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HEALTH INFORMATION SYSTEMS IMPLEMENTATION IN DEVELOPING COUNTRIES: A TRANSLATION PROCESS

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Abstract

This paper takes a look at the political issues involved in the implementation of health information system (HIS) in resource constrained countries. By doing a comparative case, we attempted to understand how two different implementation processes took shape in two countries – Tanzania and Vietnam using Actor network theory (ANT) as our analytica lens. The study suggests that by mobilizing an appropriate number of actors, the HIS implementation as a network building process can earn its effect as a hub to attract other important actors that are still reluctant to join the initiative. Furthermore, the paper argues for the need to make use of detours and pay special attention to the marginal groups of actors as siginificant approaches in the network building process in resource constrained settings.

Keywords*: Health Information System, ANT, OSS, Developing countries*

1 INTRODUCTION

Health information systems (HIS) for developing countries is a topic that has received significant attention by the Information Systems (IS) research community. Both researchers and practitioners have long recognized HIS as a tool to improve quality of heath care services and increase effectiveness through management of resources in the heath sector. However, failure reports abounds surrounding implementation of HIS attempts, where quite a number of the efforts end up as pilot projects. A number of reasons accounting for the failures include design reality gaps (Heek 2002), poor infrastructure, inadequate human resources (Braa et al 2004), complexity of the healthcare domain (Braa et al. 2007) and diverse political interests of the donors (Sahay, 2007) in these countries challenging the implementation process.

The aim of this paper is to go beyond enumeration of challenges to offering some lessons from two case studies where HIS is under implementation. Using actor network theory (ANT), we argue for the need of a translation process which involves mobilization and alignment of important actors in the health care sector to support the HIS implementation process. We see ANT as a promising analytical leverage in such contexts characterized by multiplicity of actors with myriad of competing interests where successful implementation of HIS entails the ability to align the diverse interests and forge new alliances supporting the implementation and use of the HIS.

The research was done as part of a 'global' Health Information System Programme (HISP) which involves a number of countries from Africa, Asia and Europe. Following an action research approach, HISP started in South Africa in 1994 with the aim to strengthen heath information system through the introduction and local adaptation of open source software (OSS) known as the District Health Information Software (DHIS) (Braa et al 2004). The initiative was later rolled out in a number of other countries in Africa and Asia such as Tanzania, Malawi, Nigeria, India, Botswana, Mali, Sierra Leone and Vietnam. In these countries a combination of top down and bottom up approaches were used in the implementation process.

The paper draws on the Tanzania and Vietnam HIS implementation as comparative cases sharing some important similarities and differences. In the Tanzania case, the primary actors managed to forge alliances which saw endorsement of the software as a national standard where the scaling up of the system is underway to cover the whole country. On the other hand, in the Vietnam case though the primary actors succeeded to forge some alliances to initiate the implementation in the pilot sites, the effect (in terms of the power) of the alliances and the network formed did not lead to the attainment of the original primary actors' goal of having the software endorsed for a countrywide implementation. By building on these two dissimilar results of network building processes, the paper strives to make important theoretical and practical implications and lessons on HIS implementation in developing countries contexts.

The rest of this paper is organized as follows. In the next section, we present a synopsis of the actor network theory, this is followed by the Tanzania and Vietnam cases description respectively related to development and implementation of OSS for health care sector, followed by the analysis of the two cases based on the theoretical lens of ANT. In the last section, we provide a discussion and conclusion which aims to contribute to theory and practice.

2 LITERATURE REVIEW

Unlike many other theoretical approaches to research which treat social and technological issues as entirely different, actor-network theory (ANT) proposes a socio-technical account where neither social nor technical positions are privileged. It considers the world to be full of hybrid entities (Latour 1993) containing both human and non-human actors. An actor is seen not just as a 'point object' but rather as an association of heterogeneous elements, themselves constituting a network. Each actor is thus itself also a simplified network (Law 1992). In actor-network interactions and associations between actors and networks are the important thing, and actors are seen only as the sum of their interactions with other actors and networks.

