INNOVATION DYNAMICS OF REAL TIME MONITORING SYSTEMS IN DEVELOPMENT ORGANISATIONS

MSc Thesis

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Date of Submission: 21st May, 2012

Course: MSc Thesis Communication and Innovation Studies

Department: Communication Science

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ABSTRACT

The research focuses on the reporting hierarchy of monitoring activities in development organisations and how this impedes innovation, the quality of information fed back into decision making and also has implications on costs. A hypothesis was put forward that Real Time Monitoring Systems could mitigate the problem. The hypothesis was not put forward to establish a causal relationship, but as a possibility considering emergence in open systems. A case study approach was applied on an organisation that had introduced this system and through triangulation of interviews, observation and content analysis a conclusion on the actual workings of the system was established. The findings showed that despite the inherent capacities of the system the organisation culture and the wider environment of the organisation defined actual use, even to the ends of underutilise the systems capacities. Further, that in certain organisational activities interpersonal communication versus mediated communication is more useful.

LIST OF ABBREVIATIONS

F-YR-Financial Year

IDE-International Development Enterprises

MEDA-Mennonite Economic Development Associates

M&E-Monitoring and Evaluation

MC-Mediated Communication

NGO-Non Governmental Organisation

PBVS- Paper Based Voucher System

PTI-Prosperity Through Innovation

RTMS-Real Time Monitoring Systems

SMS-Short Message Service

SSIT-Small scale irrigation technology

TNVS-Tanzania National Voucher Scheme

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1 INTRODUCTION

Over the decades the field of communication has experienced continuous innovation to develop products that enhance the connectivity of human beings. These products with a character that facilitates the transmission of messages through a medium are mediated communication (MC) devices (Pavlik, 2004). The climate of innovation supporting the development of these devices has seen products such as the telephone transform into to a mobile device with SMS (short message service), blue tooth and even internet facilities. Every stage of transformation has brought with it the expectations of improved, faster communication with the convenience of facilitating connectivity over wider geography. These expectations have also been considered a plus for organisations not only for the possibility of cutting costs, but because they translate into improved coordination of activities, reduced time taken to respond to emerging issues and provide better quality information (Gomez, 1997).

Beyond facilitating these improvements MC devices have attracted discussion on their ability to affect the social system in which they operate. That is affect the human interaction and structural relationships in the organisation they are embedded (Pepper, 1995; Stone, 2010). The possibilities of this have implications on organisation change. This is because emerging views of management that favour an organisation culture of lateral networks, power equalisation and negotiation of intervention among all levels in an organisation (Robbins, 1999) could be supported through the introduction of an MC device. Thus an MC device could foster an organisation culture of complexity oriented management which is considered critical for solving complex problem such as development that require multiple and diverging perspectives to panel beat viable solutions (Funtowicz, 1993).

Most recently the Mennonite Economic Development Associates (MEDA), of Canada, for the purpose of monitoring progress on similar projects in Zambia and Tanzania developed an MC device. It involved embedding a reporting format as an application on a mobile phone and the use of SMS to transmit data input on the form to a web (human computer)-interface. In Zambia the application was applied through the project life span, 2008 to 2010. Whilst in Tanzania it was piloted in September, 2011 on a project that had been running from 2004.

These projects were both value chain development projects, but focused on accelerating demand and supply of different products. In Zambia Prosperity Through Innovation (PTI) focused on small scale irrigation technology (SSIT's) whilst the Tanzania National Voucher Scheme (TNVS) focused on mosquito nets. The projects applied interventions on both sides of the chain to build a viable market link between buyers and suppliers. This was necessary as in the past the largest market for these products were non-governmental organizations who distributed them (Snelgrove, 2009).

PTI's design anticipated that improved supply of SSIT's could increase production for food security and wealth creation among small scale farmers. TNVS on the other hand aimed at an intervention that would reduce malaria prevalence and encourage acquisition of nets by pregnant women. In developing the value chains the projects provided a subsidy for buyers as an incentive for the supply side to invest in the desired market segment. Potential buyers would receive a discount voucher[1] on

[1] Vouchers in this case were used to develop the market to create a link between potential buyers and suppliers, as well as prime demand for products where NGOS had become the main clients of suppliers and were distributing the products to

the product from the supplier with the purpose of priming demand. This discount (the subsidy) would later be paid to the retailer upon making a sale.

Further the introduction of the MC device was also to distribute electronic vouchers to thousands of buyer and subsequently monitor voucher redemption rates, demand trends and supplier responsiveness in the most convenient way. The organisation opted for electronic means to track progress rather than a model that would use paper vouchers to short cut data entry, analysis and transmission. MEDA referred to the MC device as a real time monitoring system (RTMS). The system, as earlier mentioned, involved the use of a mobile phone as a data entry tool, linked to a web-interface on the internet. The web-interface was accessible to project staff and Canadian staff at head-quarters.

The focus of inquiry in this research is a problem around reporting hierarchy in monitoring activities that contains innovation to top management, limits information quality and the speed of giving feedback for decision making, as well as makes monitoring activities more costly. All these factors impeding organisation efficiency[2].

The next section, the problem analysis, delves deeper into the research problem, as well as the opportunities for RTMS as an MC device to mitigate it and sheds light on the relevance of the research.

end users for free (Snelgrove, 2009). Further they were applied to ensure supplier investment in reaching farmers through demonstrations and therefore suppliers were only reimbursed after proof of a sale (Klerkx, 2005).

[2] Organisation Efficiency refers to three aspects complexity oriented management, improved performance and positive cost implications, refer to figure 3 for operationalization

1.1 Problem Analysis

This section contains the discussion on opportunities for use of RTMS in transmitting monitoring information in a development organisation. Whilst simultaneously reflecting on the limitations of the popularised model of transmission. Thus as mentioned above the section establishes the relevance of the research and leads to the problem statement. The three major points for discussion in this section include the relationship of RTMS to innovation, improved quality of information, the speed of channelling feedback for decision making and reducing costs with regard to monitoring activities.

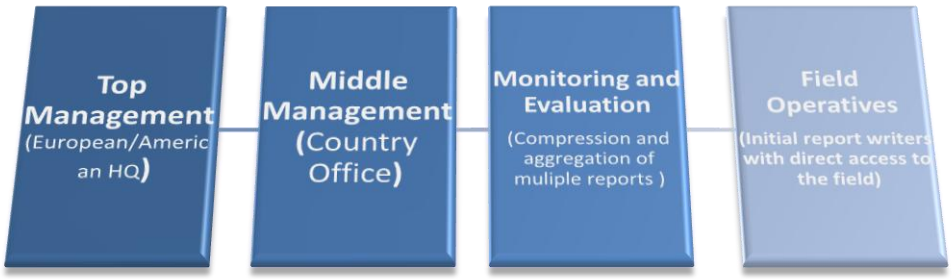
The starting point for the problem analysis is that the world of monitoring and evaluation (M&E) in the development sector comes with the challenges of collecting concise information at the right moment to give insight on whether an intervention makes a difference. That is to check project progress against set targets, as well as time lines, with the aim of feeding in to the decision making process (Sera, 2007). Thus M&E operates within an organisation to develop data collection tools, collect data from the field (where the intervention is taking place), collate, analyse it and present it to its consumers. The focus of consumption of M&E information is more than often management despite other consumers existing. The concern of the research with regard to M&E's function is monitoring reporting. That is how feedback from the field reaches management and the implications of this process on complexity oriented management, improved performance and on costs.

M&E in Zambian and Tanzanian non-governmental organisations (NGO's) often use a popularised model for monitoring reporting. This model positions M&E between the field operatives, people on the ground implementing the intervention and country management. M&E receive multiple monthly monitoring reports, which require compression into a comprehensive report destined for approval by country management. After which the report is then submitted by this level of middle management to a higher level, top management, which is usually based in the West. The flow of information from the field follows a hierarchy and subsequently the response from management flows downward through it.

1.1.1 Organisational Reporting Hierarchy and Innovation

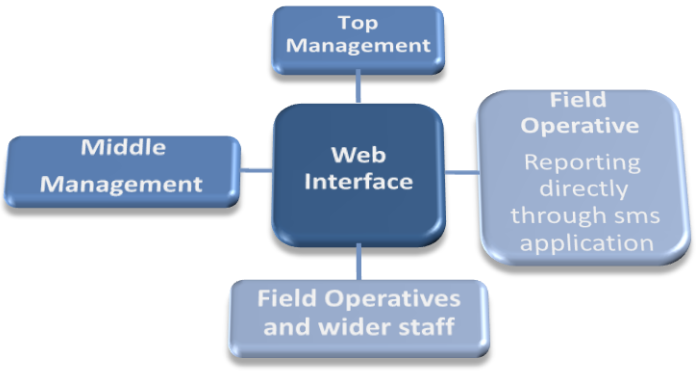
Adherence to this hierarchical passage of monitoring information has with it a number of set-backs as it has the potential to lock up space for decision making and interpreting the organisations reality to the perceptions of top management. When top management is in fact furthest from where the intervention takes place (Janis, 1982; Burnes, 2005; Pepper, 1995). Here in is the starting point for the analysis of an alternative model of monitoring reporting that applies a MC device and the models relationship to complexity oriented management practice. A practice which serves to mitigate complex problems such as underdevelopment that require even the lower organisations layers involvement in decision making for effective problem solving (Leeuwis, 2004).

Figure 1-Popularised Monitoring Information Flow



Based on the figure below, the first opportunity for discussion and probably the most obvious would be the opportunity of the RTMS to prevent the passage of information through different organisation layers. According to (Dant, 1999) this possibility for an MC device to neutralise the organisation reporting hierarchy exists. Thus RTMS could facilitate direct reporting by field operatives to top management and simultaneously to other sectors of the organisation paving way for open communication lines. The implications of the neutralisation of hierarchy Vis à vies open communication lines are crucial for the inclusion of bottom up innovation in an organisation.

Figure 2-Real Time Monitoring System Information Flow



Accordingly RTMS could then be looked at as a connector (Gladwell, 2000) acting to form links between top management and field operatives by allowing direct information flows between them. That is through a central web-interface which also allows for information to be accessible to a wider receivership. If this is coupled with a share point facility a foray for knowledge sharing and negotiation of solutions among all levels in an organisation could be created. This foray if discovered could safe guard against close-mindedness and top managements trust in their abilities to make the right decision for the organisation by the inclusion of alternative perspectives from field (Haslam, 2001; Burnes, 2005). This scenario reflects what Stewart (2008) refers to as social learning. Which involves multiple actors and strong feedback loops to prevent top-down designing of interventions.

Taking advantage of this foray, however, is dependent on the interactivity of design and desires of actors around the MC device to solicit advice or even want discussion.

1.1.2 Contextual Information and Reporting Speed

In line with linking top management to lower levels in the organisation RTMS could have an impact on the collection of "quality" information from the field for decision making purposes. More than often the distance between top management and field operatives, based on commitment to hierarchy, has an impact on de-contextualising field issues. This is because, direct reporting is limited from field to the top where decisions are made. Further, because the layered reporting hierarchy serves to aggregate issues with limited control and access of each lower level author (editor) to a report once it passes their desk. Furthermore, the distance provides an opportunity for information distortion between the layers of M&E and middle management or even at top management level. This could be for reasons such as screening upwards information to donors to paint a rosy picture (Orielly 1978). Though it should be put forward that field officers too may screen upwards information to managers to paint a rosy picture too. Nonetheless, if RTMS can perform the function of a connector a space maybe opened for the direct interpretation of the situation on the ground for the development of strategies that are more effective as they are contextual.

Another point of note, with regard to issues of improved performance, is that the RTMS based on neutralising the reporting hierarchy could provide an opportunity to reduce or omit desk delays on reports. This is because through the use RTMS data entry is faster and preliminary analysis automatic, thus development of a monitoring report requires less effort. Further considering the system is real time there is a wealth of current information ready to use. Decisions makers in some cases may not require a monthly report to determine the magnitude of a problem to chart a way forward. This directly impacting on the speed at which it takes for monitoring information to feed into the decision making process. Scholars on policy such as Chelimsky (1987) agree that a key aspect for effective decision making is timely availability of information. In the development sector this is critical with the limited time frame often provided to projects to make an impact. Nonetheless, it should be put forward that for the MC device to be real time the persons applying it must work in this fashion and the technical infrastructure available to support it. Based on a comparison of both figures it is evident that the alternative means of reporting directly from the field through an MC device could reduce time taken to develop monitoring reports and the organisation response to emerging issues.

1.1.3 Cost Effectiveness in Monitoring Project Activities

Lastly, (Gomez, 1997) puts forward that cost effectiveness is a critical ingredient of organisation efficiency and is a major reason why organisations often adopt an MC device. Further in the development sector reductions in funding can facilitate innovation solutions to cut costs for projects that would like to continue running. RTMS in this case could serve to reduce monitoring costs in an organisation with regard to per diems, fuel, staff and even communication costs. Thus the implications of the RTMS on costs require attention as they can be a pro for adoption.

1.2 Problem Statement

Following the discussion on the opportunities for RTMS for monitoring reporting and thus delving into the limitations of the popularised model there is knowledge that this new development (RTMS) can impact positively on the development sector. That is in terms of producing better interventions, improving the response time to emerging issues and in the collection of contextual information to make decision with, as well as to cut expenditures on specific budget lines. All these aspects relating to the three aspect of organisation efficiency; complexity oriented management, improved performance and positive cost implications[3] that will constantly be referred to in the research.

However, beyond speculation, solid information is required on how these types of systems actually work in practice. Therefore the research endeavours to explore the extent to which RTMS contributed to organisation efficiency and further the factors that influenced this relationship.

The research problem as discussed above is centred on how conducting monitoring reporting through organisation hierarchy can impede efficiency. Firstly, as commitment to reporting hierarchy limits innovation as only managers are involved in defining solutions to complex problems. Secondly, as the popularised model has implications on the quality and speed of channelling information for decision making in NGO's, where they often have a limited time to make impact. Lastly, as the popularised method of monitoring activities may be more expensive than RTMS.

[3] Refer to figure 3 for the operationalization of each of these three aspects.

2 CONCEPTUAL FRAMEWORK

This section moves beyond the problem statement to provide theoretical understanding of the opportunities of RTMS as an MC device and factors that can affect how it is developed and actually used.

The framework outlines the major concepts related to the research which include materiality, mutuality and the edge of chaos. These concepts connecting to views on emergence in open systems (Gerring 2007), which provides the broad framework of analysis for the relationship of RTMS to organisation efficiency.

2.1 Mediated Communication Devices and Organisation Change

In a world where change is given one area of interest in research which has also been experiencing an evolution are the perspectives on management. Thus scholars through time have been questioning the essence of an organisation and what ingredients contribute to them being run efficiently. **Efficiency** is defined as an organisations constant review on how it can improve on service delivery or performance (Van Ree, 2002). Van Ree, (2002) elaborates on how this constant goal places organisations in a position of striving to get the most output for input. That is in terms of costs, aspects of time, employee productivity, creativity and quality of services towards client satisfaction. All these factors being considered in a competitive environment and being the responsibility of management.

Alexander (2008), however, deeply ponders on this view of efficiency from the economic and strategic management perspective questioning whether it is in fact a good thing. This question arises as efficiency from this perspective promotes pushing even human resources to their maximum utility. The author further sheds light on the terms ambiguous character of being static as well as dynamic and how the term is defined by context. She elaborates on this point narrating how slavery was excused by one of the many faces of efficiency. Alexander's (2008) views though very de-constructivist are worth reflection despite the research operationalizing the term as static and progressive.

Returning to the line of thought that organisation efficiency is positive (Van Ree, 2002) and more importantly to reflect on emerging views of management as facilitating efficiency. Robbins, (1999) refers to contemporary organisations as those with flexible work arrangements and open communication systems. Brown (1997) adds to Robbins (1999) views by stating that these types of organisations as capable of surviving in the highly competitive environment of today, because they continuously innovate and improvise. According to the author this state requires intensive real time communication within an open organisation system (Brown, 1997).

