

# A Review of Portable Digital Assistant (PDA) Implementation Process in Low Resource Settings

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## Abstract

*This paper presents the Portable Digital Assistant Implementation in the Sene District of Ghana. The study sought to understand eHealth implementation in low resource settings through the lens of actor-network theory. Part of this theory is made up of the sociology of translations, which was employed as a crucial framework for exploring the Portable Digital Assistant Set-up. Data was collected between January 2011 – June 2014. Data collection has been through triangulation of qualitative methods: interviews, participant observation, and document analysis. A total of 20 human and non-human actors' were identified and semi-structured interviews conducted with the human actors using Face to Face (10), Telephone (2). It was deduced from the case that the champion in the case was able to mobilise the various actors to ensure that the project succeeds. His ability to manage the various resources ensured that there were not any lapses.*

## 1. Introduction

Nowadays, the widespread use of Information and Communication Technologies (ICT) has permeated almost all aspects of life including the healthcare sector. HIS was introduced to fully utilize especially the Internet in providing better healthcare. Health information systems are frequently refers to the interaction between people, process and technology to support operations, management in delivering essential information in order to improve the quality of healthcare services. Similar to any other industries, the nature of healthcare industry has changed over time from a relatively stable industry to a dynamic one. And health information systems have evolved through several different technologies.

Healthcare organizations now consider increased efficiency; reduced costs, improved patient care and quality of services, and safety when they are planning to implement new ICT based applications. However, in spite of enormous investment in health information systems (HIS), no convincing evidence of the overall benefits of HISs yet exists [15].

In addition, a visit to some of the facilities where eHealth is reported to be piloted by this researcher revealed that, some of them are not being patronized by both physicians and patients, and in some cases the foreign partners have withdrawn their support.

This corroborates the findings of Taylor [16] that despite the fact that much work in telemedicine is published as short accounts of pilot projects, there is little research that explicitly addresses the difficulties involved in setting-up new telemedicine services, and Tanriverdi and Lacono [12] that “most telemedicine initiatives do not survive the pilot or proof of concept phase or they become a failure in daily practice”.

Again, Broens et al. [13] noted that, telemedicine implementations often remain in the pilot phase and do not succeed in scaling-up to robust products that are used in daily practice. Whetton [14] also observed that there is limited analysis of long term or routine use of Telemedicine. Lewin Group (2000) pointed out that studies of pilot projects provides only interim findings about the feasibility of such applications, not how well they operate as mature applications. Wootton [9] acknowledges that there are practical obstacles to evaluating telemedicine and suggested a need for further exploration of this field (telemedicine) in order to facilitate an evidence based approach to the wider introduction of this new approach (telemedicine) to healthcare delivery.

eHealth systems have problematic situation to implement in organisations. Thus, Collins et al. [28] stated that it is necessary that the views, purposes and experiences of the stakeholders of eHealth in health care services are sought to enable problems to be resolved and issues addressed before eHealth systems are fully implemented.

The implementation of eHealth technology is a major concern of information technologists and has significant implications for healthcare professionals. It may be insufficient to implement a physical infrastructure without an understanding of the processes by which the technology is implemented.

## 2. The Actor Network Theory (ANT)

Callon [2] stated that “the actor-network theory describes the dynamics of society in terms totally different from those usually used by sociologists.”

A socio-philosophical approach of the actor-network theory “...rejects any sundering of human and nonhuman, social and technical elements.” [5]. The actor-network theory accepts the differences between human and nonhuman actors, but denies treating them separately. It supposes that everything

is an actor in the network, where elements of any kind hold together such as humans, technological artefacts, organisations, institutions, etc., and it does not differentiate between or delegate priorities of any kind of elements.

The basic idea of ANT is that, in order to achieve a goal, a network of faithful alliances needs to be created to carry the network builders' intentions and materialise their goals.

As the theory holds a distinctive view of society as a network of humans and non-humans that interact and cooperate to pursue a certain goal, it maintains that any network building would involve the recruitment of human and non-humans. Network building takes place through translations. Translation is the mechanism by which the network builder recruits actors and ensures their faithful alliance. It was first coined and used by Michel Serres and published by Callon [2].

Callon [2] described that the sociology of translation is composed of four moments, namely problematization, interessement, enrolment and mobilisation.