Providing powerful concepts and vocabularies, so far, ANT has widely been used in the health information systems research to investigate variety of issues around design, development and implementation of information systems in different context. For instance, Nhampossa (2005) used the concept of mutable mobiles from ANT to argue that adoption of technology for health care in different countries is not merely a technology transfer but a translation process through which the technology shapes and is shaped by the contextual realities. He emphasized on four factors which influence the translation process to include history, adaptation, participation, and process of customization. Braa et al (2007) on the other hands drew on ANT and proposed the so called "flexible standard" which acts as "attractor", and if they are well-defined and simple, they can adapt to the dynamic nature of the healthcare domain. Cho et al (2008) used event-based approach to understand contextual dynamics around HIS implementation and suggested how ANT can be used to investigate change in IT-based project implementation.

Our study makes use of ANT to investigate two different initiatives to introduce and implement new open source software in the healthcare domain of two different developing countries' contexts. Tatnall (2002) argue that an information systems researcher using ANT approach in an investigation like this would concentrate on issues of network formation, investigating the human and non-human actors and the alliances and networks they build up. The healthcare sector in developing countries consists of varieties of both local and international actors carrying out different interventions geared towards reversing diseases trends in these countries. We see ANT as providing a promising analytical leverage in such contexts characterized by multiplicity of actors with myriad of competing interests where successful introduction and implementation of new software entails the ability to align the diverse interests and forge new alliances supporting the implementation and use of the software.

Walsham and Sahay (1999) assert that successful networks of aligned interests are created through the enrolment of a sufficient body of allies and the translation of their interests so that they are willing to participate in particular ways of thinking and acting, which maintain the network. The actors' interests are flexible and can be translated, enabling the interest alignment and the maintenance of an actor-network (Monteiro and Hanseth, 1996). Translation can then be considered as a process of constructing a network of actors centered on a given controversy representing multiplicity of interests. In His paper titled 'sociology of translation' Callon (1986) described translation as consisting of four moments involved in network formation - problematization, Interessement, Enrolment and Mobilization.

Problematization involves framing of the problem and definition of identities and interests of other actors as to make the role of a given primary actor indispensible. The primary actor renders itself indispensable by defining an Obligatory Passage Point (OPP). The definition of others' interests and of the OPP are part of an actor's strategy for aligning others' interests with its own. For example, in

practice some commercial airlines force travel agents to use their reservation systems making them OPPs through which the travel agents must traverse if they want to sell airline tickets (Macome, 2008).

Interessement is the second translation phase, where the primary actor convinces other actors through negotiation and persuasion to accept its definition of their interests and roles. This includes the deployment of special devices aimed at imposing the roles and identities defined during the problematization moments. Other elements might include creating incentives to encourage others to overcome obstacles to passing through the OPP. If successful, interessement leads to the establishment of a stable network of alliances as the result of enrolment of the actors. During translation the primary actor assigns interests, projects, desires, strategies, reflexes and afterthoughts (Callon, 1991) to others. Enrollment implies a degree of acceptance of the assigned roles and this plays a large part in how certain relationships among human and technological actors become inscribed in technical standards and work practices. Bowker and Star (1999) stress that; politics exist in the process of translation and interest alignment resulting from competing agendas.

The fourth moment of translation is the mobilization of allies, where spokespersons as representatives are defined and assumed. During the mobilization stage, the primary actor use a set of methods to ensure that spokespersons for relevant collectives are able to represent those collectives properly so that the initiators are not betrayed by the spokespersons. This step consists of establishing the legitimacy of the spokesperson. The movement between each step is called displacement and when displacement occurs power is exercised (Macome, 2008). However, the displacement in the translation process does not always follow a linear logic. This is what is described by Latour as taking a detour. If the accomplishment of the agent's goal is interrupted for whatever reason (perhaps the agent is not strong enough), then the agent makes a detour, a deviation (Latour, 1999).

As the literature depicts, the way and the manner in which ANT has been used to understand HIS is broad and diverse. However, in this paper we draw on the translation process as a tool to understand how technology can play the role of an important actor in shaping a network. Our concentration is mainly on issues of network formation, investigating the human and non-human actors and the alliances and networks they build up. We intend to follow the negotiations that allow the network to be configured through different strategies leading to enrolment of both human and non-human allies.

3   RESEARCH METHOD

This research was designed following qualitative research approach in interpretive tradition. The study involved the two authors (researchers), one from Tanzania and one from Vietnam. The research was done as part of the Health Information System Programme (HISP), an action research project hosted by the University of Oslo. Both of the researchers were strongly involved in initiating HISP project in their country from the very beginning. This gave us opportunities as inside observers to understand more thoroughly the situation and the political negotiations related to the implementation processes. Moreover, we have attended countless number of meetings, email exchanges, presentations, software development, and trainings. All of these interactions provided rich experience and material for writing this paper.