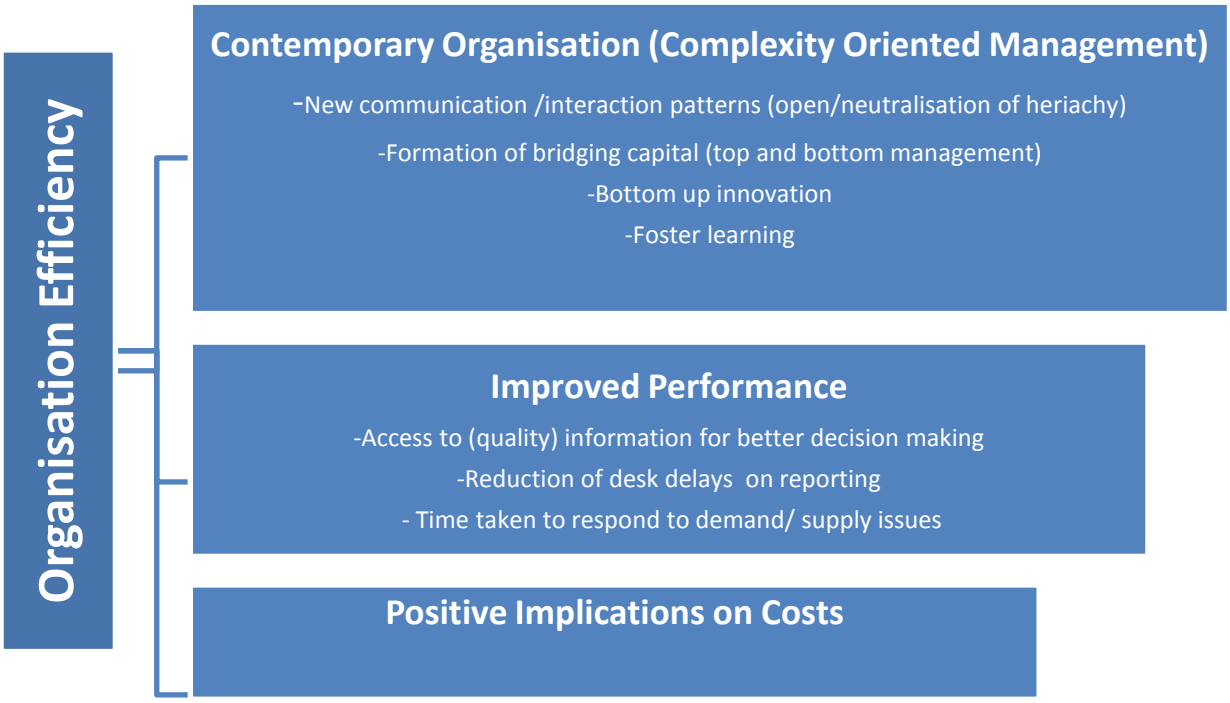
Mediated Communication Devices and Open Communication

Stemming from these contemporary views there is an important relationship between MC devices (RTMS) organisation change and efficiency that is central to the research (Brown, 1997; Gomez,

1997). Firstly that MC devices can facilitate open communication based on design and use. Accordingly, Pepper (1995) states that MC devices affect human interaction to the ends of organisation change. Stone (2010) further supports Pepper's assertion with the view that the introduction of new information systems can facilitate new structural relationships in institutions. Organisations moving towards operating on the contemporary view of management could be an example of such change.

In addition, Robbins (1999: p 298) puts forward that "organisation change based on computer technology advancements and the shift to empowering employees renders the traditional tenets of organisations design such as specialisation and the chain of command less relevant. He states that even lower levels in organisations can access information in no time that was formerly only accessible to top management and computer technology allows communication from bottom to top without necessarily following the chain of command". That is MC devices can be used as a connector of networks at all levels in the organisation (top and bottom), forming bridging capital in an organisation. This idea of a MC device acting as a connector is based on Gladwell (2000), but it should be noted that this scholar limits the role of connectors to dynamic personalities.

Figure 3- MC devices capacities as Organisation Efficiency



Furthermore, Proulx (2011) puts forward that online and networked communities produced by the introduction of MC devices create networks versus hierarchal structures to democratise innovation or allow for bottom up innovation as the take of those at the ground is presented. What Stone (2010) refers to as ''equalising power relations''. The use of MC devices to democratise innovation in the work place may be critical where the hierarchal passage of information, based on commitment to the chain of command and specialisation, can be a setback for organisation efficiency. This is because it has the potential to lock up space for decision making and interpreting the organisations

reality to the perceptions of top management, who in the case of development workers are often further from where an intervention is taking place.

Mediated Communication Devices and Real Time Information

Then the second important relationship between MC devices and organisation efficiency with regard to this research is that MC devices can facilitate real time communication. That is the faster flow and immediacy of access to information by multiple receivers (Gomez, 1997), this serving to improve the coordination of activities in an organisation and subsequently the response time to emerging issues. This being one aspect of efficiency connecting to performance. Another issue related to organisation is that the introduction of an MC device could result in lower costs and staff involvement in performing an organisation function. However, it should be considered that contextual factors may have a bearing on the technology being real time as well as the quality of infrastructure. Further that lower costs could be hard to define with regard to the shifting of expenditures across costing centres on an organisation budget. Meaning an organisation can save on one cost centre and begin to spend more on another based on introducing a new method of doing work.

Therefore despite the MC devices **materiality** being discussed as a check list of wonderful possibilities, Ipe (2003), Dant (1999) and Alexander (2008) are also weary of MC devices inherent capacities. The first set based on consideration that the socio-political context actually shapes technology and not vice versa. The point being that if the culture of an organisation is not sensitive to contemporary views of management then application of technologies may merely facilitate a hi-tech means of doing things the old way. That is through the bureaucracy (Lane, 1994). Whilst the latter warns that glorifying new technologies as completely progress could be misplaced. This is because old techniques may be equally efficient with regard to aspects of saving time, money and organisation performance (Alexander, 2008). Though it is also unwise to close off the possibility that a technology can unintentionally achieve contemporary views of management.

2.2 Technology Adaptation and Organisation

Further in relation to materiality Orlikowski (2006: p 131) states, ".....the challenge is how to articulate a view of technology's material properties without reifying them through a form of contingent determinism and without reducing them to the social." Based on this challenge what is important to note is that the definition of materiality is limited if it is centred on the inherent capacities (including social) of a certain type of technology. This is because, these capacities are made useful through decisions made by social actors and other processes in their environment (Orlikowski, 2006).

Therefore based on this realisation what should be reflected upon critically is not what makes the MC device fail to achieve what someone says it can do. That is not only be concerned with whether the MC device can in fact shape structural relationships or its technical prowess, but to shed light on the dynamic process of how its capacities are made useful in technology, such as RTMS, in the specific case of MEDA. Further putting in mind that capacities may not be applied completely and

that the organisations intended purpose of the technology may vary from actual use based on the organisations wider environment (Scarbrough, 1992).

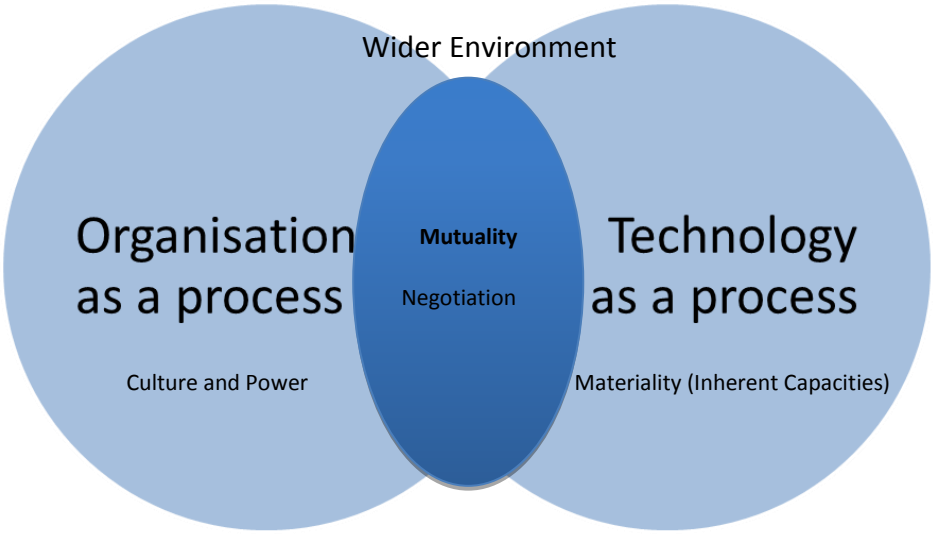
Additionally beyond a dynamic process defining the use of technology, beyond its materiality, the relationship of technology and organisation is discussed by scholars such as Scarbrough (1992). The author also follows the line of thought that what makes a technology useful cannot be put down to technology determinism or organisation choice, where the first relates technology to a defined outcome that is impermeable to the socio-political context surrounding it and the latter refers to the social systems in which a technology is embedded determining the design and use (fullness) (Scarbrough, 1992; Williams, 1996). Where both concepts though different can foster a form of top-down innovation which has implications on the actual use (fullness) of a technology (Hoes, 2011). The first for predetermining user needs to transfer a technology and the second based on a technology being in a context that conducts all activities in a top-down manner.

This author (Scarbrough, 1992) deepens the discussion on the dynamic process of making technology useful by adding that there are continuous shifts in the technology design to accommodate a variety of organisation needs, whilst at the same time the technology informs processes in the organisation. Accordingly Williams (1996) states the relationship between technology and organisation is fluid and intertwined. This idea reflecting the concept of **mutuality**, meaning fostering technology adoption involves the co-evolution of a technology and the social system in which it operates (Scarbrough, 1992). Further where technology (re)design is seen as a continuous social process that involves negotiations and power struggles among multiple users who may have conflicting technology needs and are interdependent (Alexiou, 2008; Hoes, 2011).

In relation to the diverging needs of users around a technology a focus on boundary objects comes into play here. This is based on the realisation that technology users do not have generic needs or goals, but that one technology can facilitate their separate goals towards an overarching goal based on their interdependence. Star (1989:p 393) therefore defines a boundary object, "....as an entity shared by several different communities but viewed or used differently by each of them , being both plastic enough to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites." Thus a MC device, such as RTMS, can mean different things to different members of staff, who also use information from it differently to contribute to achieving the higher organisation goal.

Nonetheless getting back to mutuality Stewart (2008) expounds further on the adaptive process and its implications on design. He adds that users feedback is considered in the (re)design process bridging the gap between them and (proxy) technology developer. Meaning this allows for users to share insight, knowledge and experience, in the process of negotiating a technology design and bring about the exploration of alternative designs. Moreover these type of designs that are not prescribed by a developer at arms-length nor solving a need established from one user's perspective are facilitated through constructed knowledge. Constructed knowledge reflects social learning (Alexiou, 2008; Hoes, 2011). This scenario where the gap between the designer and end user is bridged has implications on positive adoption patterns.

Figure 4-Relationship of Technology and Organisation



Source Scarbrough et al (199)- adapted.

On one hand, this adaptive process defined as mutuality may seem attractive, but it should be put forward that it can also lead to overall goal displacement (Stewart, 2008). This is in the light that the final design may not suit an initial intended purpose which cannot be merely shrugged off as pointless. Thus Hoes, (2011) consider these types of (technology) innovations harder to adopt due to their complexity as they are arrived at in a dynamic process with lots of uncertainty. Their view is understandable considering multi actors with diverse insight are involved in the design process and secondly, the end result may not look anything like what the sponsor of the innovation hoped for. Nonetheless these unintended consequences of a process of uncertainty could also be seen in positive rather than negative terms.

Basically the authors in this section touch on the issue that technology development is a dynamic process involving interaction between the technology and context. Further that the final design of a technology can be determined by the social actors around it negotiating on how it can be made useful to all of them from different angles. Including requirements for collaboration between technology developers and users, even if the final design is nothing like the initial vision.

2.3 Technology Use: Effects of Context and Wider Environment

In relation to the insight that technology use (fullness) is determined through a dynamic process factors that may play a role in influencing the use of the MC device are discussed in this section. This is, firstly, issues relating to the ability to adopt the technology are worth mentioning here, and because it is futile to begin exploration of the relation between MC devices and organisation efficiency if there is no possibility for their use. This reasoning stems from Capabilities theory (Mante-Meijer, 2011). Therefore the theory in short is concerned with the feasibility of adopting (introducing) a technology with specific reference to the **economic, infrastructure support, technological socialisation ability or willingness of intended users to adopt it.** These being factors

that could affect how a technology is used beyond the plan of how one party defines it should be used.

Organisation Culture

More specifically factors such as **organisation culture** also come into play to affect technologies use. This is because culture affects how things are done in an organisation (Seel, 2000), even how technology is used. However, despite this statement the relationship of culture to technology is not this simple and this is because technology can also shape culture (Stone, 2010; Pepper, 1995). This scenario reflects how the final use of a technology is not easily predicted.

However, considering that the second preposition is reflected as a capacity of MC devices (such as RTMS) it is then important to reflect on the scholarly discussion of culture and organisation change. The discussion reveals that describing a desired culture, such as one in line with complexity oriented management, is much easier than cultivating it in a context, even with a technology. This is because culture develops continually in a complex system (the world) it is thus churned by varying external and internal effects (Seel, 2000). These being factors that cannot always be isolated for introduction to a context to produce desired ends. In addition defining an organisations actual culture to determine whether it requires changing is also difficult. This is because it is possible for an organisation to have multiple cultures, some that organisation staff are not aware of and of which some could be contradictory (Smircich, 1983).

Hence based on cultures dynamic and plural nature, defining organisation culture as; the shared values and beliefs that govern behavioural norms in problem solving (Schein, 1985) that are transferred to new people in an organisation as they are status quo engrained over a period of time, seems inadequate. This is because things are just not as simple as the definition.

However, in the difficulty of defining a specific organisation culture or cultivating one it still remains that organisation culture does define organisation functioning, even technology use (Seel, 2000), but how the culture comes about is not always clear cut. Though it should be mentioned that factors such as technology (Pepper, 1995; Proulx, 2011; Robbins, 1999), economy, competition and even a charismatic individual in leadership can modify it.

Power and Resistance to Change

On the other hand, there are other scholars who view organisation culture as secondary to **power** in any process of organisation change. Power being the ability to influence peoples action with their consent or otherwise (Dale, 2008).These authors probably look at organisation culture from a static and simplistic perspective. From this perspective resistance to change can be understood for the purpose of maintaining a status quo that has been tried and tested. Thus in the event of trying to promote wider participation in innovation in an organisation operating bureaucratically barriers would be presented. Not only based on lower levels of an organisation thinking they are not in a position to provide input, but also through those who hold power safeguarding their positions and identities tied to the chain of command(Blok, 2001; Burnes, 2005).

Additionally Hatch (1997:p 367-358) who also reflections on power dynamics of organisation change focuses on the role of leadership. Change according to this author depends on those in power. Thus he states "In a socially constructed world, responsibility for environmental conditions lies with those who do the constructing. […]This suggests at least two competing scenarios for organizational change. First, organization change can be a vehicle of domination for those who conspire to enact the world for others […]. An alternative use of social constructionism is to create a democracy of enactment in which the process is made open and available to all […] such that we create opportunities for freedom and innovation rather than simply for further domination."

Thus it is important to think about power as both a force that can serve to prevent organisation change and one that can facilitate it. Therefore power can determine the use of technology towards one of these ends.

2.4 Contemporary Views on Management; Bureaucracy versus Edge of Chaos

In relation to contemporary views of management or rather complexity oriented management, as it is termed in the research, there is need to create better understanding of the label. The starting point for this explanation is that the movement of thought on management is based on criticising classical management theorists such as Henri Fayol and Max Weber the developers of bureaucracy.

Bureaucracy

This traditional thought of organisation, is mirrored by Robbins (1999) as an organisation possessing a definite structure; including division of labour and a hierarchy that incorporates authority for purposes of delegation or supervision. This idea of organisation meant to foster efficiency and avoid chaos by ensuring the uniformity of responses to issues as well as allocate appropriately (Sayer, 2000) extends to the development sector, universities, and governments to name a few organisations.

Nevertheless, this idea of organisation has been challenged for lacking sensitivity to the dynamism of the organisation environment and thus functioning on the wings of planned change when organisations operate in complexity. The supplementary shortcomings of this organisation are cited to include the concentration of power with the few at the higher end of the chain of command, fostering of goal displacement and the time delays that following set procedures can cause. Scholars such as Garston (1993) reflect on bureaucracy as idealist and therefore negligent of existing informal organisation, as well as having a tense relationship with democracy. Further it attracts criticism from complexity-oriented management scholars, such as Burnes (2005), who propose the edge of chaos as the condition management should strive for cultivate to run efficiently.

The Edge of Chaos

The **edge of chaos** is based on realising that organisations do not operate in a stable environment. There environments are not stable because organisations like complex systems in nature, are dynamic non-linear systems with unpredictable actions (Burnes, 2005) and operate in a changing society, technological climate, as well as an economic system which is highly competitive (Robbins, 1999). They cannot predict everything that they will encounter and plan for it. Thus for an organisation to thrive it needs to be adaptable and open up a wider space for determining strategies through alternative interaction patterns in communication trajectories (Burnes, 2005). Basically management requires a mind-set that embraces alternative ideas from diverging "experts" to feed into decision making and needs to leave room for distorting the status quo to deal with unexpected issues. Considering that this is a continuous process it also requires that an organisation learns from these unexpected situations to build on their planned responses and again leave space to respond to another set of unforeseen changes. This positions an organisation at the edge of chaos between rigid planning and no planning, order and extreme flexibility a place where continuous innovation and adaptability are possible Burnes (2005) and Brown (1997). In addition management in this position is required to accommodate the neutralisation of hierarchy or power equalisation, transparency among all organisations levels, increased flexibility in rerouting plans and involvement of all levels in decision making to foster organisation efficiency.

Robbins (1999) refers to these types of organisation that foster **complexity oriented management** as contemporary organisations, with flexible work arrangements and open communication systems that do not only concern an organisations internal trajectory.

