite the huge investment in the healthcare system, many healthcare professionals in NWP do not receive the benefits for which ICT (electronic health – e-health) can provide to improve on their work processes. The use of ICT in health is referred to as electronic health (e-health). The World Health Organization (2004) defines e-health as being the leveraging of ICT to connect providers, patients and governments; to educate

and inform healthcare professionals, managers and consumers; to stimulate innovation in healthcare delivery and health system management and to improve our healthcare system. Eysenbach (2001) refers to e-health as a concerted effort undertaken by leaders in healthcare and hi-tech industries to fully harness the benefits available through convergence of the Internet and healthcare. The advent of e-health seems fitting to address both opportunities and challenges in the healthcare sector. Therefore proper and holistic e-health readiness assessment in healthcare sector needs to be carried out to identify these opportunities and challenges to promote e-initiatives in South Africa’s healthcare institutions.

The concept of technology readiness assessment refers to the evaluation of the propensity of people to embrace and use new technology for accomplishing goals in life and at work (Parasuraman 2002: 308). CANARIE (2002) define e-healthcare readiness as the degree to which a community is ready to participate and succeed in e-healthcare adoption. Mannan et al. (2006) explain that the concept of “readiness” to implement technology is used as a shorthand term to cover a range of organizational dimensions. The related terms to readiness are “inno-

vation and adoption” of new technologies (Manna et al. 2006). Aas (2001) emphasizes that the introduction of e- health technology into a healthcare organization should be regarded as an innovation and adoption of information technology. Aas (2001) further states that any innovation into a community or system requires the community or system to adapt to the changes when such innovation is introduced. The degree of change therefore needs to be assessed to evaluate the impact and readiness for new innovation.

However, the question is what theoretical framework guides the assessment of e-health readiness in the health care institutions to achieve a holistic evaluation? In answering this, the different types of e-health readiness assessment models which are applied in hospitals in the North West province will be evaluated and the outcome matched on to activity theory framework to ascertain alignment between the two for possible adoption of Activity theory as a basic framework for e-health readiness assessment.

Activity theory (AT) is an umbrella term for a line of eclectic social sciences theories and research with its roots in the Soviet psychological activity theory (Verenikina 2001). These scholars sought to understand human activities as complex, socially situated phenomena and to go beyond paradigms of reflexology and physiology of higher nervous activity (the teaching of Ivan Pavlov and his school), psychoanalysis and behaviorism. It became one of the major psychological approaches in the former USSR, being widely used in both theoretical and applied psychology, and in education, professional training, ergonomics and work psychology (Bedny and Meister 1997).

## Objectives

The objectives of this paper is to investigate the different e-health readiness assessment models applied in health institutions the north- west province and map the outcome onto the constructs of activity theory framework to ascertain alignment between the two (e-health readiness assessment models and activity theory constructs) for possible adoption of Activity theory as a framework for e-health readiness assessment. The rest of the paper is presented as follows: related work, methods, results and discussion and a possible adoption of Activity framework for e-health readiness assessment.

## Related Work

There are many e-readiness assessment models that are used in the healthcare sector today and many of them assess a specific dimension in the healthcare environment. Each assessment model has a different assessment goal. Within the healthcare sector, there are currently six of these assessment models that are commonly used for assessment (Coleman 2010). These models include those proposed by Campbell et al. (2001), Demiris et al. (2004), Jennett et al. (2005), Overhage et al. (2005), Wickramasinghe et al. (2005) and Khoja et al. (2007). The readiness assessment model proposed by Jennett et al. (2005) is relatively comprehensive in terms of its evaluation scope. In this research the proposed model by Jennett et al. (2005) will be adopted. Her readiness model outlines four different domains of readiness assessment which are: core readiness, engagement readiness, structural readiness and non-readiness. These four types of readiness are explained below (Jennett et al. 2005):

- Core readiness: refers to the realization of needs and expressed dissatisfaction with the present situation and conditions;
- Engagement readiness: involves the active participation of people in the idea of e-health, risk assessment and the question of e-health as a solution;
- Structural readiness: focuses on the establishment of efficient structures as foundation for successful e-health projects within an organization for example, human, technical, training, policy and funding; and
- Non-readiness: is expressed as a perceived lack of need or failure to recognize a need for change and implementation of e-health technology

The model proposed by Jennett et al. (2005) addresses the overall readiness categories. The model stresses the importance of end-user ownership of innovation adoption and assesses the organizations, health providers, and public and patients readiness for e-health. The next section discusses the concept of activity theory.