Data collection in various forms: handwritings, emails, project documents, user manuals, reports were synthesized and grouped into related themes. By employing actor network theory as our theoretical lens gave us a guideline in data analysis. Data from the two cases were later merged together and compared to find the similarity and differences through plenty discussions between the two researchers. The comparative case approach helped us to understand the process in which the two networks were formed.

4 THE CASE STUDIES

Tanzania case

The Health Information System Program (HISP) in Tanzania started in 2002 with masters' students studying information systems at the University of Oslo (UiO). As part of their research project the students secured permission with the Ministry of Health, Tanzania (MoH) to conduct their study in two districts – Bagamoyo and Kibaha. Their first research goal which formed the basis for problematization process was to conduct a situational analysis of the existing HIS which included data collection, analysis and use. The research identified a number of problems which included poor data processing, analysis and presentation, lack of an information culture, lack of staff, lack of trained personnel and poor and inadequate resources and infrastructure for health care activities are the causes of poor use and management of health information at local levels within the HIS (Igira, 2003; Lungo, 2003). The second research goal was to implement a data processing tool in the pilot districts. The aim was to provide alternative solution to some of the problems identified. A software product called District Health Information Software (DHIS) adopted from South Africa was adapted for use in two pilot districts. As a strategy to gain acceptance, the software was translated into the Local Language – Swahili, and populated with real data from the districts for demonstration.

The results from situational analysis and the alternative data processing solution were presented to the Ministry of Health officials. The aim was to gain support of the MoH for the software and the HISP approaches to be adopted for the whole country. Though the officials indicated to have been aware of the problems of the HIS, the software tool was appealing to them. The most appealing part was the flexibility of the software. Their existing software (MTUHA) was dysfunctional in most districts and inflexible in terms of responding to new data requirements. However, having spent a lot of resources on that software, and being a bit skeptical about the proposed solution the MoH officials were reluctant to accept the DHIS software right away.

Though HISP failed to enroll the ministry in the project at that time, work in the pilot districts continued as usual. Among the activities conducted included training for the districts officials on data management using the DHIS software. One of these trainings was a formalized programme offering certificates on Health management information systems strategically organized by HISP under the University of Dar salaam. As a strategy to enroll the ministry, a number of officials from the ministry were invited to provide lectures to the participants on HIS issues. The participants of the training were health officials from different districts and regions in the country. The trainings enrolled other institutions working in Health related issues in the country such as the Ifakara Health Research Institute and the Muhimbili University of health Sciences through lecturers who provided lectures on public health related issues. Being aware of the problems of the HIS in Tanzania, and having seen the software and learned some of the HISP approaches, the lecturers from the two health institutions accepted to become part of the HISP team.

The training also provided an arena for the top level MoH officials to learn about the HISP approaches to the extent of talking about some of the approaches in meetings – e.g.: the need for flexible modularized software tool. Furthermore, the districts officials who attended the trainings became aware of better solutions compared to their existing systems. By this, these districts officials became supporters and spokesmen of HISP in top level meetings, advocating about the software and the HIPS approaches.

Other actors representing NGOs such as the Clinton Foundation, and Italian Health research organization learned about the HISP software, and they requested to be implemented in the districts

where they were operating. Through this, the number of districts where DHIS was in use grew from two pilot districts to five.

Having the alliance of actors ranging from the University of Dar es salaam, University of Muhimbili, Ifakara Health Institute, and the University of Oslo, HISP was accepted by the MoH for the software and its approaches to be implemented in the whole country. However, this was preceded by a presentation by the HISP team to the top MoH officials including the country chief medical officer, where among other things, extolled the involvement of the health institutions as part of the HISP implementation team.

A consortium consisting of the four public institutions and the MoH was formed to work out a plan for strengthening HIS in Tanzania which will include rollout of the DHIS software. The plan was also meant to solicit funds from donors to support the implementation. The Norwegian Embassy in Tanzania, with their Maternal and Child health program, interested in a monitoring and evaluation tool, when approached agreed to support implementation of the plan in seven regions. However, the decision on whether the funds should be handled by a third party or by the MoH led to delays in disbursement of funds. Handling funds through the MoH as asserted by the Embassy would lead to mismanagement and bureaucracy in the use of the funds. On the other hands, the MoH insisted on handling the funds which ultimately led to a dilemma.