Figure 5-Evolution of Perspectives on Organisations

TRADITIONAL ORGANISATION	EMERGENT ORGANISATION
Stable	**dynamic**
Inflexible	**flexible**
Job focused	Skills focused
Work is defined by job positions	Work is define in terms of tasks done
Individual oriented	Team oriented
Permanent jobs	Temporary jobs
Command oriented	Involvement-oriented
Managers always make decisions	**Employees participate in decision making (not only top management)**
Rule oriented	Customer oriented
Relatively homogenous work force	Diverse work force
Workdays defined as 9 to 5	Work days have to no time boundaries
Hierarchal relationships	**Lateral and networked relationships**
Work at organisational facility	Work anywhere any time

Source Robbins (1999)

Additionally avoiding the limitation of innovation to management can be valuable to ,"guard against members of any small cohesive group (such as top management) maintaining esprit de corps by unconsciously developing a number of shared illusions and related norms that interfere with critical thinking and reality testing," (Janis, 1982: p 35). These being factors that can impede innovation and thus organisation efficiency. This phenomenon described by Janis (1982) is referred to as group think and is widely discussed by other scholars (Haslam, 2001; Pepper, 1995). The edge of chaos framework with regard to guarding against group think comes into play as managers who operate in

this state are required, "to rethink the nature of hierarchy and control," plus according to Tetenbaum (1998: p 46), ''destabilise their organizations and develop the skill of managing order and disorder at the same time[.....]encourage experimentation, divergent views, even allow rule-breaking, and recognize that 'people need the freedom to own their own power, think innovatively, and operate in new patterns.''

What is more is that the criticism of classical ideas of organisation are also reflected in the development sector. Funtowicz (1993) puts forward a point, from the complexity perspective as well, that explains why this is happening. He states that under-development is a complex problem. A problem which requires opening up space in development organisation to co-produce effective interventions. That is not limiting innovation role to a selected few (the experts) and excluding grassroots actors. However, more research is needed on how the emergent views on organisations are directly shaping project management practice in developing countries.

In light of the arguments put forward for the edge of chaos and its contribution to efficiency, one point that should be established is that bureaucracy cannot be labelled as inefficiency considering the multiple definitions of efficiency. Further, without sounding naïve a question that should be raised with regard to the edge of chaos is whether it is achievable or achieves its own ideal of organisation efficiency. This question is fuelled by thought that opening up space for innovation in an organisation could merely lead to information overload. The provision of a wider base of solutions of with a top actor still required to use their discretion to make a decision. Furthermore lead to serious chaos if no prescription of the right dosage of flexibility is available. Burnes (2005) also acknowledges the limitations of the application of 'complexity theories' to management principles based on its roots being in natural sciences and ideas such as evolution. Nevertheless, he advances it as a useful analytical lens for management practice.

2.5 Research Objective

To describe how RTMS was used in a specific development organisation and establish how this relates to aspects of organisation efficiency.

Research Questions[4];

What was the intended purpose of RTMS?

- What was the organisations intended purpose for the RTMS?
- What factors influenced the initial design of the technology?

How was the RTMS developed?

- Who was involved in designing the technology?
- What kind of user producer interaction led to the "final" design?
- What was the "final" design of the RTMS?

What was the actual use of RTMS?

- What are the cost implications of adopting the RTMS?
- What is the use of RTMS in relation to complexity oriented management?
- What are the factors influencing the use of RTMS in relation to complexity oriented management?
- What is the use of RTMS in relation to enhancing organisation performance?
- What are the factors influencing the use of RTMS in relation to enhancing organisation performance?
- To what extent are the capacities of RTMS utilised?
- What are the emergent uses of RTMS beyond its capacities?
- What are the use(s) of RTMS with regard to alternative ideas of organisation efficiency?

[4] Please note that the Interview/Observation guide is attached to the document with sub-questions as Annex 1

3 METHODS AND RESEARCH DESIGN

The research process was guided by a critical realistic epistemology. Therefore the research considered the limitations of researchers in observing facts and had regard for interpretations of interviewees in data collection and drawing conclusions. This interplay between observation and interview accounts leading to answers to the research questions closest to the "truth" (Walliman 2006); Sayer, 2000).

3.1 Type of Research

The research was qualitative in nature as it provided in-depth description of the relationship between the two main variables in the context of MEDA Canada (Green, 2009). That is the introduction of RTMS and organisation efficiency. The relationship of the two variables being defined as the reasons behind the introduction of the technology, how it was developed, used and why it was so in the context of MEDA. The context including variables such as the organisation culture and factors such as mobile network coverage. The study was only guided by the variables in terms of them being a possibly scenario based on the problem stated, but not tied to establishing a causal relationship. That is considering the relationship between the variables could have been positive, negative and the independent variable could lead to alternative outcome, all being scenarios worth description.

3.2 Research Design

The research design was a case study of MEDA. The sampling was based on the use of RTMS in the organisation since 2008. The case study required analysis of holistic units (De Vaus, 2001) such as different staff types (management, support, field level) at different levels in the organisation hierarchy, in three countries and two projects in different countries with a number of sites (regions). Further the case included the analysis of embedded units such as such as the organisation culture with regard to communication and innovation. This set up did not make analysis easy; however, each unit provided valuable perspective.

Figure 6-Organisation Structure and Interview Targets

	TNVS	PTI	Number
Top Management (HQ Level)	Head (Senior Vice President) Production Market Linkages		1
	Project Manager (currently vacant)		0
Support staff HQ	*Head M and E*		1
Middle Management (Country Level)	Country Manager	Country/Finance Manager	2
	Finance Manager	Country/Finance Manager	2
	Project Team leader/Operations Manager	Senior Business Linkages Officer	2
	(Proxy) designer Technical Associate	(Proxy)designer Country/Finance Manager	2
Support Staff	*Project M and E Coordinator*	*M and E officer(Researcher)*	1
Field level	Regional Field Operatives for 3 sites (regions) in each project		6

Further the two projects were included in the study for different purposes despite both being voucher based and using RTMS. This was also because this was where there similarity ended. TNVS, which has been running since 2004 in Tanzania, facilitates increased demand and supply of ITNs by developing linkages in the value chain through a public-private partnership of clinics, wholesalers, retailers and the net manufacturer. PTI Zambia, on the other hand, was a project that run for two years until the end of 2010 to increase demand and supply of SSIT's. Thus based on having different settings, budgets, targets, value chains and periods they could not serve as strong comparative frame for the use and non-use of RTMS, in relation to organisation efficiency. Even though one project used the technology and the other did not. This was not a big issue considering the study was qualitative and sought then to understand the different project perspective to feed into the overall organisational experience with the technology.

PTI was the first project in MEDA to apply RTMS and test it. As such RTMS was applied throughout the project life. Inquiry on this project was thus important to gain insight on longer term implications of the technology. It was also relevant in investigating the organisation culture where the project was closed and as interviewees, former employees external to MEDA could provide independent views of the culture. Additionally in the discussion of culture the project was relevant, as field officers were seconded to MEDA based on an MOU with a partnering NGO that allowed MEDA to use their structures to reach the field. Thus field officers were not employed by MEDA and had more room to express their views openly.

Whilst the latter that recently piloted RTMS (in September, 2011) served to give retrospective information on functioning without such as system and provide a limited comparative frame of a before and after use scenario. Further TNVS provided more opportunities to conduct observation for triangulation with interviews, especially with regard issues such as culture and power dynamics, as well as for the reasons as lack of finance to cover Canada and the closure of PTI. Further this project provided the best information for cost implications having run for a longer time without the technology and then introducing it. However, considering the limited time the technology was in use

and difficulty in isolating monitoring activities in the project's cost centres establishing a comparison was limited. Thus only indicative figures were acquired based on financial document analysis and discussion with staff connected to finance. This data being sufficient for a qualitative study. However, there is room to conduct further research for cost effectiveness of the technology in future using a highly quantitative experimental methods for information for internal validity.

Lastly headquarters provided the overarching perspective of applying the technology, however, with the limitation of there being no project manager at HQ for TNVS and PTI which was closed. Meaning only one top level manager, who was an appropriate source to be interviewed based on having contact with both sites. Though it should be mentioned efforts were made to make contact with the former Canadian Manager of PTI, but the attempt did not produce any results.

3.2.1 Data Collection

In-depth interviews were the major method of data collection used to obtain insights from respondents on their experiences with the RTMS in the organisation and the outcomes of use. An interview guide was developed for face to face interviews in the respondents setting, but for the respondents based in Canada Skype calls with video were applied. Further confidentiality in data collection was upheld religiously. Focus groups were not applied due to the geographical location of field operatives, limitations in number of possible participants and the importance of obtaining individual information at each level of the organisation to triangulate information from sources versus obtain a general idea of the opinion on issues[5].

Observation was also applied, specifically to collect insight on the organisations culture, to triangulate it with what respondents express and identify RTMS use patterns that may not be mentioned by the respondents. The site for observation was the project office in Tanzania, however, observing the cultural link with headquarters was difficult as there was limited access to this site for financial reasons. Further the closure of PTI was a set back as only limited information on observable factors was collected from one site with no comparison or support. However, the fact that TNVS had been running longer and thus has a defined culture gave it a stronger basis for observation of culture versus PTI that only run for two years.

Document and Artefact Review was also used. This included review of project proposals, reports, organisational promotional/marketing literature, the website and the web interface. This was to gain insight on MEDA in general, on the initial purpose of the technology, how the technology was being used and financial documents were reviewed to establish RTMS' implications on costs.

3.2.2 Data Analysis

Data analysis proceeded by identification of key themes[6] guided by the questions from the conceptual framework and those that emerged in the field. The themes were the basis of a coding

[5] The interview targets are described in figure 6.
[6] Refer to Annex 1 the Interview/Observation guide for the themes

system developed to mark field-notes from observation and recorded interviews. The data was therefore represented through thematic framework analysis.

3.3 Access and Reflexivity

Access to the projects was not be too difficult considering the organisations expressed interest in learning lessons on the application of RTMS and the researchers' prior employment in the organisation. Though, there was a delay in getting clearance to visit TNVS where the researcher had not worked.

However, for purposes of reflexivity the prior engagement of the researcher with the organisation may have biased results based on having an insider's account or limited the contributions of respondents based on having the feeling that the researcher was asking questions they should have the answers to. On the other hand, the situation lead to ease in developing rapport with subjects to extract information, but it should be considered that the effects of researcher's prior engagement with the organisation were mitigated by the fact that the researchers had been out of the system for a substantial period of time.

3.4 Ethical Issues

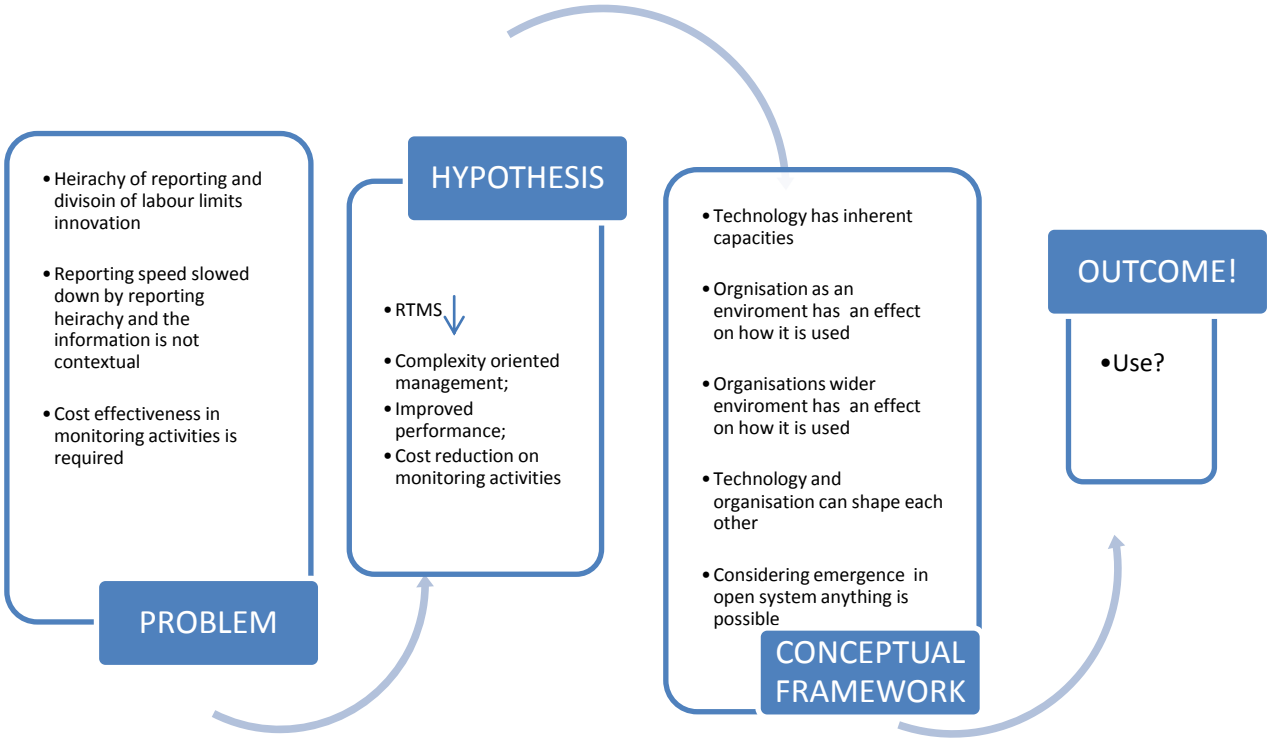
The researcher assumed an overt role for most of the research process, but was required to tackle observation of the organisation culture in a covert manner. The basis of this being that culture as a reflection of the organisations identity was a sensitive topic area to probe and could not to be assessed directly to get the truth.

4 FINDINGS

The preceding chapters provided insight on the problem and put forward a hypothesis that the RTMS has the capacity to remedy the problem. The conceptual framework then shed light on factors that could affect the use of the technology in the final analysis.

The analytical lens is based on the view that beyond the inherent capacity of the RTMS, as a MC device, the organisation as an environment and indeed the wider environment of the organisation has a bearing on the final use of the technology. The capacities of the RTMS include that it can modify organisational structural relationships, have an impact on the quality or speed of reporting, and cut operational costs.

Figure 7-Comprehensive Analytical Framework



Based on the conceptual framework the starting point of this chapter is then to define beyond the hypothesis the purpose the organisation identified for the RTMS, then putting into consideration the organisation culture (functioning) and the wider environment of the technology elaborate on the actual use of technology in regard to complexity oriented management, performance and cost implications.

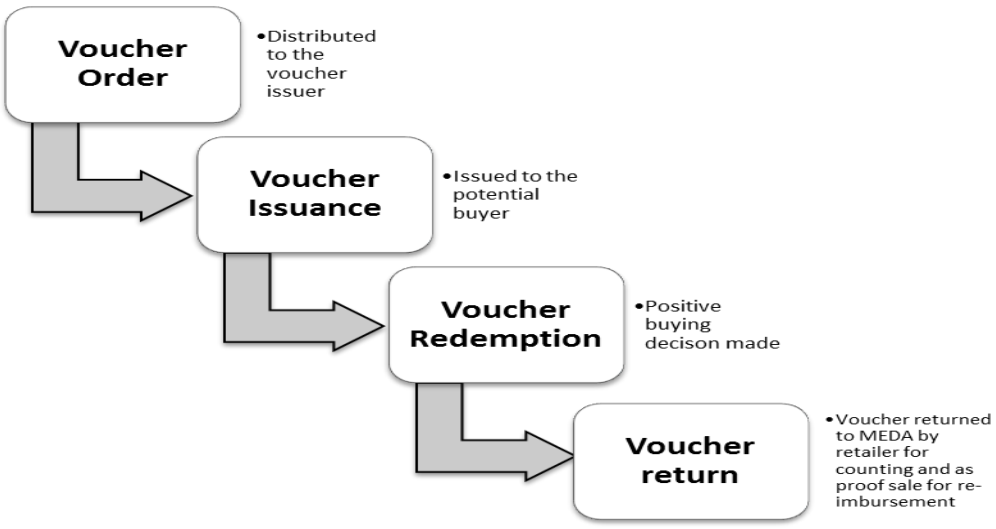
4.1 MEDA: INCENTIVES FOR RTMS ADOPTION

The idea to introduce RTMS came about due to MEDA's experience with a paper based voucher system (PBVS) on TNVS. The use of papers vouchers according to MEDA had limitations and there was need to explore alternative ways of tracking vouchers. In relation to exploring alternatives the organisation identified mobile application as a viable option. This was no surprise considering in the context of developing countries these types of applications are the current modus operandi to facilitate services such as home banking, subscription for lottery type products, money transfers and even marketing information platforms. This is due to the pervasiveness of mobile technology and its ability to create access even to people in rural localities (Hansmann 2003). Accordingly RTMS, based on a mobile application, was put forward as an alternative to PBVS.

To touch on the limitations of PBVS, MEDA considered them to be higher costs on voucher distribution and controlling fraud. Additionally, the organisation considered this system was less efficient in tracking voucher performance, supplier responsiveness and voucher liability. Therefore in 2008 the trial of RTMS on PTI a new project was initiated. Later, in September of 2011 to be exact, based on lesson learnt from PTI, RTMS was introduced on TNVS and by this time PTI had closed.