*Problematization* is the first moment of translation, which relates to the process of a focal actor striving to become indispensable to the other actors by defining the problem and motivating them into the network, and suggesting that the problem would be resolved if the actors negotiated the "obligatory passage point (OPP)". Problematization describes a product of alliances, or associations between actors by identifying what they want [2]. OPP refers to a process in which a focal actor convinces all other actors to accept the proposal of a network. OPP also refers to a process in which a focal actor shows an interest in all the actors who accept the proposed network [2].

*Interessement* is the second moment of translation, which relates to a series of processes where a focal actor attempts to lock other actors into a position that has been offered to them in the network. Interessement also means the group of actions by which the focal actor aims to impose and stabilise the other actors' identity. These actions are defined through the problematization process. Different devices for different actors are used in these actions. For example, in the scallop case, some devices of the interessement process had a favourable balance of power: the fishermen's device was the towlines in St. Brieuc Bay and their scientific colleagues used devices such as texts and conversation, which attracted the actors concerned to follow the project [2]. If the interessement succeeded, then enrolment could take place.

*Enrolment* is the third moment of translation, which refers to a set of strategies in which a focal actor attempts to define and inter-relate the various roles that allow other actors to enrol. The process of enrolment involves "group multilateral negotiations,

trials of strength and tricks that accompany the interessements and enable them to succeed" [2]. When the negotiation between actors has been achieved, the inscription appears. The inscription is a process of artefact creation that ensures the protection of some interests [6]. In brief, an enrolment relates to the other actors' acceptance of the interests defined by a focal actor through the process of bargaining and making concessions [6]. *Mobilisation* is the final moment of translation, which relates to a set of manners utilised by a focal actor to ensure that all actors have legitimate speakers to represent them in groups, and avoid betrayal in various collectives from the latter [2]. Speakers or representatives are actors who speak or deputise for other actors [11].

### 3. Central Concepts of ANT

ANT's vast potential for explaining the complex social interactions associated with information technologies has been recognized by previous research [3], [11]. ANT approach has been widely accepted to interpret surrounding process of technology implementation projects [4], Walsham and Sahay [7], [10]. Although there are a lot of key concepts in actor-network theory [11], only two key concepts are described elaborately, as these two are equally necessary for analyzing the sense PDA implementation project.

#### 3.1. Actors

ANT focuses on the stakeholders, or actors, within the socio-technical network and how they are involved in shaping the form, the social spread and the geography of the technology [4], [11]. Actors can be defined as entities which serve as an intermediary between other actors. Actors are not limited to humans, but may include technology, texts and organisational groups. This is a key concept of ANT.

There is no differentiation between the human and material or the social and the natural [17].

#### 3.2. Research Methodology

The actor-network is a unit of analysis in this study. To explore the interrelation in it comprehensively, this research carried out documentary research for data collection, on which this study heavily relies. The study used multiple sources and techniques for data collection. The sources included face-to-face interviews with semi-structured questionnaire, informal discussions, telephone conversations and in some cases video conferences with participants (see Table 1).

Table 1. Different Techniques

Project Name	Location	Number of Interviews	Interview Duration (Min, Max)	Interaction Type
ePortable	Sene, Ghana	12	(20,45)	Face-to-Face(10), Telephone(2)

Data collection was between from October 2011 to July 2012. The data collected were triangulated to different data sources, so as to build a coherent justification for common themes [18]. The project site was analyzed in parts and whole using Creswell [19] within-case, cross-case and holistic-case analysis template. Table 1 provides further details on interviews conducted during the fieldwork.

### 3.3. Case Description

According to Ofori et al. [1], the PDA EPI data capture project in the Sene District [26] was started initially in 2004 as a collaborative work between the Berekum Health Directorate and Access to Health [27] an NGO from the United States [1]. It was improved upon and started in Sene District in 2006. It is one of the pioneer mobile health projects in Ghana and indeed the very first mobile project within the Ghana Health Service.

The Sene District PDA Project involves the use of Pocket Digital Assistants (PDAs) to collect public health service data at the lowest level of service delivery in Ghana – Community-based Health Planning and Services (CHPS) zones. It is in the form of medical records to aid in following up clients to ensure continuity of care. The project also aims to produce accurate service data and reduce the time spent by service providers to compile inaccurate monthly data. The project has reached an advance stage in collecting Expanded Programme on

Immunization (EPI) data and use of EPI data collected to ensure that every registered child completes his/her immunization. The Safe motherhood aspect of data collection, i.e. Antenatal care supervised delivery and postnatal care has been started but it is still in the rudimentary phase.