While the MoH continued to look for other partners to support the plan for systematic implementation, this led to delays in starting the actual implementation according to the plan. By this time many NGOs working in health learned about the Software and requested immediate implementation in their respective locations. Japan International Cooperation Agency (JICA) working on VCT and STI programs was the first one to request implementation of DHIS in one region with their own support. While this at first appeared as violating the national plan, negotiation between the MoH, JICA and the HISP team agreed to take the JICA implementation as a pilot region for the overall plan. Following this, implementation of DHIS in one region was effected which involved trainings and support to districts and the regional staff on data management using the software.

Results from the 'test' region were presented in a meeting where different partners working with other health programs were present. PMTCT program supported by a number of partners, following the presentation requested for their program to be implemented using DHIS in the same Costal region. This raised the number of health programs implemented using DHIS in that region to four. When the Norwegian Embassy learned this, they provided funds to support implementation of all health programs and data sets in the test region, as a preparation for countrywide rollout. While this implementation was in progress, Clinton Foundation requested implementation of DHIS in two regions – Mtwara and Lindi. The implementation in the two regions increased the number of regions using DHIS software to three.Whereas, the Consortium expected a systematic implementation of the plan, the current state of the implementation is rather more ad hoc though aligned with the original objective.

Vietnam case

Children's health is a big concern in every society and has a longer consequence. Hence, it receives a lot of attention from health management authorities and policy makers. Early 2004, HISP started in Vietnam by a visit of a professor from University of Oslo (who is also considered as the pioneer of HISP in Vietnam) as a result of an invitation by Ministry of Science and Technology. In its very first activities, HISP and its local partners in Vietnam decided to pilot the projects in two districts in HoChiMinh city with a focus on mother and child health. To implement the plan, District Health Information Software (DHIS) was installed in two districts and necessary training was provided to the

users. However, data entry was not done timely and the users were reluctant to enter data into the software. In addition, the project did not get any financial support from the local health services, making it less effective and serious. The consequence was that the pilot ended up with a failure.

In 2007, a group of developers including one of the authors of this paper initiated a project to build an online repository for children's medical records with the hope that it would give health managers better information for decision making related to children's health, contribute to the improvement of clinical treatment, and support medical research. The argument of the group was that the online approach would help doctors and parents to access the medical records (say on immunization, nutrition, history treatment, and allergy) at anytime and anywhere. Another argument was that the medical record system would serve as a data source into the DHIS system and therefore help to encourage use of the system in a daily basis.

The system was built using flexible approach based on the internal developed software called OpenEPR (Open Electronic Patient Record). This design was claimed to help end-users without software development skills to define the data capture forms on their own. By employing this design, the system was completed in a short time with basic functionalities like child registration, history of treatment, and other relevant information. The system was installed in a normal computer that the group assigned as a server, supposed to be running at 24/7.

After the group demonstrated the system, the child health manager at the city granted permission to pilot it in the clinic at the Center for Reproductive Health – HoChiMinh city (Center Clinic for short). At the beginning, it didn't go very well because the nurse who was responsible for using the system to register children was not good at computer. However, for some reason she was transferred to another department and was replaced by another nurse who happened to have very good computer skills. Since then, the system started running very well with promising results.

Encouraged by this initial success, the group got other permission to implement the system in all the clinics of two districts. Since the system was centrally installed in the "server" located at the Center Clinic, only training was needed to get it scaled up to other districts. However, because of the limitation of the budget, Internet kiosks were rented to conduct the trainings. There was one training session for each district with approximately twenty clinics involved.

After these official trainings, due to financial constraints the group could not give any more training. However the group was surprised that other districts managed to log-in and start to register child health data in their districts by only receiving a piece of paper containing instructions on how to use the system and password to log-in for every unit. The child health manager told the group that in every monthly meeting, he also mentioned and encouraged them to start to use the system and this was how they got involved.

5 ANALYSIS

In this section we draw on the moments of translation concepts from ANT to analyze the two cases.