However, to get back to MEDA's incentives for adopting RTMS, it is imperative to avoid generalising them to the "whole" organisation. This is because, staff of different levels and functions expressed diverging views on incentives for RTMS adoption. As the discussion on these diverging views proceeds the voucher flow on the PBVS will require explanation; this is to facilitate better understanding of its shortcomings and reflect on RTMS adoption incentives through a range of perspectives. *Please refer to the diagram below;*

Figure 8- Paper Based Voucher Flow



The diagram is a basic representation of the voucher flow on TNVS which worked[7] with PBVS. More importantly, from the onset it should be made clear that it excludes other activities such as capacity

[7] TNVS at the time of the research was in the process of moving from the PBVS to the RTMS. Thus to some extent the project was still working with PBVS, but in this case what is more important is to focus on the comparison of PBVS to RTMS in a before and after scenario from the wider organisation perspective.

A loose voucher showing the bar code

building interactions with retailers[8]. This is because staff expressed that limitations related to voucher activities were the reason RTMS required introduction.

4.1.1 Voucher Ordering and Distribution Logistics

The starting point of this flow was vouchers being ordered. For PBVS this involved MEDA contracting an external (South African) company to produce vouchers on order. The company produced the vouchers with security features such as serial numbers and barcodes which made them identifiable and allowed for their genuineness to be determined by MEDA. These vouchers were produced in cheque book style with matching serial numbers on the stub and on the actual voucher which was torn out of the book.

These books would take approximately 5 weeks to reach the project offices from order time. They moved from the port of Durban to the port of Dar es Salaam in bulk stock of at least forty thousand books (one million vouchers). Once at the office they were distributed to voucher issuers across the project area to reach potential buyers. This activity was considered quite costly and tedious for the project management team and even field officers who were of the view that a reduction in their logistical work of distributing vouchers would allow them dedicate time to more important activities such as tackling retailer responsiveness and product quality.

> *"The RTMS reduces time in terms of distribution and reporting," Field officer TNVS, Dar es Salaam (February, 2012)*

> *"We experienced a reduction in funding and had to reduce our workforce and our motor vehicle fleet. We also had to find an innovative way to cut down on voucher distribution costs, a large part of our spending," Finance Manager TNVS, Dar es Salaam (February, 2012)*

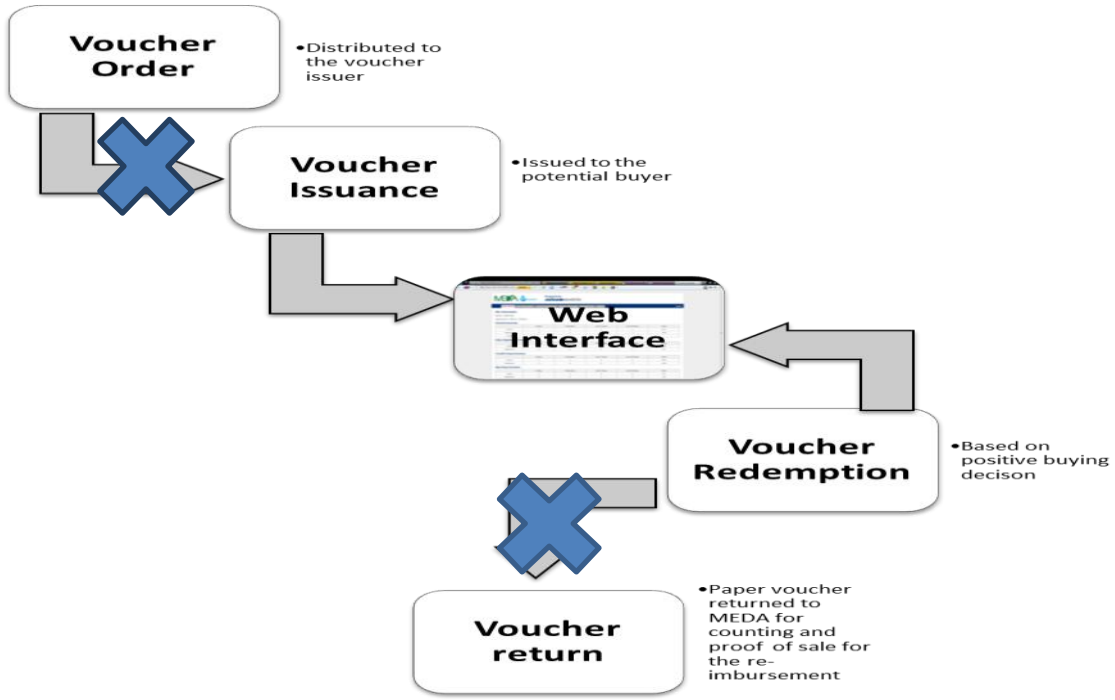
Further insight from the Finance Manager reflected that from a finance perspective there were external factors that necessitated the adoption of RTMS. Secondly that he was positive the technology cuts costs, however, whether the technology actually had positive implications on costs falls under another section of this report. For now the interest in this statement and the one before it is that RTMS is seen to have an advantage over PBVS.

[8] For more information on organisation activities refer to Annex 2, the project log frame for PTI which was also modelled on that of TNVS.

This is because RTMS allows for unlimited volumes of vouchers to be generated electronically. This can be done with immediacy, excluding shipment logistics from South Africa and distribution costs to the voucher issuers. The short cut between voucher ordering and issuance (by passing distribution) was considered a more efficient method of getting vouchers to potential clients by (top and middle) managers.

The short cut reflects on the RTMS voucher flow as it begins with the voucher issuer filling in a menu based application installed on their phone. The menu base application requires input on the name of the potential buyer, their identity number (in the case of PTI this was the number assigned to the farmer by IDE), their sex, location, mobile number and the product they are interested in purchasing.

Figure 9- Real Time Monitoring System Voucher Flow



This information is then sent to the web interface via SMS, after which the voucher issuer receives a message containing a voucher number, serial number, transaction reference number and the amount the voucher is worth. The information once received is written down on a paper representation of the voucher, a dummy voucher, to ensure the potential buyer leaves an issuing site with a physical product to avoid doubts of the authenticity of a voucher generated in thin air.

In the case of the RTMS developed for TNVS voucher issuance is slightly different. The only difference between RTMS-PTI and RTMS-TNVS is that the latter uses a command based mobile application. Therefore the web interface has similar data on the issuance of vouchers (the number issued) and most importantly sends back a voucher number to the issuer. However, information from the voucher issuer is sent in a different format and thus through a different mechanism. The

procedure basically requires issuers to send an SMS with the desired product for purchase and an identification number (in the case of TNVS this is the clinic card number). The desired product is represented in the SMS with a specific code. After sending this message the issuer receives a message with the voucher number and the date of the transaction. This information is then written on a dummy voucher to enable the next stage of the voucher flow to occur.

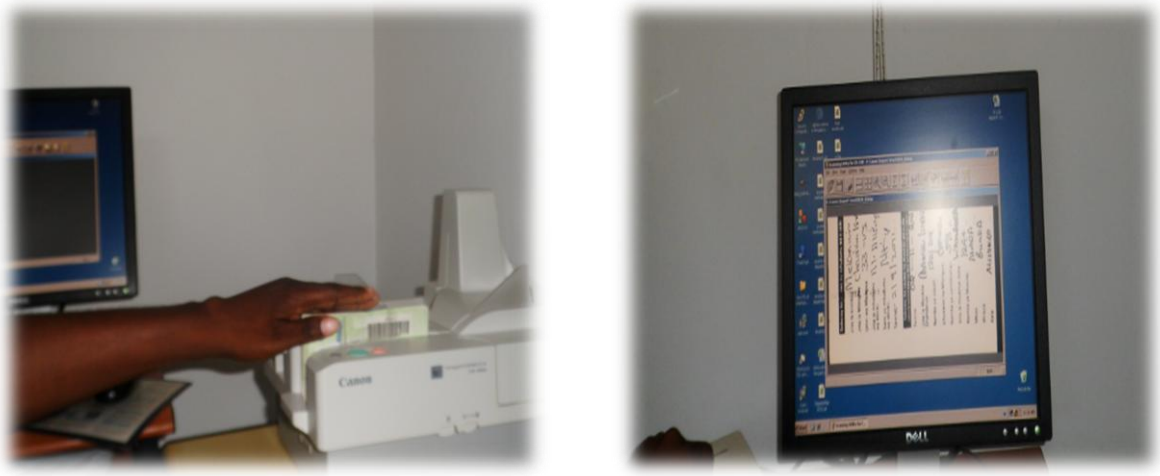
In spite of the differences in issuance mechanisms for the RTMS' the point to take home here is that due to their functioning, facilitating omission of activities along the PBVS voucher flow, top and middle management identified an incentive to introduce RTMS. This, however, was not expressed as a strong incentive for adoption by M&E staff who were more concerned with the information RTMS provided.

4.1.2 Fraud Control

Beyond stage one (voucher ordering) and stage two (voucher issuance) the next phase of the PBVS voucher flow is redemption. This stage of the flow is the point at which a potential buyer decides to buy a product and proceeds with a paper voucher to a retailer to purchase it. As it was mentioned earlier potential buyers are under the assumption the discount voucher was from the retailer who is having a promotional sale. Meaning the buyer gets a discount on the product, but the retailer claims the amount of money equal to the discount from MEDA.

After a sale is made the next stage of the voucher flow came into effect that is the voucher was physically returned to MEDA by the retailer seeking re-imbursement. At this point MEDA physically checked the genuineness of the voucher to pay retailers and also got information on the actual number of redeemed vouchers. In regard to RTMS the process of verifying vouchers and aggregating the redeemed vouchers was considered faster by organisation staff. This is firstly because, just like information of issuance, information on redemption is received with immediacy as the vouchers redeemed do not have to be returned physically for MEDA to count them. Secondly, because validation of redeemed vouchers is not done manually, the RTMS automatically does not allow redemption to take place if the voucher number is not recognised by the system. That is if the voucher number is not generated from the system through issuance.

This was not the case for the PBVS, where there was a department, the Voucher Tracking Department, employed to count vouchers with a money counter, as well as validate them for retailer re-imbursement purposes. Further via PBVS the process of validating the voucher or rather fraud control was centred on the bar code on each voucher. Thus the bar code feature of the voucher was useful in determining the genuineness of the voucher at the point when a retailer was claiming re-imbursement. At this point when the voucher was returned from the field, after redemption, a pictographic scan of it would be taken to show information on the issuing location, issuer, the date of issue and redemption. This was done through a bar code scanner. This scanner allowed for the picture to be taken and saved in a computer database based on the specific barcode number on the voucher.



The vouchers being counted and scanned at the Voucher Tracking Department

This barcode number could be thought of in terms of a "file" and thus information on the database could be called up for reading based on the specific voucher barcode using a scanner (just as it does in super markets). Once the barcode was saved in the computer data base with the pictographic information it could not be saved a second time. This meant that if a voucher came into to the office and did not have a genuine barcode or one that was already saved in the system it would not be saved in the data base and deemed invalid.

However, through the use of the RTMS on PTI, on full term basis, there was no need for a department for fraud control as this was done automatically and with immediacy. On RTMS-PTI the retailer and not the voucher issuer would fill in a menu on the phone with information on the voucher number, the product type, its serial number and the amount paid for the product. This information would be sent to the system and the retailer would in turn receive a message with the amount they accrued on sales, owed to them by MEDA, but this is only if the voucher number was recognised by the system. That is, it was a number already in the system based on voucher issuance.

In the case of RTMS-TNVS the retailer sends an SMS to the system with the word sale, the voucher number and the serial number of the product. Just as in the case of RTMS-PTI if the voucher number is not recognised or the serial number of the product already exists in the system the transaction does not follow through. The retailer in the case of TNVS can then check the number of products they had sold and claim money from MEDA by sending an SMS with the word savings and their shop number as recognised by the system.

Here the redemption mechanism of RTMS is seen to be a validity check of a voucher and is another incentive that (top and middle) management saw to adopt RTMS. The other related to fraud control is that RTMS generates random and not sequential voucher numbers (like the voucher books) which makes it easier for a voucher number to be copied. Furthermore, unlike a voucher book it is impossible for an electronic voucher to be stolen and unintentionally issued or lost.

"There are no losses of voucher on the e-voucher system as it was in the case of the paper vouchers, e-voucher cannot really get lost," Field Officer TNVS, Dar es Salaam (February, 2012)

4.1.3 Real Time Information and Managing Voucher Liability

Further along the voucher flow stages of issuance and redemption middle management and finance expressed other limitations of the PBVS. One of the limitations was that the system could not foster up to date reports on issued, redeemed or expired vouchers. This was because TNVS experienced a time lag in reporting due to the time taken for figures to be collected from across sites and sent to M&E for aggregation into a report. Getting this information basically involved field officers calling issuers and retailers. Hence the time between the actual activity and the monthly calls to collect information was where the lag occurred, as well as at report development where information from different areas had to be put together.

Additionally the accuracy of the information was questionable as information from calls was not verified and an indication of the vouchers issued or redeemed in real time was not provided. For instance in the case of vouchers issued they could only be verified when used voucher books with stubs were returned from issuing sites for the numbers to be aggregated and this information was further from real time than information collected by telephone.

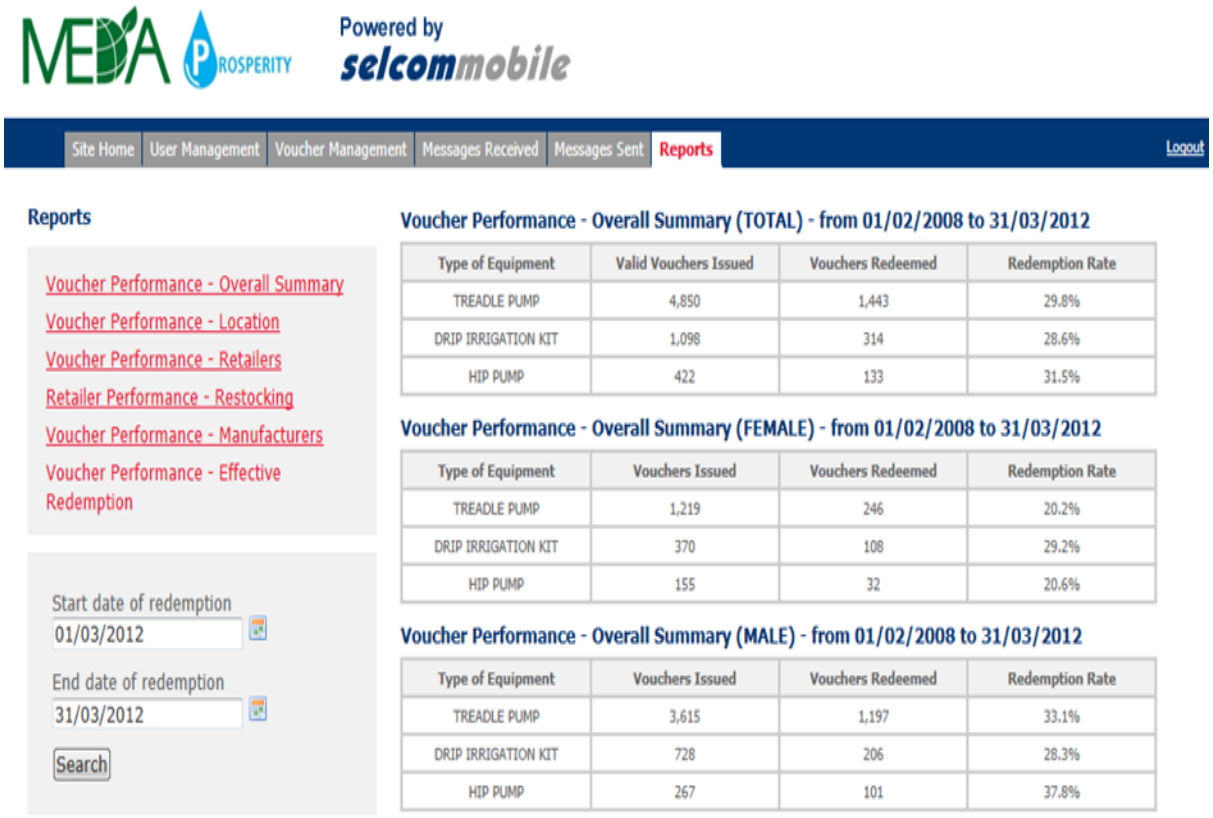
In regard to redeemed vouchers the delays were threefold. One being the immediacy with which a retailer organised themselves to make a claim for re-imbursement, the second being that unlike the vouchers issued they could not be counted per book used with a standard number of vouchers and therefore a counting machine was required to count them.

As mentioned earlier TNVS had a department dedicated to conducting this counting to feed into to M&E. This situation allowed for vouchers that were actually issued or redeemed months earlier to be accounted for in following months. So the reports were not necessarily by month in the accurate sense. Further it was one thing for the organisation to know how many vouchers where issued, but another to establish active vouchers. That is vouchers for which there was still a possibility MEDA would be required to reimburse retailers on. It is also worth noting that vouchers had an expiration date that served the purpose of making the "promotion" by retailers appear realistic, therefore to prime demand of the product based on the real price. Nonetheless, what is of more importance in this case is how the setup of PBVS made establishing active vouchers difficult.