Activity theory is a conceptual framework based on the idea that activity is primary, that doing precedes thinking, that goals, images, cognitive models, intentions, and abstract notions like “definition” and “determinant” grow out of people doing things” (Morf and Weber 2000).

Activity Theory uses the whole work activity as the unit of analysis, where the activity is broken into the analytical components of subject, tool and object. The subject is the person being studied, the object is the intended activity, and the tool is the mediating device by which the action is executed (Hasan 1998). Engestrom's (1999) modified Vygostky's original work on activity theory and provides two additional units of analysis, which have an implicit effect on work activities. The first is rules, which is described as sets of conditions that help to determine how and why individuals may act, and are a result of social conditioning. The second is division of labour, this provides for the distribution of actions and operations among a community of workers. These, two elements affect a new plane of reality known as community, and through this, groups of activities and teams of workers are anchored, and analyzed (Verenikina 2001). Engeström (2001) states that the work activity system comprise of the following components:

- individual workers, their colleagues and co-workers
- the conceptual models, tools and equipment they use in their work
- the rules that govern how they work, and
- the purpose to which members of the workplace community direct their activity.

Activity theory sees the integration of technology as tools which mediate social action. These tools, or artefacts, include instruments, signs, language, machines and computers. The relation between the individual and their environment is considered through the component of *community*. The relation between subject and community is mediated by *rules* and the relationship between object and community is mediated by the *division of labour* (Hettinga 1998). Due to the fact that the tools which have been incorporated into the social system have been created and transformed by humans during the development of the activity they will carry with them remnants of the cultural and historical evolution. Mediation through tools and technology is therefore not a neutral process; the tools will have an influence over the interaction between the subject and the object. Leont'ev (1981) refers to this phenomenon as "ring structure", a combination of three code terminating elements – subject, activity, and object.

A key attribute of Activity Theory is its focus on argumentative (dialectic) analysis on the in-

teraction between people (human) and their mediated tools or artefacts (purpose) which have been shaped by human activity (technical elements). With the advancement of the Internet, information systems and computer-based technologies Wartofsky (1979) proposes these information systems as tools of mediated human activities which have several characteristics. They can be primary, thus, tangible, external and physical, or secondary thus internal, semiotic and mental. Again they can be tertiary thus, schematics where mind and culture act together such as ecosystems.

## METHODS

The study was carried out in the North West Province of South Africa. Ten community hospitals (Taung, Ganyesa, Revilon, Bloemhof, Klerksdorp, Rustenburg, Christiana, Boitumelong, Empilisweni and Classic House Hospitals) in the North West Province of South Africa were purposefully selected based on their geographical locations which span across the entire province and form part of the government owned healthcare institutions in South Africa. The participants for the study were drawn from the entire population of doctors and hospital administrators in the ten hospitals. In describing population Polit and Beck (2008) indicate that it is the aggregate of cases having a common and designated criterion that is accessible as subjects for a study. A purposive sampling technique was used in selecting the participants. A doctor and a hospital administrator were selected from each of these hospitals. The participants were selected by their profession which was relevant to the study. Ten doctors and ten hospital administrators volunteered to participate in the study. Data was collected using semi-structured open ended interviews. The interviewees represented different roles ranging from specialist doctors to general practitioners to hospital administrators. The interviewees were asked to tell in their own words the different e-health readiness assessment models applied in their hospital and how they evaluate the hospitals readiness to use e-health applications (e-consultation, e-referrals, e-description and e-records keeping). The interview lasted for one and a half hours with each interviewee and was audio-recorded and transcribed by the researcher. Integrity of data entry from the study was checked by another researcher. Transcripts

were coded using Wolcott's (1994) method of case study analysis techniques. After the initial coding, broad categories were identified by searching for patterns in the participants' responses. Different broad categories were noted and discussed below.