The Tanzania case

Problematization

The primary actors in the Tanzania case was comprised of the Masters students and University of Oslo representing the HISP international with a goal of doing research as part of their academic life and contributing to society through practical problem solving. To gain access to the Health sector in Tanzania, they had to prepare the ground for problematization which involved conducting situational

analysis in two districts to uncover problems with the existing health information systems (HIS). The situational analysis went alongside with collection and capturing of data into the DHIS software – proposed solution. The primary actors aim was to enroll the MoH into their network, by accepting the proposed solution through which the researchers would establish themselves indispensable. Presentation of the HIS problems and the proposed solution to the MoH officials was done with an expectation of being accepted. However the MoH appeared reluctant as was hard to let go the existing system where huge amounts of money was hitherto spent. Their skepticism was also based on their perception of the primary actors as being mere students and researchers wanting to further their research and academic aims.

Interessement

A number of interessement strategies were instituted in order to meet the great goal by the primary actors to get the MoH endorse and support the proposed solutions. Use of specialized training with a formal University status offering both certificates on DHIS and later Masters in Health informatics was instituted to lure MoH. Involvement of the MoH HIS officials in the provision of the trainings as Trainers were ensured. This opened door for the officials to learn of the proposed solution. Through the training the primary actors sought to enroll other big actors working in the health domain. This included the Muhimbili University of Health and the Ifakara Health Research Institute who were first requested to participate in offering courses in the training program. Learning about the primary actors proposed solution, and being aware of the problems of the existing HIS conceded to join the network as researchers on HIS.

The participant of the training programs coming from different regions and districts within the health sector, got an opportunity to learn of a better solution especially on data processing compared the existing system which was dysfunctional. This made them to speak on behalf of the primary actors in meetings. Sometimes, when invited to attend meetings where the proposed solution needed to be defended, some health officials who attended the trainings were invited to speak in the name of the primary actors. The enrolment of two NGOs through implementation of DHIS in three districts increased the bargaining power of the primary actor.

Enrolment

Having the support of the different actors behind them, the primary actors requested a meeting with the MoH top officials where the proposed solution was presented. This time, training programs, the health public institutions and the NGOs supporting the primary actors' solution were presented. The MoH officials who participated as trainers spoke in favor of the primary actors. This led to the endorsement of the proposed solution as a national standard where a memorandum of understanding between the MoH, the primary actors and the Health Institutions was signed.

The Vietnam case

Problematization

HISP Vietnam started as a pilot project with a political support of the Ministry of Science and Technology. However, the HISP team as primary actors needed to demonstrate tangible results from the pilot districts which would act as a springboard to entice the ministry of health and other partners to endorse and support the DHIS software as a countrywide standard. However, failure of the pilot due to partly lack of financial support from the local ministry of health services meant that the primary

actors needed other problematization strategies to make their proposed solution (DHIS software) indispensable.

Children health being of great concern in the country, the primary actors sought to make themselves indispensable through the child health program through design, development and implementation of a web-based Electronic Medical Record (EMR) for child health. This was done with an expectation of integrating it with DHIS software as a strategy to mobilize support and increase its value. The primary actors therefore started the problematization moment by the argument that the web-based approach will provide better integration solution for the fragmentation problem in EMR for child health. By providing the OpenEPR software as a solution for this problem, HISP Vietnam became an obligatory passing point (Latour 1986) - the one who had the solution for the problem where all other actors must pass through to get into the network.

Interessement

HISP defined different roles for different actors to play. The health program managers needed the system to have timely and integrated data, the patients needs the system in order to receive better health care service (by centralizing medical history in one place), the nurses and doctor who directly operates the system can save their time by avoiding re-entering data in different books, composing report quickly. However, a number of strategies including training and presentation of the results from the pilot sites to the health officials were instigated to ensure acceptance of the defined roles. Flexibility and easy of use of the EMR was a vital interessement strategy which lead to the acceptance of most of the defined roles leading to enrolment of the actors.

Enrolment

Following acceptance of the defined roles, district and ward clinics were gradually enrolled into the network during the first phase of the EMR implementation. Being successful in the first implementation phase, all the clinics in the two districts were enrolled into the network. However, pediatrics and their guardians who are the key beneficiaries of the system were forced to enroll into the network where the key active role they could play was to login to the web page and review their online medical records. The flexibility and simplicity of the EMR and the fact that it was web based, acted as a strong mobilization force for other districts to enroll in the network in the face of financial constraints to perform formal training. Nonetheless, it must be noted that though a number of districts have been enrolled in the network using the EMR, getting the ministry of health and other key partners endorse and support the systems as national standards (EMR, DHIS) is yet to be seen.