Therefore the time lag plus the blindness to active vouchers made it difficult for the project to ensure they had accurate funds to pay retailers on possible and actual sales. That is manage voucher liability, because the true indication of the number of vouchers issued, redeemed and expired was not available and the project had to work with estimates. The organisation considered RTMS could speed up reporting time and improve management of voucher liability. This is because when issuance and redemption are completed via RTMS the data on the activities immediately reflects on the web interface. That is reports are sent via SMS just after data input.

Additionally for voucher redemption, information on the cost of the product purchased and what is owed to the retailer is also reflected in the system immediately. Then specifically with regard to voucher expiration RTMS is seen to work better as the system automatically calculates active demand, vouchers in circulation that are expired and the system is guaranteed to only allow redemption transactions on vouchers that have not expired.

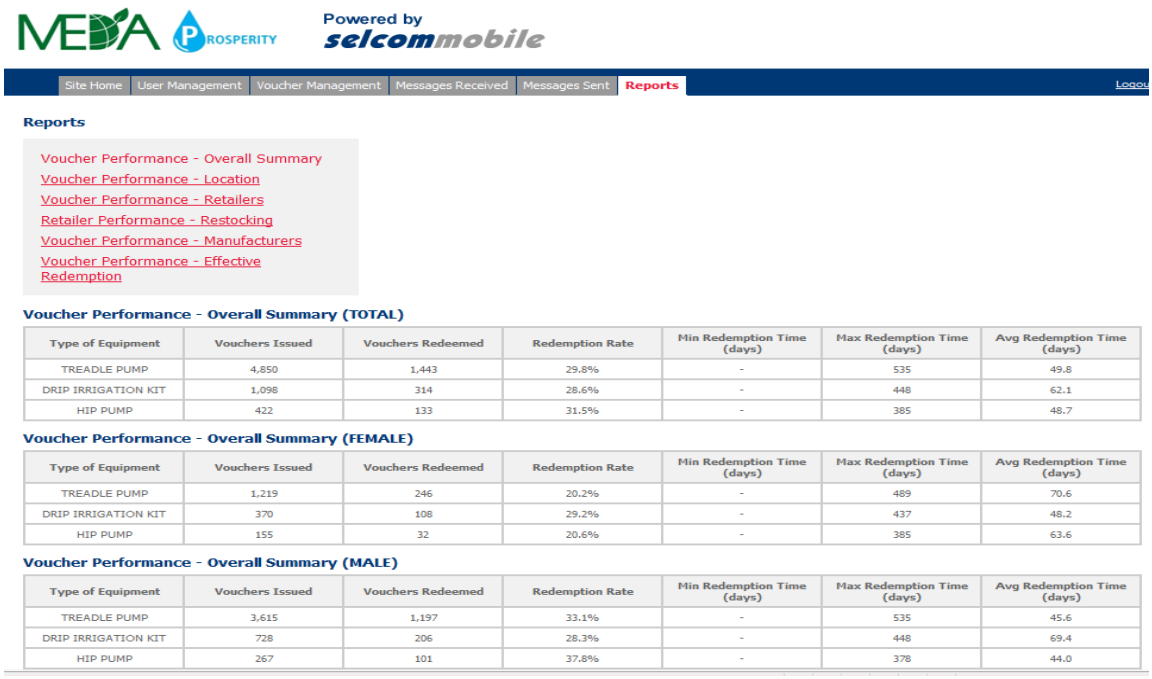
Figure 10-Screen Shot Active Vouchers



Source MEDA

This shot differs with the one below as it shows the real redemption rates calculated automatically by the system and therefore is based on active vouchers unlike the shot below;

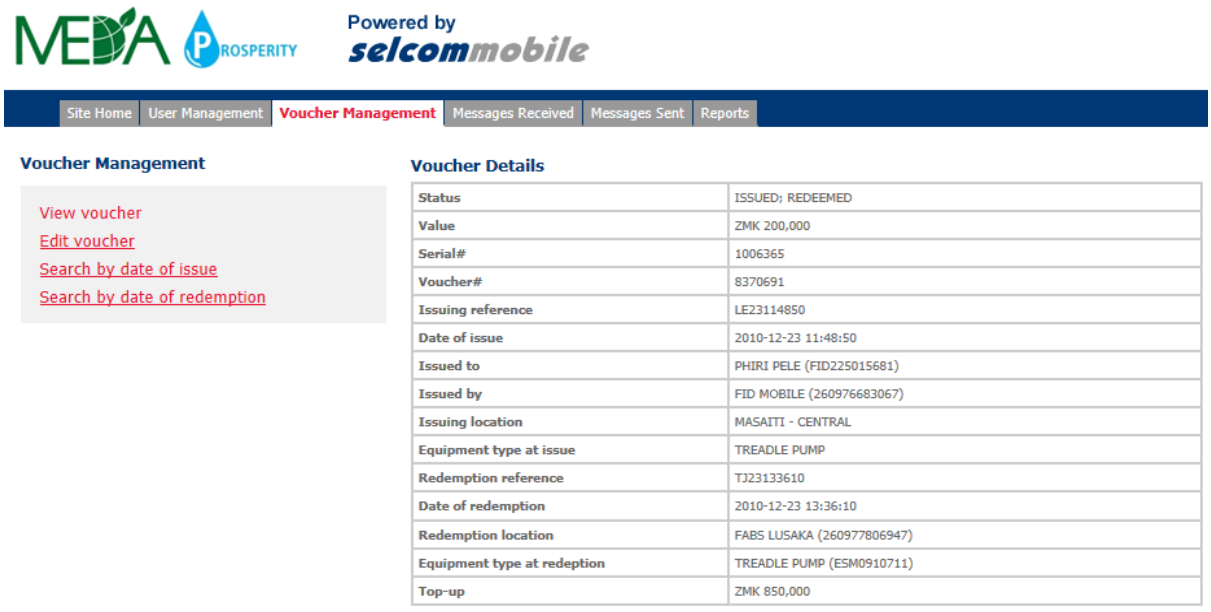
Figure 11-Screen Shot Vouchers Issued



Source MEDA

Further it should be mentioned that the system is multi layered and interconnected. To provide some insight on this setup of the RTMS below are more screen shots of the web interface. For instance figure 12 shows how one can search for information by voucher number and from the results access information on when or where it was issued and redeemed at one go.

Figure 12-Screen Shot Interconnectivity, Voucher Issuance and Redemption



Source MEDA

The last figures show amounts accruing to retailers, which was interest to the Finance Department to monitor payments and to M&E to monitor increases in sales over certain periods. There are also other important layers on the system such as the ability to search issuance and redemption by location[9].

Figure 13– Screen Shot Payments Accruing to Retailers

Retailer	Total Vouchers Redeemed			Value of Vouchers (ZMK)			Avg Top-up (ZMK)		Min Top-up (ZMK)		Max Top-up (ZMK)	
	Total	Drip Irrigation Kit	Treadle Pump	Total	Drip Irrigation Kit	Treadle Pump	Drip Irrigation Kit	Treadle Pump	Drip Irrigation Kit	Treadle Pump	Drip Irrigation Kit	Treadle Pump
CHOKWADI ENTERPRISES LTD (260976685718)	250	3	246	56,690,700	576,000	55,854,700	288,000	319,282	240,000	0	336,000	650,000
CROPSERVE (260976685725)	69	1	68	16,276,000	278,000	15,998,000	417,000	635,324	417,000	370,000	417,000	796,000
CROPSERVE (260976685724)	65	25	40	12,810,000	4,810,000	8,000,000	94,000	380,625	0	370,000	420,000	795,000
CROPSERVE (260976685728)	130	113	17	24,372,000	20,972,000	3,400,000	80,513	348,235	0	0	300,000	370,000
CROPSERVE (260976685733)	88	58	30	18,152,000	11,600,000	6,552,000	137,276	395,433	0	0	370,000	695,000
CROPSERVE (260976685734)	145	36	106	30,008,000	7,250,000	22,200,000	93,194	366,981	175,000	200,000	315,000	695,000
CROPSERVE CHOMA2 (260976683083)	175	21	125	45,285,600	4,073,000	35,986,000	344,500	700,912	279,000	279,000	550,000	795,000

Source MEDA

Furthermore beyond looking into the system, in terms of being a driver for the introduction of RTMS, the non-availability of real time data affected the functioning of another department apart from (top and middle) management. This directly affected M&E personnel as they were not able to provide accurate voucher performance information at the right time for planning and decision making purposes. This was a major limitation of the PBVS expressed by the M&E (Canada and Country level) and reiterated by middle management, however, not by top management.

> *"RTMS is very important, and as it gives us an immediate window into program activity that we did not have before [.....] It enables us to do more higher value work, by reducing error rates, eliminating the daily grind of data collection, shortening data collection and cleaning cycles," Head M&E Canada, email correspondence (May, 2012)*

However, top managements view was that voucher performance monitoring information was more useful to country management that looked into the day to day management of the project. Top management was more concerned with meeting donor obligations, due to being in close contact with them and therefore more concerned with incentives of RTMS adoption such as prevention of fraud and accountability on spending, including voucher liability issues.

[9] However, for more information on this and other layers please refer to Annex 3 the sitemap.

"The RTMS tool in Zambia and Tanzania is primarily a tool for country management, not a tool for HQ to make decisions. Though I did have log in information and would have a look, but based on my jurisdiction would respond to certain issues," Head Production Market Linkages Canada, Skype interview (March, 2012)

"We relied on other organisations responsiveness for reporting, clinics (issuers) and retailers and it took long for them to report […]The channel we used for distribution was long and this connected to a long channel of reporting," Field Officer TNVS, Dar es Salaam (February, 2012)

Corresponding with this M&E personnel, field operatives considered one of the advantages of RTMS is that it reduces the time taken to develop monitoring reports as it short cuts the process of collecting information on vouchers issued (from clinics) or redeemed (from retailers) in the wide geographical areas MEDA operates. Field officers said this increased their time to conduct other activities such as liaising with retailers on ways to respond to demand.

4.1.4 Conclusion

The intended purpose (s) of RTMS, as related to the limitations of the PBVS were distribution of vouchers with less effort and time, generally reducing costs along the voucher flow[10] and thus to the project as a whole.

The other aspect was improving on voucher performance monitoring specifically, to respond to demand and supply issues on the ground faster, with better quality information due to it being real time.

Fraud control was another issue out of the scope of performance that was an intended use of the technology. Another was the management of voucher liability to ensure the project could honour payments to retailers on the programme as per contractual agreement. Where re-imbursements on the discount were an incentive for retailers to join the programme and see the potential of the targeted buyers as a viable market segment.

Additionally, different incentives for adoption were identified by different types of staff members. Top management, middle management, M&E and field operatives identified their own core purposes of RTMS. These uses or rather incentives for adoption are tabulated below. The core uses are denoted by two stars.

Figure 14- Variegated and Overlapping Incentives of Adoption

INCENTIVES FOR ADOPTION AND USES	**Top Management**	**Middle Management**	**M&E**	**Field Operatives**
Managing voucher liability	★★	★★		
Managing voucher costs	★	★★		
Fraud Control	★★	★★		★
Monitoring Reporting Information	★	★★	★★	★★
Reducing logistics of issuing vouchers		★		★★

Nonetheless, despite the variegated use, it should be put forward that the use of the technology in practice could challenge these incentives of adoption put forward by the organisation. This was another area of interest for the research. Thus the research also endeavoured to establish whether the intended use of RTMS differed from the actual use. This is what is described in the following sections.

[10] For a summary of the functioning of RTMS-PTI and RTMS-TNVS refer to Annex 4

4.2 MEDA ORGANISATION CULTURE

The previous section outlines the intended purposes of RTMS and thus the incentives for adoption as defined by MEDA staff. Nonetheless, before delving into to the description of how RTMS actually worked in MEDA, it is imperative to describe the organisation culture, considering that this could have a bearing on how the technology was used. Therefore, the discussion will consider contextual factors that affected the use of the RTMS, organisation culture being defined as the organisations communication and intervention innovation practice.

Additionally this section is focused on TNVS, which was still operational at the time of the study and for reasons expressed in the research design.

4.2.1 Open Communication and Reporting Hierarchy

In general MEDA staff said they had and an open door policy. Staff at all levels of TNVS alluded to this sense of freedom in relating to supervisors on issues and supervisors (including HQ) stated they encouraged these open communication lines. In other words staff said information was free to flow either verbally or by email in the organisation regardless of hierarchy.

Work cubicles a representation of the open door policy

> *"We have open communication, because if I have anything to say I can channel it immediately to the Country Manager. Even field officers can share information with me as their supervisor. [.....]The Country Manager sometimes channels directives directly to the field and this has been the way we have operated," Team Leader TNVS, Dar es Salaam (February, 2012)*

In spite of the organisation having open communication lines it also had high regard for reporting hierarchy and the division of labour connected to it. The organisation thus had contradictory reporting practices. In one light reporting hierarchy was important for what the Tanzanian Country Manager referred to as formal reporting, whilst in another light fore going this hierarchy to give

information was seen as necessary, the informal reporting channel. Through the discussions with staff it was clear that the organisation had two reporting channels.

> *"The feedback loop depends on the type of issue. One may inform me directly if it is an emergency [.....] thus reporting from the field directly is not optional it is a space you need to give staff even though you have to follow the official channel to have order, but in a case that the staff is talking and may not be attended to by the supervisor you should not shut your ears to them" Country Manager TNVS, Dar es Salaam (February, 2012)*

These contradictory reporting channels could be understood from the point of view that only having free information flows could lead to chaos in an organisation, even if these situations allowed for vital information to flow through the organisation for immediate action. This is because information would be received in tit-bits and on ad hoc (not organised) basis leaving a lot of room for disorganisation as response and actions would not follow the same pattern. In line with mitigating chaos the pros of the formal channel were explained by the Head of Production Market Linkages and the Tanzanian Country Manager respectively.

> *"We are comfortable with open systems, but we have to be clear there are defined channels for reasons [.....].It brings a new communication dynamic of immediate information, but in balancing this open communication system there clear borders of responsibility in management and obviously for field officers. It is not right for HQ management to respond directly, because then what is the essence of country management. Organisationally we have documents to describe accountability to define different levels of responsibility in the organisation and use it to determine which issues to be involved with, meaning even for such a system there are limits of interacting " Head of Product Market linkages Canada, Skype interview (March, 2012)*

> *"It is not neither nor you cannot go full open or full hierarchy. The catch word is balancing as you need structured information and to use the added value of each layer as it is there for a reason," Country Manager Tanzania, Dar es Salaam (February, 2012)*

The formal channel required information to flow from the field, to M&E who put a comprehensive report together, then to the Project Manager, after which it landed on the desk of the Country Manager and then finally to top management. Then points for action flowed downwards. This set up was important to ensure that the organisation had structured and comprehensive information to base their next steps on and also that specific directives were delegated to the accountable person(s) effectively. Delegating directives effectively was essential as information from each level of supervisor came in bulk and required digestion by the target to see which person under their supervision was required to respond to matters so that the overarching action point could be achieved.

Therefore the layers of the formal reporting channel were required to make sound decisions based on solid information, where each layer added value to the report in terms of experience, perspective or knowledge they possessed. They were also required to maintain a respect for division of labour

which prevented chaos in the organisation by allocating work efficiently and subsequently allowing systematic responses to issues.

4.2.2 Conspiracy Theories of Reporting Hierarchy

Cosmetic Reporting

On the other hand, the former Project Manager of PTI seemed very sceptical of the open communication system of other middle managers in general (the development sector). He was of the view that despite managers referring to reporting layers adding value these served to dilute the reality and contextuality of information from the field for the sake of public relations. He called this act cosmetic reporting which involved painting a rosy picture to donors and top management.

"There can be these artificial reporting layers that suit the powers that be to sound their own ideas and put things as correct as they see them. Dilution of the facts happens at middle management level not with people on the ground. The ground gives information in good faith[.....] Generally NGO's are trying to go towards open systems, we need two way reporting mechanism with no doctoring of information. This idea of direct reporting will prevent middle management from painting a rosy picture or doing damage control" Senior Business Linkages Officer PTI, Lusaka (November, 2011).

He spoke in general terms making it difficult to assess this was a reflection on MEDA and further he added  *"[……] At least in PTI we engaged as a team to chart ways forward."*

Whether this act served to control outward flows of information to save face with donors in TNVS was worth thought as one field officer did allude to TNVS having open communication internally, but that there was control of information going outside the organisation. Then again management's emphasis on collecting contextual information and allowing informal reporting gave doubt as to whether the Business Linkage Officers views were more than a conspiracy theory. Further another field officer also questioned the genuineness of field officers in providing the same contextual information and stated they were just as susceptible to cosmetic reporting to protect their jobs and have country management think all is well. However, to unravel the conspiracy theory more time as a participant observer at a management level in MEDA would be required.