Data is collected by the Community Health Officers at the CHPS zones by registering each child who receives immunization service. The demographic details of the children are taken using the PDA. The children are given unique identification numbers generated by the community health nurse. Address of the child is captured so that the child can be traced for home visits. Every month this register is used to follow up children who are due for immunization in the communities. For each community visit that the community health officer makes for an outreach clinic, she queries the database and has the names of the children who are due to be vaccinated and the type of vaccines they will be taking. This helps in the preparation in

getting adequate vaccines for an outreach and also ensuring that she identifies and vaccinate every child in the community who is due to be vaccinated. This same data is synchronized with a computer at the

District Health Directorate and an interface is used to generate the monthly immunization facility report as required by the EPI program. The generation of this electronic monthly immunization reports has been estimated to save the community health nurse about five working days every month of report preparation, which can be used for service delivery. District Health Management Teams also gets immunization reports promptly in order to make decisions on which community health nurses need extra support to reach their target populations.

### 3.4. Data Analysis

The objective of the data analysis was to follow the actors and their networks [20], [21] to understand their actions and inscriptions along moments of translation of the eHealth formation. ANT was therefore used as a guide for both data gathering and analysis [22]. All the data gathered through interviews, observation, documents analysis and workshops were analyzed qualitatively [23]. The analytical process involved summarizing, coding and categorizing all the gathered data from the multiple sources [23] by Callon's [2] four moments of translation: problematization, interessement, enrolment and mobilization, and also accounting for episodes of inscription.

Throughout the project, continuous and careful reading of and reflecting on the data [10] was used to create a data-theory link [24]. Peer review review by colleagues and other researchers helped to check for authenticity, plausibility and criticality [24] of both the data analysis and the interpretation. The research process was evaluated according to the set of principles for conducting and evaluating interpretive field studies [25].

## 4. In-Depth Interview

### 4.1. Problematization

Dr. Ofori brought the idea when he was schooling in Seattle. It started in Berekum Health Directorate initially in 2004 when he the District Officer there. The project was brought to Sene district when he was transferred there. I think the project succeeded in Sene because he got a champion (coordinator) to train the nurses. These champions were there to solve problems on the ground. It was a collaborative work between the Berekum Health Directorate initially and later Sene District Health Directorate and Access to Health, an NGO from the United States.

Dr Ofosu's own interest is to identify how to use information technology to improve service delivery at the lowest level of service delivery – Community Based Health Planning and Services (CHPS) compounds as OPP [2] for health workers to Reduce the time Community Health Officers spend to generate monthly report on services, Generate more accurate reports that can be used to make decisions by the Community Health Officers and the District Health Management Team, and Improve the follow up of children/mothers registered for services and reduce the drop- out rate for immunization and safe motherhood services.

As part of problematisation process, he identified other actors, potential allies, to help transfer the PDA idea into a stable network. He also identified network roles and interest and attributed them to the potential allies [2]. First He identified the district health officers as potential customers who would use the system. Second, he mobilised [2] employees and technology from Access to Health.

According to Weasel, a Community Health Officer,

*“We basically deal with data collection and hard copy was not helping us, duplication of data. PDA could help us collect data appropriately and reduce the tendency to fabricate figures. What motivated us to use the system was the fact that we could store data for long, duplication removed and cooking figures ceased. So they believed that with the PDA coming in, they can collect data, enter data, send to district for downloading and pick your PDAs back easily. Hence they embraced it. We do this monthly just as we do for hardcopy but we can however do it weekly.”*

In spite of these benefits, Dr. Ofosu identified some challenges as follows, Strong leadership required because there was the tendency to go back to paper-based reporting, Funds to scale up. It's a district initiative, financed by USA NGO; Access to Health, GHS wants to scale-up to 50 districts or 15 districts. Starting from Asuogyaman and Kintampo South with smart phones (Nokia E3) and you need somebody who can trouble shoot at the local and office level (technical support very critical). Other challenges he identified include Data security issues such as restricted area is physical and the use of PC as a server. Since Dr. Ofosu was the District Director, it was very easy for him to develop the interest of his staff in the project and enrol them. However, from the other stakeholders from the field Anoka, a District Information Officer puts it this way:

*“Initially, it was difficult since we were all learning, No internet access then and In the Ghana Health Service (GHS) and as with Ghanaian, our systems have been paper based. There was this initial resistance to PDAs.”*

and when they were asked how the intressment mechanisms they adopted, this was their responses:

*“In fact, how we were able to get report from them quickly at the end of the month and they can go and concentrate on their clinical, Frequent visits to them on the PDA project. We also told them that it was a district programme and there are plans to scale-up, and they would be call upon to train others across the country”.*