6 DISCUSSION AND CONCLUSION

Based on the analysis provided above, in this section we make an attempt to compare the two case studies and discuss the similarities and differences between them. The two case studies present the current state of the two networks involved in implementation of health care information systems in Tanzania and Vietnam, their political and heterogeneous nature, histories of formation, and the processes through which they are built.

The most visible similarity between the two networks is the translation processes which took place, though the steps, paths and the end results don't seem similar and straight forward. In the Tanzania case, the problematization at the beginning was not accepted by one of the important actors, i.e. Ministry of Health (MoH) creating a "space" for Interessement. Enrolment came after a number of interessement strategies, negotiations and activities were utilized to convince the MoH to endorse and support the OPP.

The Vietnam case on the other hands, failure of the DHIS on the pilot sites due to the lack of support by the important actors necessitated for different problematization strategy, which saw the design, development and implementation of an EMR. The EMR problematization strategy was successful with the defined and allocated roles being taken up leading to enrolment. The scaling up of the system then took place gradually with increasing number of actors joining the network slowly. It is not a "big bang" but incremental process where new actors are added as they come in. Furthermore, the Vietnam case shows how a flexible and simple to use web-based EMR, acted as a strong mobilization force for other districts to enrol in the network despite of financial constraints to conduct formal training on the system.

However, on the Tanzania case after enrollment of the important actors, the implementation process took a route which was rather different from the agreed plan. Due to delays caused by some actors, popularity of DHIS software as one of the actors in the network led to enrollment of new actors who requested and supported implementation in different regions. As an important actor, DHIS software was delegated a vital role to mobilize and align other actors with the HIS network.

Drawing on the two cases, we offer some observations for HIS implementation in developing countries which serve as our theoretical and practical contribution.

Pay attention on network effects

Looking at the translation process on the Vietnam case, only a limited number of actors were involved in the translation process. Other important actors like health research institutions, public health universities, and private sectors (e.i. NGOs) which could have greatly contributed to the strength of the network were not engaged in the translation process. This could have created a network effect to mobilize "powerful" actors like the MoH to the network, setting up the base for endorsement and support of the systems as national standards.

This observation comes out very clearly from the Tanzania case, where the primary actors failed to enroll the Ministry of Health (MoH) to have the OPP become a national standard at the onset. However, the enrollment of other important actors like the Ifakara Health Research Institute and Muhimbili University of Health into the network gave the primary actors' power resulting from the network, to enroll the most important actor – the MoH. Therefore taking power as an effect that emerges from the network rather than from an individual actor as was for the case of Pasteur, shed light to the need for the primary actors to mobilize and enroll other actors to strengthen the network as an interessement strategy to enroll even the most important actors who are hitherto reluctant.

Start with the marginal groups

We find what was pointed out by Star (1999) concerning marginalized groups and the actor network theory very relevant especially in one of our case study. As a critique to ANT Star emphasized the importance of human experiences and subjects in the network where she viewed subjectivity as constructed and multiple. Rather than considering the subjects of the network as mere effects, she argued for further scrutiny of the human subjects to include the way these subjects are shaped when new networks and standards are created; and how both powerful and marginalized positions are created. Using the metaphor of 'being allergic to onions' Star argued that creation of standards and various conventions in the network enable specific forms of subjectivity and disable others.

In the Vietnam case, the assumption that nurses must have computer skills in order to operate the system created a barrier for those who were not computer literate to join the network. This led to marginalization of a large number of clinics that refused to use the system by arguing that they do not have capacity. The implementation of the child EMR could have better outcomes if as stated by Star

(1999) we start from the marginalized groups. This means that our translation process could have started by training on basic computer skills to ensure acquisition of the necessary skills by the marginalized. Starting from the marginal though costly, promises emergence of even more strong network which includes all the actors (marginal and non-marginal) in question.

The need to take some detours

The translation process especially on the Tanzania case indicates how enrollment of other actors necessitated deviation from the original goal to something completely different in order to gain critical mass of actors. This is what Latour (1999) described as taking a *detour*. If the accomplishment of the agent's goal is interrupted for whatever reason (perhaps the agent is not strong enough), then the agent makes adetour, a deviation. The use of formal university training programs though indirectly connected to the initial goal, was a detour which the primary actors on the Tanzania case had to take to get their proposed solution endorsed by the MoH. Furthermore, deviation from the original formalized plan for implementing the system in Tanzania to relying on implementation based on new actors as they are being mobilized by the DHIS as an actor is another example of the role detours play in the translation process.

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