

## Mobile Technology-Enabled Healthcare Service Delivery Systems for Community Health Workers in Kenya: A Technology-to-Performance Chain Perspective

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**Background and Purpose:** Community Health Worker's (CHW's) are often the only link to healthcare for millions of people in the developing world. These health workers represent the most immediate and cost effective way to save lives and improve healthcare in their respective communities. They contribute to delivery of quality primary care by inter-alia conducting monitoring and evaluation exercises, disease surveillance, and point-of-care diagnostic support. There is consequently growing interest in supporting CHWs at the point-of-care through the application of mobile-health (mHealth) technologies. Unfortunately, these mHealth initiatives are often unsustainable pilot projects that fail to 'scale-up' meaningfully and there is a lack of substantive evidence of the impacts of these mHealth tools on healthcare service delivery outcomes. Moreover, extant literature on mHealth largely comprises studies that are non-replicable, and do not have large sample sizes.

Consequently, we lack answers to fundamental questions: To what extent can mHealth platforms enhance the performance of CHW's, and how can their workflows be improved through the utilization of mHealth tools? Without such answers we cannot provide rigorous evidence-based solutions for the enhancement of community-based healthcare service delivery systems, the empowerment of CHW's in the delivery of healthcare services, and the proper and successful scale up of mHealth projects.

The purpose of this study is to address these questions. More specifically, this study aims to examine (1) the fit (from multiple fit perspectives) between healthcare tasks and mHealth tools used by CHW's (2) the factors influencing CHW perceptions of the fit of mHealth tools to their work tasks, (3) the extent of mHealth tool utilization amongst CHWs, (4) the precursors to utilization, and (5) the perceived effects of mHealth tool utilization on the performance of CHW's.

To address these objectives, the study draws on theories of task-technology fit and utilization, to develop an extended, replicable Technology-to-Performance Chain (TPC) model. This model not only hypothesizes the effects of selected technology and task characteristics on task-technology fit perceptions of CHWs, but also subsequent implications for the utilization of mHealth tools and CHW performance. This study conceptualizes task-technology fit by drawing on four of Venkatraman's (1989) fit perspectives: (1) Fit as Matching, (2) Fit as Moderation, (3) Fit as Mediation, and (4) Fit as Covariation. This model is appropriate because despite efforts to study mHealth deployment and CHW performance in the developing world, there is a lack of consensus on how to assess their effectiveness, efficiency, and quality of care, coupled with poor methodological study designs. Whilst prior research has made important advances, there still remains a gap in our understanding of (1) the determinants of utilization of mHealth tools for healthcare service delivery in the developing world, (2) the impacts of mHealth tool utilization on CHW performance, and (3), whether the mHealth tools are adequately designed to fit with their intended healthcare service delivery purposes, thereby enhancing the workflow efficiencies of CHW's. Such gaps in mHealth research can be overcome by (1) having more replicable study designs, with adequate sample sizes for purposes of generalizability and (2) comparison studies to study the effectiveness of technology for healthcare intervention in developing countries, across varying healthcare service delivery tool usage settings.

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**Methods:** The empirical context for this study is Kenya. Kenya is amongst Africa's developing countries becoming synonymous with the rapid diffusion of mobile technologies, and has one of the highest mobile penetration rates in the developing world. Moreover, it is one of the leading developing countries in the deployment of mHealth initiatives. Due to the need to identify and operationalize the concepts of fit, utilization, and performance, formulate hypotheses of relationships amongst them, and subsequently use multivariate data analysis techniques – this study lends itself to a hypothetico-deductive approach, consistent with empirical positivism.

To test the proposed model, a cross-sectional survey instrument – which helps ensure generalizability and replicability, will be used to collect data from CHW's with access to mobile-technology enabled tools in the areas of Kibera, Nakuru, and Kajiado. A survey instrument will also be administered to CHW's operating within a manual (paper-based tool) setting. Their results along various performance metrics will be compared to data collected from the CHW's in mHealth technology settings – so as to demonstrate the expected impacts of mHealth tool use. A total sample size of 700 CHW's in the three areas will be targeted, via proportional stratified sampling techniques.

**Expected Results:** It is expected that results of this study will be used to determine which perspective of fit offers the best explanation for observed variations in mHealth tool utilization and CHW performance. Since the four fit perspectives examined in this study are theoretically and methodologically distinct, an empirical comparison would have implications for the design and implementation of mHealth tools for healthcare service delivery - if one perspective of fit better explains CHW utilization and performance than another. It is also expected that this study will provide evidence-based solutions for the enhancement of community-based healthcare service delivery systems, and the empowerment of CHW's in their delivery of healthcare services – thus informing the improved scalability of current and future mHealth deployments.

**Conclusions:** This study makes a number of contributions. First, a theoretical contribution is made as a result of the development of a TPC model, drawn from theories of fit and utilization, to test perceptions of task-technology fit, utilization, and performance impacts amongst CHW's in Kenya. In addition, this study will contribute to growing knowledge repositories in the sub-disciplines of Information and Communication Technologies for Development (ICT4D), Information and Communications Technologies for Community Health Workers (ICT4CHW), Mobile Informatics, and Health Informatics. Second, a contextual contribution is made by examining the concepts of task-technology fit, utilization, and performance within the context of community-based healthcare service delivery systems in Kenya, and thereby providing much needed empirical evidence into the use and impacts of mHealth in developing country settings. Third, a methodological contribution is made by conceptualizing, developing, and validating scales to measure task-technology fit, utilization, and performance. Advanced data analysis techniques such as Partial Least Squares (PLS) path modelling will be used to test the context-specific TPC developed. Fourth, a practical contribution is made by informing policymakers, funders, and implementers charged with the responsibility of deploying mHealth initiatives in the developing world.

**Keywords:** Public Health Informatics, Healthcare Service Delivery, Community Health Workers, Kenya, Task-Technology Fit, Technology-to-Performance Chain