#### 4.2. ePortable Implementation

Dr. Ofosu mobilised [2] staff under him and Daniel (Access to Health), his friend to identify a set of requirements specifications for the project. The implementation of PDA has been characterised by several actors. They include Field officers (Disease control officers, Comm. Health Nurses, PDA to capture data on the field, Designated computer at District office, Java based platform and IT consultant based in Seattle (He developed software for PDA and computer. And the Computer also acts as server) at the facility level and CHPS compounds, the officers do everything- accounting, dispensing, environmental and health, because of workload, the reports are late to deliver. It takes about 7 days to deliver at the expense of service delivery. So a platform to generate the report on time and accurately is needed hence the PDA project. Any problem they encounter are able to solve, those problems beyond us are referred to our international IT consultant for assistance. There was no local IT person. We did everything our selves. We occasionally get support from PPME.

A challenge Weasel identified during implementation was:

*“Send PDA to District and they could not download data because of network problem (Download and give a copy to us) so we leave the PDA with the until they download and send them to us”.*

#### 5. Enrolment

The PDA is used at the facility level; those who use are the one who come into with clients. But then they are all trained. At the district level, they upload the PDAs and generate report and do local trouble

shooting. Some of the obstacles encountered according to one CHO were:

*“Initially Sene is one of the deprived areas in Ghana. We had problems with how to enter data since most of us were not computer literate and have not used computer before. The IT skills were low before the PDAs. No ICT centre and no attempt on our part to learn ICT. PDAs came as something new. But we have to keep practising to master”.*

Asked how they were motivated to use the PDA, An CHO provided this answers:

*“Our motivation came when at the end of the year data was stored properly duplication reduced. We also realised that Dr. Ofosu appreciated our work and he kept praising us at each meeting and this motivated us. He kept using us as role models. At any meeting, our names would be mentioned and praised MOH/GHS was happy with it. It reduced the burden of carrying books to the field and its attendant risks, rainfall, forget in the field etc but PDAs has solved the problem. We became the train the trainers for the field workers in about 8 other districts that is Kwame Danso, Basa, and Kojo Krom.*

When asked to access the PDA project on the whole, Weasel, Another CHO has this to say:

*“A good program that can be implemented in the GHS. It makes data collection easier and you are rest assured that you can retrieve data as and when you need it. It has helped cooking of figures. It has also reduce the situation where we get high figures we are unable to interpret. Dr Ofosu was actually interested. ‘if we get people like Dr Ofosu in the GHS, they would ensure that we deploy it across Ghana. I recommend that District Doctor should champion it. The person should be interested in ICT and determined to use PDAs”.*

In the view of Dr Ofosu, the project has reached an advance stage in collecting EPI data and use of EPI data collected to ensure that every registered child completes his/her immunization. The Safe motherhood aspect of data collection i.e. Antenatal care supervised delivery and postnatal care is still in the rudimentary phase. Data is collected by the Community Health Officers at the CHPS compounds by registering each child who receives immunization service onto the PDA. Each child in the district is given a unique identity number. Every month this register is used to follow up children in the

communities. This same data is synchronized with a computer at the District Health Directorate and an interface is used to generate the monthly immunization facility report as required by the EPI program. Safe motherhood reports can also be generated using the same interface. With support from Global Alliance for Vaccine Initiative (GAVI) the project has been extended to three more districts.

## 6. Conclusion

It can be deduced from the case that the champion in the case was able to mobilise the various actors to ensure that the project succeeds. His ability to manage the various resources ensured that there were not any lapses. The idea was sold to the DHMT and they in turn sold their idea to their subordinates who bought into the idea. The subordinates were encouraged to use the system and the got favourable feedback.

They were always praised at their meetings and it motivated them to give off their best. The GHS also bought into the idea and encouraged them to deploy it during the test period the expanded programme on Immunization (EPI) Service, and supported them technically.

They were in addition, supported financially and materially by Access to Health, an NGO, which was also available to trouble shoot and resolve all technical problems.

By the coming together of the actors, it was ensured that there exists a harmony among them.

Each of the actors ensured that they deliver to enable the system function always. According to them, they realise the system will solve a major problem for them. Thus, it is important for the users to realise that the system will address some issues for them. Staff were also encouraged to buy into the idea. The governing authority in charge of healthcare in Ghana also supported the whole project. Future research should focus on the users' acceptability of the PDA for Healthcare delivery.

## 7. Reference

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