## RESULTS AND DISCUSSION

The categories identified were need-change readiness, engagement readiness, technological readiness and societal readiness. Each of the categories is discussed below.

### Need-change Readiness

Need-change became evident as one of the models apply in readiness assessment in hospitals when the research findings from the hospitals revealed that there is a widespread shortage of doctors in these hospitals and as a result the delivery of healthcare services in these areas is affected. Respondents expressed their dissatisfaction with their current situation such as the long queues at the Outpatient department's (OPD's) and indicated how they felt that e-health solutions (for example, e-consultation) can help to alleviate or reduce such difficulties. Thus, e-health solutions are seen as a mediator between the shortage of doctors and the delivery of quality healthcare service. The staff who are less qualified than medical doctors can perform clinical activities in the absence of a doctor, but through the use of e-health applications. In such cases, professional advice can be obtained from a distant doctor or specialist doctor through the e-health solution and the relevant clinical activity can be executed.

They express a need for integration of disparate ICT systems within each hospital and across hospitals in the North West Province to facilitate e-consultation. The respondents further indicated that using an integrated network of healthcare professionals to consult with peers and specialists for professional advice and information can assist improve their work process. A doctor said *"from my point of view if one system is put in place, it will minimize the entire problem. Over and above that, information about patients can be retrieved within seconds if stored on computer system. Again I think the change will solve any problem at the end of the day"*.

Furthermore the current condition was viewed as unacceptable and doctors raised a need

for e-health system. This is in agreement with what Jennet et al. (2005) called "Core readiness" which refers to the realization of needs and expressed dissatisfaction with the present situation and conditions. Improving work process through the use of ICT is echoed as work activity in Activity Theory. Hasan (1998) indicates that Activity Theory uses of whole work activity as the unit of analysis, where the activity is broken into the analytical components of subject, tool and object, where the subject is the person being studied. In this instance the doctors and the hospital administrators are the subjects in activity theory and the work process is the object while the ICT applications are the tools.

### Engagement Readiness

It is a process in which community members are actively engaged in the idea of e-healthcare, weighing its perceived advantages and disadvantages to provide insight into the factors that potentially encourage or impede further readiness for e-healthcare adoption. The doctors showed signs of curiosity about potential implications of e-health adoption asking questions about e-healthcare as to what it could do and expressed concern about adopting e-health. This is in agreement with Jannet et al. (2005) who indicate that engagement readiness involves the active participation of people in the idea of e-health, risk assessment and the question of e-health as a solution. Morf and Weber (2000) state in Activity Theory that the object is the intended activity which the subjects engage in. Furthermore, Engeström (1996) states that the object shows the purpose to which members of the workplace or community direct their activity. In this instance, the doctors and hospital administrators willingness to make initial investment shows how they are ready to engage with the object.

### Technological Readiness

Technological readiness can be further decomposed into key technological categories that are needed to support successful implementation of e-health. These key technological categories are Hardware, Network, Related software and Healthcare providers' past IT experience. The study of Overhage et al. (2005) involves system readiness evaluation rather than practitioner or organizational readiness confirms technological

readiness as one of the categories of evaluating the readiness of e-health in the healthcare sector. In the technological readiness Overhage et al. (2005) considered clinical components, a demonstration of community commitment and leadership, matching funds, plans for a sustainable business model, use of data standards, and the use of replicable and scalable tools. Morf and Weber (2000) state that Activity Theory uses the whole work activity as the unit of analysis, where the activity is broken into the analytical components of subject, tool and object, and the tool is the mediating device by which the action is executed. Activity theory sees the integration of technology as tools which mediate social action. These tools, or artefacts, include instruments, signs, machines and computers.