Threats to identity

Additionally, the idea that supervisors sought to keep the hierarchy due to being threatened and wanting to maintain power was another conspiracy theory that surfaced in discussion with field officers. A field officer from PTI gave insight on this. It should be mentioned that he was a field officer under MEDA based on the MOU signed with IDE and thus he was far removed from the real functioning of MEDA. However, as he spoke in general terms or reflecting on how he worked in IDE he stated management did not listen and also questioned the genuineness of management.

"Management makes no conscious effort to seek our feedback, they fear if they implement your suggestions that we will threaten their position. Also having one report leaves room for those above to say what they feel. The problem now is communication is top-down as even planning meetings are ceremonious. However, with MEDA (our partner) things were different MEDA, with MEDA feedback given was acted on," Field Officer IDE/PTI, Kafue (November, 2011)

Another field officer who had worked for other NGO's stated  *"MEDA considers feedback from the field unlike in many NGOs," Field Officer TNVS, Dar es Salaam (February, 2012)*

According to these field officers, despite both having different relationships with MEDA, one working in partnership with the organisation, the other employed by the organisation, both were of the view that MEDA had a management which was ready to listen to people in the field.

However, the sentiments of the first field officer can be questioned based on his response to an interviewer who was a former employee of MEDA. Meaning the officer may have found it difficult to give criticism of MEDA. Then the sentiments of the second field officer could also be questioned as he was still employed by MEDA and could have practised self-censorship to save the face of the hand that feeds him.

Therefore, just as in the case of the conspiracy theory of cosmetic reporting that of protecting identity requires full involvement in the project and more observation for a longer period of time. That is to unravel whether the reporting hierarchy and identities tied to it are protected for those who enjoy power to retain it. Even though another question is whether in reality power or rather authority can be shared, considering that even when those at the top use their authority to facilitate a learning organisation, they may be required to make final decisions based on experience or knowledge and where it is not possible for everyone to do this in a sea of diverging views.

4.2.3 Contextual Information and the Learning Organisation

Nonetheless, moving further into the discussion on the organisation listening to field officers, MEDA emphasised the importance of having contextual information to have better responses to issues on the ground. The organisation management recognised the role and ability of field officers to provide such information.

"*We rely on field people to provide input as context specific information is very important for planning," Country Manager TNVS, Dar es Salaam (February, 2012)*

"Field people are the originators of any decision," Senior Business linkages Officer PTI, Lusaka (November, 2011)

However, this acknowledgement left a gap in whether the field staff were programmed to only give the raw material for decisions to be made by the powers that be or field staff actually engaged in providing advice to middle or even top management. This was later answered by further discussion

with top management and field officers who alluded to specific foray where advice was solicited from field staff.

In the case of TNVS there were specific periodic activities where their advice was solicited and negotiations for a way forward occurred. The first was the physical bi-weekly meetings held with their supervisor(s) and other field officers. Apart from negotiating solutions and accessing their feasibility these meetings also allowed for field officers to share their experiences and learn from each other.

> *"The monthly report as complied by M&E is shared with all of us for us to learn from each other. Even in the de-briefing meetings when we come from the field we share problems, experiences. We sit with the field team and sit with supervisors even the Country Manager, "Field Officer TNVS, Dar es Salaam (February, 2012)*

> *"We encourage field officer to advise, that is why we have de briefing meetings," Team Leader TNVS, Dar es Salaam (February, 2012)*

Another activity was the annual planning meeting. The difference between this one and the first was obviously that it was held annually, but more importantly that it included a representative from headquarters. Further this activity had to do with long terms action points versus short term action points as solicited in bi-weekly meeting which were a preamble to developing work plans for the field officers. This activity was an inclusive process for charting a way forward for the organisation, but putting in to consideration also the donor obligations, these obligations being connected to the boundaries of financing, the project time frame and thus feasibility of the array of possible actions to pick one.

The two activities or events described above were conducted in an interpersonal space. This brought reflection on whether this was done on purpose to facilitate better negotiations, even to the extent of having a representative from Canada present. Or for the sake of convenience as all field officers came to the office anyway and the opportunity for dialogue could be taken advantage of versus using Skype or a share point facility.

Furthermore, even though no one expressed the usefulness of face to face interactions in the negotiation process it is plausible that MEDA could have been applying interpersonal communication in these forays because this method was more effective.

4.2.4 Conclusion

In summary the RTMS operated in an organisation that had multiple ways of channelling reporting information, solving problems and making decisions depending on the situation. These being the informal, formal and periodic face to face channels. The RTMS was an addition to these reporting channels.

RTMS having the property of converging information on the web interface brought with it a new dynamic in organisation reporting. The dynamic being an open access and open communication system that neutralised hierarchy. However, whether this new dynamic facilitated or enhanced inclusion of field officers in decision making, negotiation of project solutions or use as a foray for learning is another issue. This issue being the focus of a following section.

Nonetheless, in terms of the organisation having a listening management another issue that requires description is the organisations technology development process. This is because it provides further insight on how the organisation functioned to find solutions, but in regard to technology innovation. Where this process could also have a bearing on the use of RTMS in regard to design and social acceptability. Therefore the description of how RTMS was actually used in relation to complexity oriented management will follow that of the technology development process.

4.3 RTMS DEVELOPMENT PROCESS

The process of technology development is an important focus, because of the assumptions around a more inclusive process holding more promise for adoption, social acceptability and usefulness of technology. This is because the final product is negotiated to meet requirements of ''all'' actors around it, even though there is a possibility that the final product may not look anything like what was expected. Nonetheless, in line with these thoughts it should be considered that if RTMS was developed in an inclusive manner there are implications on the design and actual use beyond what was intended. Further information on the technology development process is essential as it sheds more light on how the organisation functioned.

In view that technology innovation is an on-going process the focus for the section will mainly be PTI, which run for at least two years with RTMS and leaves more room for innovation dynamics to be explored. This is unlike TNVS that only run with the technology for five months on a pilot basis in 2011. However, there were connections made between TNVS and PTI, as sister projects in MEDA, in the innovation process as the limitations of PBVS informed the design of RTMS-PTI and further experiences with RTMS-PTI informed RTMS-TNVS. Additionally, the focus on PTI was imperative considering field officers actually conducted voucher issuance, unlike on TNVS where it was personnel at clinics who performed this function. Field officers under MEDA were thus direct users of the technology, apart from other users. Field officers under MEDA were users in terms of inputting data and using information on the system to respond to issue on the ground. However, them not being direct employees of MEDA, but working under the organisation based on an MOU with their employer IDE had implications. These were to the effect that could have included reluctance by MEDA to fully involve them in project activities such as designing the RTMS. This will be discussed at some point in this section.

Nonetheless, from the interaction with the staff it was clear that within the organisation top management, middle management, M&E level and field staff were involved in the development of the technology. Apart from an external party, the consulting firm that was behind the technological development of the system. This was for both PTI and TNVS. However, their roles and level of involvement will be established in subsequent paragraphs[11].

4.3.1 (Proxy) Designer

The starting point for the technology development process in each project was the (proxy) designer. In the case of PTI this was the Country Manager, but for TNVS this was the Technical Associate, an intern from Canada who was employed to perform the function of overseeing product development. Based on MEDA's incentives for adopting RTMS these (proxy) designers developed a sitemap. The initial design was developed from a middle management perspective based on the limitations of the

[11] Note other users such as retailers, mentioned in preceding sections, but that were completely excluded from the technology development process will not be explicitly mentioned in this section. Though it should be mentioned they had similar experiences with the system as field officers on the ground with whom they worked closely and therefore their feedback on the system was channelled through field officers. However, this can also be a reflection of the technology innovation process of MEDA not extending to external parties.

PBVS with regard to costs, inaccurate monitoring information to respond to issues on the ground with precision, fraud control and managing voucher liability. These limitations were collected from TNVS staff through formal and informal communication of their experiences with the PBVS. This information fed into the design of the site map[12]. Even into the development of the sitemap for PTI as the project was in contact with TNVS when RTMS was being developed.

The site map was the basis for discussion with the external consultant on what the site should look like, to determine how it would work and for the consultant to make it work. On PTI prior to discussing the sitemap with the consultant middle management received input from top management, at that time the Canadian Project Manager who was then employed by MEDA, to improve the design and give the go ahead to start developing the technology.

The discussions with the consultant then yielded results in terms of developing the software for the system. According to a representative from the company that was developing the technology the design was decided by MEDA.

> *"The Manager from Zambia developed a sitemap, we modelled the system on it. During the process of maintaining the system we made adjustments based on observation and hence advise from the Manager [.....]We were more concerned with the technical aspects of making the system work and MEDA was our client," Representative of the IT Solutions Firm, email correspondence (May, 2012)*

This e-mail response is a reflection of how the negotiations on the technology proceeded. The (proxy) designer took the lead in determining what should be amended, keeping top management in the loop and the consultant responded to the needs of this client on technicalities. However, it should be mentioned there was a point when the consultant visited the field to test the RTMS. That is to test it in the condition that voucher issuers would experience. This was considered important on both projects. This was the juncture at which the involvement of field officers became apparent in developing the technology.

4.3.2 Field Officers as Users

In spite of this level of involvement of field officer, according to one the design of RTMS came from the top (country management) and field officers were used to operating within these parameters. He also stated this was how things worked even for country management who also got directives from top management. Through his statement he raised the issue that organisations with hierarchical structures require those in lower levels of the organisation to adapt to decisions or obligations bearing down on them.

> *"We were not involved in the design process, we were just trained to use the technology it was just part of the job. The technology was specific to MEDA needs, we had no input it*

[12] For sitemap refer to Annex 3

came from the top (IDE country management) and we had to adapt. When things come from the top you have swim or sink" Field Officer IDE/MEDA, Livingstone (November, 2011)

Further the Senior Business Linkages Officer (project manager) of PTI (who was not employ by MEDA as the project had closed) shared the view of this field officer leading to a point that the limited involvement of field officers in the design process could have impeded adoption if it was not for the authority they had to respect in the organisation hierarchy. By saying this he eluded to the "powers-that-be" having the ability to facilitate change in an organisation even against the will of employees under them.

The statement of the Senior Business Linkages Officer also reflected on the "doctor-knows-best" management style. A management style, which is more than often demonised for its top-down nature, when in fact it maybe of necessity and effective at times; necessary as authority is difficult to share and effective as even though solutions are prescriptive they are made by a knowledgeable and experienced manager.

"Initially the field people were not receptive to the technology, there was not enough time taken to orient them on the usefulness of the technology. MEDA was saying this is the way to go.[.....] If M&E come up with a tool and it is divorced from the ground how does it help?[.....]Things like lack of techno phobia were assumed, listening to people on the ground to improve technology is not developed, but MEDA was also on a learning curve and sometimes to bring change this is the way to go." Senior Business Linkages Officer PTI, Lusaka (November, 2011)

Despite the technology design coming from the country management on PTI, other field officers did not expressly say this was a bad thing as they identified the need it met for them and felt they were consulted on the ground to work it over at some point.

Voucher issuance in the field using a mobile phone

"There was consultation on the ground; the design was based on what happened on the ground. Thus I had no problem with the design or query it as Yusuph (consultants representative) got input from the farmers (potential buyers) and trainers (voucher issuers)" IDE/PTI Field Officer, Kafue (November ,2011)

On the other hand, with regard to the diverging views of the two field officers on participation in the technology development process, it should be considered that first field officer feeling detached from it could have been due to the limitations of the design team consulting and testing the technology in all of PTI's areas of operation. Whilst in the case of the second field officer, who had a different view, the consultant did visit his area and ask him for input on the functioning of the RTMS.

However, it should be mentioned that this input from field officer was tailored towards minor modifications versus substantive change to the technology, as the RTMS was being tested at this stage. Thus in spite field officers stating they were consulted in the process of developing the technology their involvement was limited and the technology development process was quite linear. Nevertheless, this may be positive for country management (the proxy designer) as this scenario could reflect how well they were connected to field officers needs and interpreted them in the design of RTMS.

4.3.3 Support Staff as Users

Moving onwards, despite M&E benefiting from the RTMS in terms of monitoring voucher performance better the department was not involved in the development of the technology design. The Senior Business Linkages Officer for PTI gave reasons behind this, alluding to (top and Middle) managements incentives (of mitigating fraud and costs) for RTMS adoption or rather their perception of the need being a priority in the design of the technology;

"The RTMS was purely an accountability tool and then it became a reporting tool," Senior Business Linkages Officer PTI, Lusaka (December, 2011)

However, based on the incentives of RTMS adoption put forward by top management and both Country Managers in the previous section the view of the Senior Business Linkages Officer was countered. This is because consultation with other actors revealed wider intentions of use of RTMS and that the incentive for reporting was not stumbled on.

Another reason that M&E was excluded from the process is the reality of project practice. That is the bulk of project planning, no matter how inclusive in decision making an organisation maybe, is done before staff below the country manager are identified or have settled in to the job. That is interventions are set, the M&E plan developed and in the case of PTI the basic idea for the RTMS was probably already established by top and country management. These sentiments were expressed by the top manager based in Canada who was privy to both PTI and TNVS. However, this reality could not hold for TNVS that introduced RTMS at a point where the project had been running for over five years, but still excluded M&E from the RTMS design process.

M&E Coordinator TNVS

"M&E was not heavily involved in developing the system, but the field people were checking for short coming," M&E Coordinator TNVS, Dar es Salaam (February, 2012)

The M&E coordinator for TNVS was of the view that M&E was not involved in the design of the RTMS, despite finding it very useful for monitoring purposes.

4.3.4 Conclusion

The design of the technology involved multiple actors, but the bulk of input on the design was a single actor at middle management level. Top management served to red tape the design and allow for financial investments in it. Field level operatives were involved in the RTMS design process to the effect of slightly perfecting the vision the (proxy) designer had for it. Whilst support staff, such as M&E, were excluded from the process though they found the technology useful too and it was based on voucher indicators in the project M&E plan.

The organisation stuck with an intentional design and tried to make it work. There was not much variation from the intended design on the sitemap and the final look of RTMS after two years of application on PTI. The process of RTMS development was not adaptive, but to say the technology development process was completely top-down was difficult. This was due to the need for user involvement being identified by management to a certain extent.

Furthermore, even if the design process was quite top-down it was hard to say that this was a bad thing considering that different users around the technology identified the need the technology met for them towards achieving the objectives of the project. Thus even though the development of RTMS was focused on the (proxy) designer it reflected outcomes of an adaptive processes. Meaning in this case the (proxy) designer was able to discern the diverging user needs through an internal negotiation process upon listening to staff or making observations. This finding has implications on whether top-down innovation should be demonised as a deterrent of adoption and the social acceptability of technology.

4.4 RTMS: INTENDED VERSUS ACTUAL USE

The previous two sections provide a picture of how the organisation functioned. This section will reflect on the uses of the technology beyond its capacities to facilitate organisation efficiency and the organisation incentives for adoption. Going beyond these two perspectives being necessary to create a comprehensive picture of the workings of RTMS. That is to explain why the RTMS was used in a certain manner in MEDA.

4.4.1 Complexity Oriented Management and the functioning of RTMS

Therefore, this part of the report is also concerned with RTMS' relationship to complexity oriented management. Complexity oriented management being based on an organisation functioning to uphold transparency and disregard for hierarchy in communication lines. An organisation functioning in a manner that management provides room for bottom innovation; management allows for organisation solutions to be put forward by lower levels and not limiting this role to top managers who have held it traditionally. Therefore complexity oriented management requires and organisation with an attitude of learning from diverging avenues.

Further, this part of the report is concerned with how RTMS influenced the prevalence of complexity oriented management in MEDA, even though the organisation did not express that this was an incentive for adoption. However, this is based on the assumption that MEDA was not running in line with this type of management and there was a possibility that the MC device could facilitate a change, based on its capacities and also considering emergence in open systems.

However, it was established that prior to RTMS introduction the organisation was operating in line with complexity oriented management. RTMS was embedded in an organisation where open communication was considered part of the organisation culture and reporting hierarchy considered important in certain reporting channel. These channels working simultaneously and the organisations problem solving styles depended on the situation. However, the reality was that RTMS added to these channels and brought with it a new dynamic in the organisation monitoring reporting trajectory, but did not make grand structural changes to the organisation.

4.4.1.1 *Regulated use of an Open Access System*

RTMS was embedded in an organisation which embraced free flowing information, especially internally. In light of this the technology that neutralises reporting hierarchy fitted the mode of operation. Thus it was no surprise that access to the information on the web interface was not restricted in the organisation. Only in the case of the field officers under PTI, who were not actually allowed to log in to the system, but were provided information on request and sent monthly reports. This was not surprising considering these field officers were not directly employed by MEDA, but worked with the organisation based on the MOU with MEDA's partner IDE. Nonetheless it should be considered that they had some form of access to the RTMS, but not directly.

Despite the wide access to the RTMS the use of information or rather the response to this information was regulated. This was due to the conflicting culture that embraced open

communication, but also valued reporting hierarchy and division of labour tied to it. This was how the organisation functioned and RTMS fitted into to this. Hence, top and middle management (country manager TNVS) were of the view that protocols had to be established so that personnel at all organisation levels would not jump the gun with information from the RTMS.