**Societal Readiness**

A societal readiness assessment result is determined by organizational communication links to hospitals, administrative centers and provision of healthcare in collaboration with various healthcare organizations. A consideration of socio-cultural factors among staff and among clients is also considered as societal readiness (Khoja et al. 2007). In this case locally relevant content shared among the practicing community. The activity theory which is expanded by Hettinga (1998) indicates that the relation between the individual and their environment is

considered through the component of *community*. The relation between subject and community is mediated by *rules* and the relationship between object and community is mediated by the *division of labour* (Hettinga 1998). Due to the fact that the tools which have been incorporated into the social system have been created and transformed by humans during the development of the activity itself they will carry with them remnants of the cultural and historical evolution, mediation through tools and technology is therefore not a neutral process, the tools will have an influence over the interaction between the subject and the object.

It is therefore evident that Activity Theory forms a key attribute of analysis and evaluation of e-health readiness which take into cognizance the interaction between people (human) and their mediated tools or artefacts (purpose) which have been shaped by human activity (technical elements). These attributes of activity theory can be mapped unto e-health readiness assessment constructs as indicated in Figure 1.

Figure 1 clearly indicates that the doctors and the hospital administrators are the subjects in activity theory who have expressed a need for change; and the work process which the doctors and hospital administrators engage in is the object while the ICT applications are the tools.

Activity theory forms the theoretical framework upon which e-health readiness assessment in healthcare institutions can be based. Many

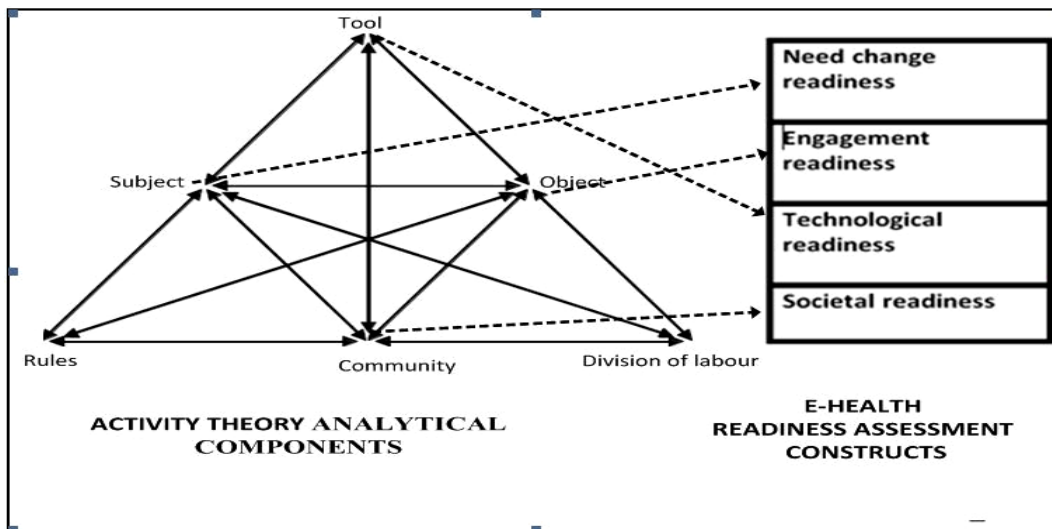


Fig. 1. Mapping of activity theory

researchers recognized this theory as being holistically rich in terms of understanding how people do things together with the assistance of sophisticated tools in such intricate and dynamic environments (Crawford and Hasan 2006; Hakkinen and Korpela 2007).

### CONCLUSION

Having reviewed the e-health readiness assessment models that are used in the healthcare sector, unpacked the activities that facilitate the process of each model it was noted that the components of activity theory directly maps onto the e-health readiness assessment constructs. Activity theory components therefore constitute a perfect framework which underpins e-health readiness assessment. The findings further revealed that societal readiness assessment construct is underpinned by Activity Theory component of community and division of labour. The findings lead to the proposal of Activity Theory being adopted as a framework which underpins e-health readiness assessment in hospitals and other healthcare institutions.

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