> *"The answer is not to restrict access but put in place protocols to respond to information, access to information requires discipline, respect for roles and responsibilities to retain integrity of different layers of management," Head of Product Market linkages Canada, Skype interview (March, 2012)*

Therefore based on the respect for division of labour RTMS was used for different core purposes by different staff members as it was reflected in the conclusion of section on the adoption incentive of MEDA. Top management was reluctant to respond to issues directly as seen in the system, so despite top management being privy to information from the field they considered any information they saw in the system subject for discussion with country management.

> *"Business development is managed at HQ, but we expect country management to be a part of it. They in turn deal with the day to day programmatic decisions that happen in the field. Advice from the field is channelled upwards in appropriate ways, through the planning process (annual planning) and these plans come up to HQ to inform HQ. We are comfortable with open systems, but we have to be clear that there are defined channels for a reasons," Head Production Market Linkages Canada, Skype interview (March, 2012)*

Furthermore, field officers despite saying they felt free to channel their issue to any level of management based on the respect for the formal reporting mechanism would confine this to limited circumstance and opted to converse with an immediate superior most times.

Therefore, despite the technology having the capacity to neutralise reporting hierarchy to foster direct interaction between top management and field officers; a prerequisite for bottom up innovation, as well as open up wider space for organisation learning, this capacity was limited.

On the other hand, there was a direct link fostered by the system between organisation levels. The system created a link between the field and management, by passing M&E, but as earlier stated top management somewhat excluded themselves from this link. This is because this level of the organisation was of the view that middle management was in charge of responding to the day to day issues coming from the field and doing this required up to date information on the key indicator voucher performance, the information on RTMS. However, this direct link was limited to providing information from the field and not facilitating interaction with field officer, so open communication lines where not fostered through the system.

Additionally, before concluding that the by-pass of M&E contradicted the organisation respect for reporting layers it should be added that the RTMS only served to give *on-the-minute* quantitative information on voucher performance for day to day responsiveness. It filled in an information gap in the organisation multiple reporting and problem solving trajectories that altogether reflected complexity oriented management. The formal reporting channel still requiring M&E to produce

comprehensive-structured information by incorporating figures from RTMS, querying the figures to collect qualitative information and incorporate information on other indicators and all from field officers in a monthly report. The report being solid served the purpose of meeting donor reporting requirements and showing project progress in a systematic manner. Further in relation to emergency and emergent issues, RTMS was used in line with the informal reporting trajectory and in these situations there was room for the system to be used without regulation.

However, it should be put forward that the description of RTMS use is a snapshot and new dynamics in the future could come into play in to modify it. That is the organisation may explore new opportunities for the technology through serendipity, a new employee or through feedback in their next planning meeting. However, at the time of the research the use of the technology with regard to complexity oriented management was to enhance the structures already in existence which already fostered this type of management.

4.4.1.2 *Design Limitations in Facilitating Connectivity and Learning*

Another issue with regard to the use of the system in relation to complexity oriented management is the design of RTMS. The technology was limited in the sense that it did not create linkage between top and bottom management. The technology did not actually capture the thoughts of field officers, but recorded transactions made in the field to the effect of voucher issuance and redemption. RTMS allowed for presentation of figures and only served to provide a window to the field not provide a connection to field officers. The language of the systems is numerical and therefore it had no channels to solicit recommendations or respond to them. This situation was not useful for discursive purposes.

Therefore the technology provided information versus facilitating interaction for the purpose of learning in the organisation. This pointing to the underutilisation of the technologies capacities, where the organisation defined the extent to which these capacities were taken advantage of.

Further despite RTMS being limited in providing connectivity this should not be looked at as a bad thing considering the organisation had other reporting trajectories that allowed for learning and inclusive planning. Therefore, the need for duplication of these foray was not apparent. Additionally, there could have been no need to duplicate the fora based on the effectiveness of interpersonal communication in bi-weekly and annual planning meetings which facilitated links across the organisation levels.

4.4.1.3 *Conclusion*

In this case the contradiction of the technology innovation and the intervention innovation could be understood in terms of MEDA having different ways of solving problems. It applied top down, bottom up solutions and interplay of the two depending on the situation.

Further RTMS only responded to a gap in the wider reporting trajectory. Thus a middle management actor with a listening ear developed a design with inherent knowledge of the needs of staff.

Figure 15- Monitoring Reporting and Problem Solving Trajectories

	RTMS	FORMAL	INFORMAL	PERIODIC
Purpose	To provide a picture of the ground for day to day responsiveness	To provide solid information to define next steps and delegate actions for these next step effectively	To respond to emergency issues with immediacy	For long term planning and organisational learning
Type of information	Voucher performance (quantitative)	Structured, organised and comprehensive (quantitative and qualitative)	Piece meal (verbal and email)	Deeper insight on issues on the ground (verbal)
	Contextual information			
Reporting lines	Direct channels of reporting from the field to top and middle management, as well as wider staff	Reports are built on following reporting hierarchy and division of labour	Direct channels of reporting from the field to top and middle management	Direct channels of reporting from the field to top[13] and middle management, as well as wider staff
Reporting time	Real time	Monthly	Ad-hoc	Annually Bi-weekly
Type of learning to solve problems	The system answers question through interpretation of data and not interaction between staff members or involving negotiations around multiple and alternative views	Suggestions are provided in the report Brainstorming by management to respond to issues put forward No interaction or discussion occur	?	Interactive, involving negotiations around multiple and alternative views

[13] The reference to top management in terms of direct reporting by field officers relates to the annual planning meetings specifically.

Furthermore, this actor left room for response to the design of which only minor modifications were made, but not to the effect of the wider opportunities of RTMS. This is because wider opportunities were covered in other foray, these being the annual and bi weekly planning meetings for which interpersonal and not mediated communication was an advantage.

Thus RTMS fitted into the organisation contradictory culture as such its use was defined by division of labour, even if it was an open access system that could neutralise reporting hierarchy. It was also used for informal reporting purposes in emergency or specific situations where hierarchy was not an issue. The organisation was operating in line with complexity oriented management prior to the introduction of RTMS and RTMS did not enhance this condition, but was designed to fit into a missing reporting trajectory and made to work in the bounds of the way the organisation was already functioning. Above is a table reflecting RTMS's workings in the organisation

4.4.2 RTMS and Improved Performance

As it was put forward earlier one of incentives for RTMS adoption was to provide effective solutions to issues on the ground based on improving the speed of channelling and currency of voucher monitoring information. The reason for the adoption of RTMS was related to organisation performance as this had a bearing on MEDA working better to create linkages between suppliers and potential buyers in the value chains the organisation was operating.

In terms of improving the speed of channelling information and its currency the RTMS design had the capacity to reduce the time lag on reporting issuance and redemption. This is because the figures appeared on the web interface at the time the actual activity was taking place. Whereas before, with the PBVS, there was a lag between actual issuance or redemption and reporting, because field officer counted the number of vouchers issued through secondary sources and verified the figures with the stubs in the used voucher books. In the case of redemptions, vouchers were counted when the retailer returned them to MEDA for the purpose of processing a payment.

This method of tracking voucher performance was not speedy, as calls to collect the information were made monthly and because issuing sites are often widely spread making it difficult for the books to be collected from each of them monthly or with immediacy. Additionally, the work of establishing redemptions was made difficult as retailers hardly submitted vouchers redeemed in real time. This was due to the time taken by them to move vouchers physically to the project office that was dependent on their urgency for re-imbursement and balancing their other commitments as business people.

Furthermore collecting information on verbal basis from issuing sites and retailers was unreliable due to the fact that there was no evidence to back these numbers or it followed much later. From the scenario of the PBVS it was clear that the information collected was not reported on a real time basis, this had implications on supervising field staff, monitoring supplier responsiveness to demand, project planning and decision making. Organisation staff were of the view that RTMS altered this scenario.

''RTMS facilitates direct reporting with immediacy it is better than monthly reporting [.....] This reduces the time taken to respond to issues and it gives a feeling of the ground, this is usually a problem of the project reporting set up,'' Field Officer TNVS, Dar es Salaam (February, 2012)

Additionally the M&E person specifically stated RTMS made his work less time consuming as the RTMS would aggregate information in the reporting section. Therefore, the M&E person for TNVS did not have to wait for multiple calls to be made or deal with multiple emails to put together ''current'' voucher performance information from the field.

"The RTMS increases reporting accuracy and we use the figures to spark further inquiry to collect qualitative information from field officers. Further this reduces the adhoc requests

from for other staff in the organisation" M&E Coordinator TNVS, Dar es Salaam (February, 2012)

4.4.2.1 *Limitations in the Provision of Real Time Information*

Despite these affirmations from the staff that the RTMS collected real time information, which was channelled directly excluding reporting layers and made life easier. There are a number of factors that affect how real time the RTMS could be and therefore how the technology was used. Thus the phrase, "*the RTMS had the capacity to report information on a real time basis to improve the responses to demand and supply issues,*" rings closer to reality in terms of how the technology was used, considering capacity may not be taken advantage of.

Human Factors

During the process of data collection it came to light that in reality for the RTMS to be real time the person issuing or redeeming vouchers had to be real time as well. This may seem like a simplistic issue, but it was nonetheless relevant. The issue being that if a retailer made sales and had all the relevant information to make the transaction so it would reflect on the web interface, but did or could not, then how real time would information on the system be? Meaning real time is not only about the technology, but the people around it having the same attitude.

Lacking this attitude could be based on a number of factors, off hand it could be laziness. On the other hand, it could be factors relating to the user friendliness of the technology, such as the users comfort level with using the mobile phone as a data entry tool or the application. However, in this case there was a general consensus that the RTMS was user friendly and the best way to go.

 *"It was user friendly and we adapted quickly [....] it is based on a phone which we all use and have all the time," Field Officer IDE/PTI, Kabwe (November, 2011)*

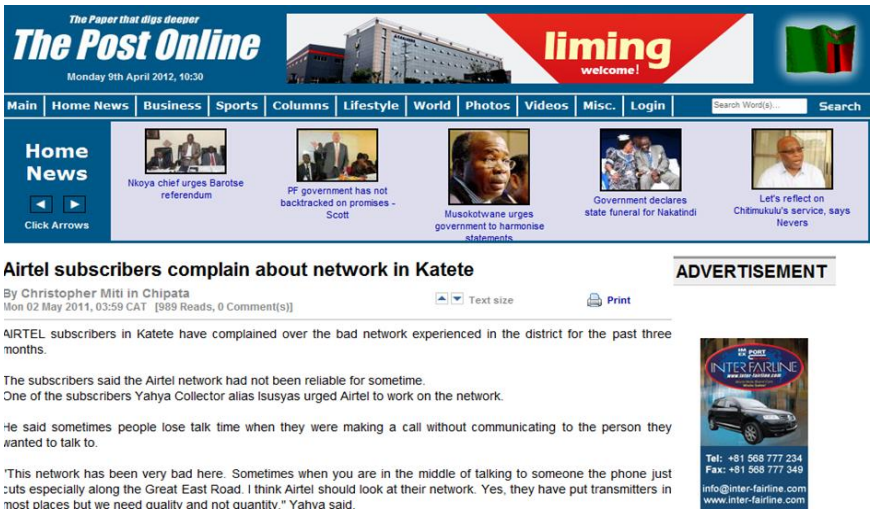
Infrastructure Factors

The other factors that affected how real time the RTMS could be were infrastructure based. During the research it came to light that reach of mobile network coverage and electricity supply in certain areas reduced the efficiency of the system. The reality on the ground was that network coverage of mobile service providers and electricity companies had an impact on the extent RTMS could be applied. Both TNVS and PTI used Airtel to run the RTMS as the provider had the largest market share, coverage and thus was the leading mobile service provider in country. Airtel held 79.3 % and 30% of the market share in Zambia (Habeenzu 2010) and Tanzania (AllAfrica.com 2012a) respectively.

However, despite being the leading mobile provider's it was apparent that the need for network expansion and complaints on the quality of the service were frequent news items in Zambian and

Tanzanian newspapers. The room for network expansion in rural localities, which most projects often aimed to penetrate in Africa, could not be ignored (Habeenzu 2010).

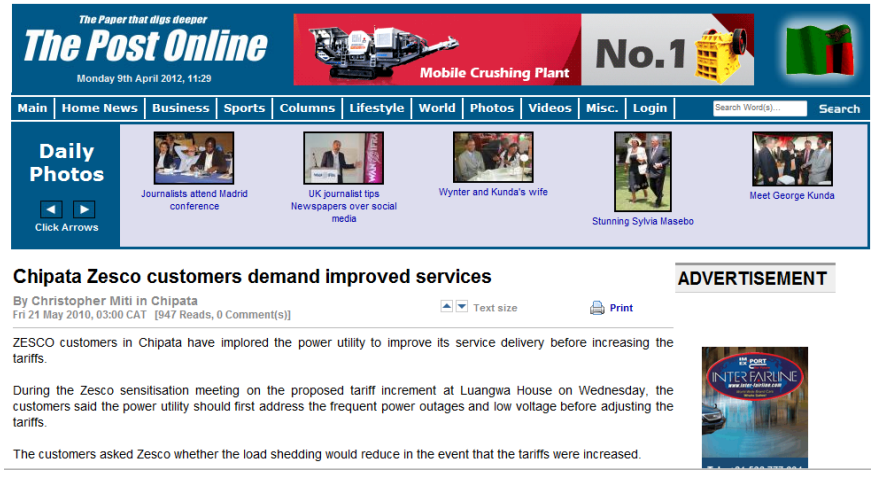
Figure 16 -Complaints over Airtel Zambia Services



Source Post Newspaper Online

In terms of the coverage of electricity supply there was also limited coverage to rural areas where the projects were operating. The calls for rural electrification and improved electricity supply were not new in the media or on the agendas of the Government (Haanyika 2008); (AllAfrica.com 2012b). The Government is explicitly mentioned here considering in both countries the only electricity provider was state owned, in Zambia this being the Zambia Electricity Supply Corporation (ZESCO) and in the latter the Tanzanian Electric Supply Company (TANESCO). Further media reports to the effect of power outages for areas with electricity were no surprise in Zambia.

Figure 17-ZESCO Power Outages



Source Post Newspaper Online

Furthermore, beyond the adhoc power outages the ZECSO website had a planned load shedding timetable to inform the public when they would not have electricity. This was a part of life.

In view of the limited infrastructure in Zambia and Tanzania there were implications on information being channelled through the RTMS on real time basis. Off-hand the limited mobile infrastructure reduced the speed at which message from the application users to the system could be delivered and poor electricity supply meant no issuance or redemption if the user's mobile was not charged.

However, moving from the general implications of the limited infrastructure, with specific regard to network and electricity coverage for PTI and TNVS the implications were firstly that in places where there was no network coverage RTMS could not be applied. For each project this meant different things, for PTI that only used the RTMS to track voucher progress it meant that in places where there was no coverage user (issuers and retailers) would have to hold onto information and perform transactions when they moved into a locality with coverage. In the case of TNVS that had been running on the PBVS for years it was decided that in areas where there was no electricity or mobile coverage the project would continue to apply PBVS.

Additionally, it should not be taken for granted that in areas where there was coverage the RTMS ran smoothly. The issue being that despite service existing in certain areas it was poor, erratic or in the case of Airtel Zambia the network was congested. Due to congestion on the Airtel network delays on the receiving message on RTMS went up to twenty four hours or some did not even go through. These delays and non-responses lead to anxiety on the part of users who were losing phone credit to re-send the messages to the system. Below are exerts from email provided by the former M&E person from PTI. The first, reiterates the congestion issue as a concern raised by the PTI M&E person, the second one is from a voucher issuer;

M&E Person

From: Business Linkages Officer

To: Consultant RTMS Development

CC: MEDA Zambia Country Manager

Subject: RE: Delays on receiving replies 0976685721

Morning,

I think one of the major problems we will have with the system is the delays on replies or them not being sent. The part of delays is not really a shock as even in Zambia on the Celtel (now Airtel) network replies are sometimes slow.

However, for the replies not being sent please refer to messages received from trainer 0976685721 he sent in 72 but has only gotten 17 replies according to the interface. I phoned and he said things have picked up and he has gotten about 42 replies that is has issued 42 vouchers!? However checking the interface I only see 17[.....] 10th March, 2008

Voucher Issuer

From: Field Officer

To: MEDA Zambia Country Manager

Subject: Re: Voucher Issued TODAY/ Kabwe - Munema IC CODE

Greetings,

Thanks for the voucher info and we have also received a few replies. Then as you have advised we are also mindful of the fact that we are supposed to have space in both the text inbox and outbox all the time and that is what we are doing exactly-deleting old messages.

So kindly investigate with your SMS system provider because as I highlighted to the Business linages officer (the M&E person) this morning, we are losing a lot of airtime for non-replies and she advised to keep on resending the same information until the reply reflects on our phone or your system[.....]29th July, 2008

These emails serve as the last example of how the RTMS had the capacity to foster real time information, but the infrastructure available could not support this.

Design Factors

Further there were design factors that limited real time information flows on RTMS. The starting point for the discussion on the design of RTMS is based on the emails in the last section. Due to the expressed delays on information reaching and being sent through the RTMS a technical investigation by the external company overseeing the system was conducted. This was initiated by the Country Manager due to the frustration surrounding RTMS use being directed at the project when in reality the problem was not in any person's control. Nonetheless, what transpired was that the technical investigation of the system yielded positive results.

It was discovered that use of an international SMS route contributed to extraneous delays and not only network provision. Based on this information PTI then opted to use internet routing to send messages to the system, this minimised delays, but not completely as sometimes mobile provider problems still affected the speed at which the RTMS functioned. This remedial SMS route that used the internet required that the mobiles used for the RTMS were compatible with internet. This is a cost related factor to be considered for adoption of RTMS. However, note that this cost was circumvented by TNVS when they used RTMS as they opted for a different issuance and redemption mechanism as mentioned earlier. TNVS decided to fore go a menu based internet based application for an SMS command based method. In this case any phone with an SMS function could be applied.

In summary the point to take home from this section is that these design factors are alternatives for the basis of a decision on how information delays on the RTMS can be reduced within the projects

control. They are to be considered in the design so that the provision of real time information is enhanced.

4.4.2.2 *Limitations in the provision of Contextual Information*

In terms of performance another issue brought out beyond the system producing real time information was that it provided contextual information. Contextual information could be considered quality information by a project as decisions affecting the ground came from information that reflected what was actually pertaining on the ground.

> *"Using RTMS we are to do more higher value work, by eliminating the daily grind of data collection and shortening data collection and cleaning cycles[.....]It gives us an immediate window into program activity that we did not have before; reduces error rates and cuts costs," Head M&E, Canada (May, 2012)*

Design Factors

Despite the M&E head and field operatives expressing that the RTMS could reflect the situation on the ground, in reality there were limitations on the information the system provided. The RTMS only provided quantitative data. This voucher specific data was reported accurately and the manner in which it was reported did reduce delays to some extent. However, this information was not comprehensive, but only contextual with regard to voucher performance indicators. RTMS was limited to voucher centred indicators such as distribution, redemption, the number of retailers participating and not on, for instance, technology quality or supplier investment in developing presence in the rural areas where the project was working to develop linkages (network expansion).Therefore as a monitoring reporting tool the RTMS did not stand alone. Thus information on the web interface information often sparked questions for investigation or requiring an explanation. An example would be a big gap in voucher issuance and redemption in a certain location sparking questions on retailer's presence or product quality in the area.

The information to answer these questions was often captured through verbal informal reports from field officers, especially in the case of PTI where the field officers were not obliged to report to MEDA, but also through a comprehensive monthly report compiled by the M&E person. The idea of comprehensive reporting in this case was that the report contained quantitative and qualitative information, it also covered a wider range of project indicators to track project progress.

Basically, the RTMS was limited in the information it provided as in only provided contextual information on voucher related indicators. Meaning it could not stand alone as a monitoring tool. This was also reflection on how the technology did not have the human face to raise questions and bring wider insight on issues in the field. To do this still required the expertise of the M&E person and field officers, because the technology knows no process. However, it should be put forward that beyond the limits of the design, for information to be contextual there is a requirement for honesty from actors developing reports. Though no evidence on the extent to which reporting was honest is

provided, one thing that was certain is that the system was not able to collect information based on observation or discussion.

The Added value of Reporting Layers

It was established from the research that reporting layers added value to reporting and the distortion of data in the hierarchy of reporting required further investigation in an organisation where management expressed that contextual information from the field was valued. Therefore despite the capacity of RTMS to neutralise the reporting hierarchy for direct reporting this insight countered the necessity of this to collect contextual information.

4.4.2.3 *Conclusion*

The chapter outlines that despite the capacity of the RTMS to foster real time information and contextual information, to feed into MEDA responding to demand and supply side issues effectively, there were factors limiting this capacity.

The factors include the technology design, limited infrastructure support, the requirement that users are also real time and that reporting layers added value to reporting.

Lastly, that RTMS lacked the human element that was sometimes advantageous over a hi-tech mechanism to perform certain functions such as observation and discussion to collect wider insight on issues in the field.

4.4.3 Cost Implications of RTMS

The implications on cost of introducing RTMS were another aspect of interest for the research with regard to organisation efficiency. As stated earlier if an organisation can find a better way of conducting the same activity, with less or the same financial effort, this serves as motivation to forego the status quo. Thus introduction of technology such as RTMS could be an alternative solution for collecting monitoring information worth investment.

In terms of collecting information on savings that RTMS could foster the focus of inquiry was TNVS. This strategic choice was made due to the fact that despite both projects falling under MEDA they were in different settings with firstly different economic climates. One was in Zambia, the other in Tanzania. One of the issues connected to the different climates was that the weakness of the supply side varied for the projects. Meaning for instance their investments in monitoring activities to determine supplier responsive (redemptions) were not standardised. The lack of standard investment also tied to another fact that the projects had different budgets and further cost centres for expenditure. The reasons behind the variation in budgets was, because TNVS that had been running for more than two years, unlike PTI which had closed, dealing in mosquito nets in the most rural areas, covering wider space and distances.

In a nutshell the projects were too different to compare. Even on the basis of one running with RTMS (PTI) and the other without based on input and output on monitoring activities. Further where TNVS had only run with the technology for a few months. The next option was then to narrow the data collection to a comparisons of expenditures made on TNVS by month in the financial year before RTMS was introduced and the year of the pilot. This exercise provided some indication on cost savings as discussed by the Finance Manager, but it should be mentioned that this comparison had limitations. One was that the technology was only used for a few months, in limited localities, to really determine whether in real terms savings had been made and secondly that a major factor that led to reduced expenditures on the project in the 2011 financial year (f-yr) was the reduction in donor funding.

"We experienced a reduction in funding and had to reduce our workforce and our motor vehicle fleet. We also had to find an innovative way to cut down on the voucher distribution costs a large part of our spending," Finance Manager TNVS, Dar es Salaam (February, 2012)

Figure 18-Budget Financial year 2008-2010 TNVS

Inflation factor = 5%	Year 1 - 12 Months	Year 2 - 12 Months	Year 3 - 12 Months	TOTAL - 36 Months
Program Implementation				5%
Salaries, benefits and allowances	$ 642,670	$ 674,804	$ 708,544	$ 2,026,018
Office Expenses	$ 67,427	$ 70,799	$ 74,339	$ 212,565
International Travel	$ 31,260	$ 32,823	$ 34,464	$ 98,547
Local Travel and field costs	$ 281,202	$ 295,262	$ 310,025	$ 886,488
Minor Equipment Purchases	$ 11,000	$ 11,550	$ 12,128	$ 34,678
Contracted Services	$ 36,360	$ 38,178	$ 40,087	$ 114,625
Vehicle Operations	$ 122,160	$ 128,268	$ 134,681	$ 385,109
Other program costs	$ 50,000	$ 50,000	$ 50,000	$ 150,000
Sub-Total Program Implementation:	**$ 1,242,079**	**$ 1,301,683**	**$ 1,364,267**	**$ 3,908,030**
Indirect Costs	**$ 250,900**	**$ 262,940**	**$ 275,582**	**$ 789,422**
New Initiatives for "keep-up" (ie. Community voucher including Indirect)		$ -		$ -
Sub-Total New Initiatives:	**$ -**	**$ -**	**$ -**	**$ -**
Capital Equipment	$ 7,000	$ 7,350	$ -	$ 14,350
Sub-Total Capita Equipment:	**$ 7,000**	**$ 7,350**	**$ -**	**$ 14,350**
Commodity costs (Redemption and Voucher Printing	**$ 3,624,088**	**$ 5,645,146**	**$ 7,324,114**	**$ 16,593,349**
TOTAL PROGRAM COSTS:	**$ 5,124,068**	**$ 7,217,119**	**$ 8,963,964**	**$ 21,305,151**

Source MEDA

Figure 19-Budget Financial year 2011 TNVS

USAID Tanzania UC 621-A-00-10-00005-00		11/11/2011
Year 3 Work Plan Summary Budget		
		TOTAL Year 3 before Supplementary Budget
Program Implementation		
Salaries, benefits and allowances	$	639,854
Office Expenses	$	73,255
International Travel	$	31,260
Local Travel and field costs	$	506,044
Minor Equipment Purchases	$	29,144
Contracted Services	$	196,226
Vehicle Operations	$	171,917
Other program costs	$	81,244
Sub-Total Program Implementation:	**$**	**1,728,943**
Indirect Costs	**$**	**349,246**
Capital Equipment	**$**	**17,900**
Commodity costs	**$**	**4,730,232**
TOTAL PROGRAM COSTS:		**6,826,321**

Regards,

Moses Mokua-MBA, CPA.
Finance Manager:
MEDA Economic Development Associates_Tanzania.
Mobile: **+255 787 444 280;** Skpe: **moses.mokua**

Source MEDA

Another issue with regard to the limited data was the inability to isolate monitoring related activities based on costing centres in the budgets for TNVS. This is because monitoring activities were not always conducted intentionally, nor by M&E staff alone, nor specified and thus were often lumped under general cost centres such as travel, operational or communication costs. Despite this limitation an attempt was made to isolate cost centres such as these to conduct a comparison of expenditures between the f-yrs 2010 and 2011 to see any declines/rises in spending from the period that the RTMS was piloted. Beyond the limitations in the case TNVS was the best focus for the extraction of useful quantitative information.

4.4.3.1 *Communication Costs*

Communication expenditures were considered in the data collection, because they related to monitoring activities such as telephone calls. Calls were made through the project lines and mobile credit was provided to staff to discuss project related issues. These issues included anything from ad-hoc requests for status of activities on the ground, to immediate directives from supervisor, to finance requesting retirements on an impress made on travel. Thus the communication cost centre was very wide and even included the line item internet services. The line item internet services was also of interest to the research as the monthly expenditure to "maintain" RTMS a communication based service would fall under this cost centre in future, but more because this item had the capacity to inflate expenditure on the communication cost centre, even if savings were noted on other cost centres such as field travel. Field travel also being related to data collection for monitoring information.

However, at the time of the research it was discovered that MEDA headquarters was managing all payments as the technology was still at the development stage, the pilot stage. This was meant to change after December, 2011 when the project would foot the bill of maintenance. With this crucial aspect of costs related to the RTMS not being available, from TNVS' financial records the explanation for the lower expenditures between f-yr 2010 and 2011 was that monitoring calls had declined on the project.

Note the f-yr for TNVS began in July and ended in June the following year. In regard to this data collected on communication expenditures (other cost centres) was collected in full for the 2010 f-yr, but only until December, 2011 for the 2011 f-yr, which was affected by the introduction of RTMS. This was because, data collection was conducted at the end of January and the beginning of February 2011 and the reports considered in the analysis were the only ones available to compare the f-yrs.

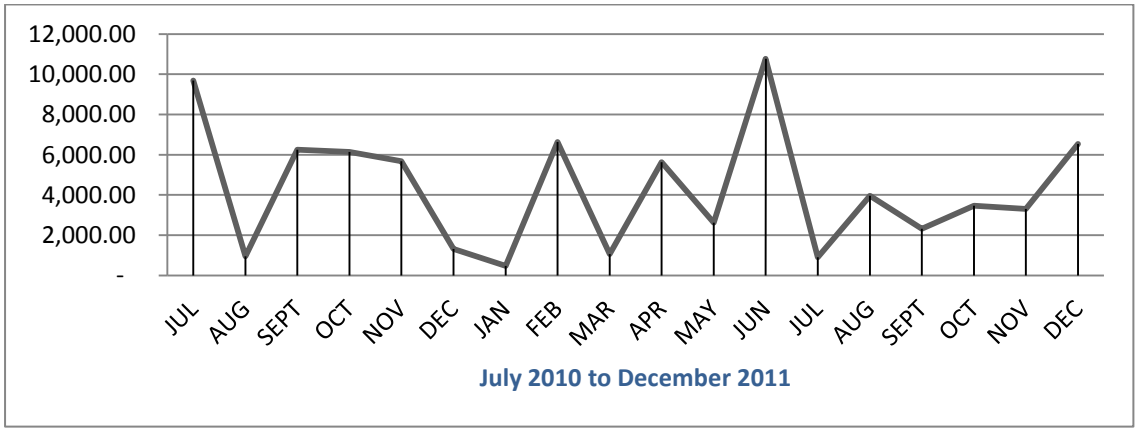
Nonetheless, according to the comparison of expenditures on communication TNVS in the first six month of the f-yr 2011 was running on $1,000 less per month than in the previous f-yr (2010). Further between the sum of expenditure on communication at the middle of the f-yr 2010 and 2011 there was a difference of close to $10,000. Basically, from July to December, 2011 even though RTMS was only piloted in September there were indications that the project had spent less on communication than they had the previous year during the same period.

Figure 20-Average and Sum, Communication Costs

Period	Monthly Average USD	Sum USD
2010 (Jan-Dec)	4,766.08	57,193.00
2010 (Jul-Dec)	5,001.17	30,007.00
2011 (Jul-Dec)	3,414.33	20,486.00

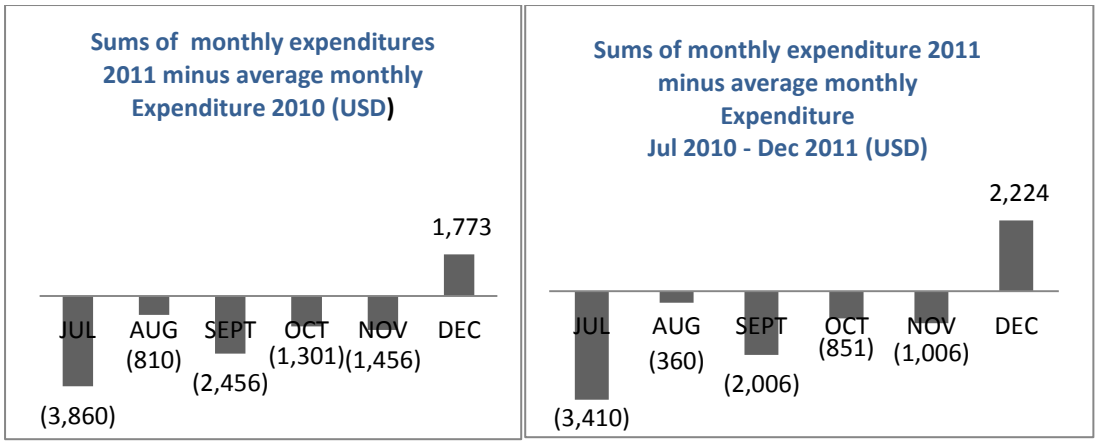
However, in terms of the general trend from July 2010 it was difficult to see a clear reduction in expenditure. In this case a consideration that should be made is that in financial management there are instances when payments are delayed. For instance, if credit allowance is usually paid at the end of each month and due to unforeseen circumstances is paid one day late (the first of the next month) this can off-set figures for the month it should be paid and the month it was actually paid. This would be very noticeable if expenditures are uniform each month.

Figure 21- General Trend, Communication Costs



As such averages provided a clearer picture of monthly expenditures on TNVS. The graphs below are based on averages.

Figure 22-Difference Sums of Monthly Expenditure (2011) and Average Monthly Expenditure (2010)[14], Communication Costs



They showed that all monthly expenditure on communication, except that for December 2011, in the f-yr 2011 was below the average monthly expenditure for the first six months and the whole f-yr of 2010. Therefore in general communications costs had reduced on the project.

4.4.3.2 *Travel and Operation Costs*

Further this cost centre was considered in data collection as it includes staff per-diems, which are allowances given to any TNVS staff going out into the field (in country) to work. This cost centre therefore included monitoring activities, such as missions to collect voucher books or in other cases chase after voucher for redemptions and general see what was happening in the field beyond voucher performance. However, these first two activities which are referred as relating to voucher performance were not done in isolation. Sometimes one person would go out and collect books, as well as distributed them and follow up retailer stocking issues, these activities hardly being monitoring activities alone.

As much as the travel cost centre proved difficult in isolating monitoring activities, so did the one closely related to it, operation costs. This cost centre was focused on fuel for vehicles and it was difficult to determine which trip carried which people and how much fuel was allocated to monitoring activities strictly or specifically non voucher monitoring activities (qualitative indicators). Nonetheless, amidst this difficulty it was still necessary to collect some indicative information for on an expenditure comparison between the f-yrs. This being necessary because, the cost centres of travel and per diems were affected by monitoring activities and since RTMS gave a picture as to what was pertaining on the ground. This translating into fewer requirements for physical presence of staff and therefore less travel to the field for monitoring purposes reduced. At least this was the

[14] This graph was developed by calculating the sums on monthly expenditure for f-yr 2011 and the subtracting the average monthly expenditure f-yr 2010/ Jul 2010 to Dec2011 from each of them. Therefore, if the bar is below the line the expenditure for that month in f-yr 2011 is less than the average monthly expenditure f-yr 2010/ Jul 2010 to Dec 2011.

view of the Head M&E (Canada) and Project M&E Coordinator and was supported by the evidence below;

Figure 23-Average and Sum, Travel and Operation Costs

Travel costs (per diems)			Operation costs (fuel costs)		
Period	**Average USD**	**Sum USD**	**Period**	**Average USD**	**Sum USD**
2010 (Jan-Dec)	38,803.67	465,644.00	**2010 (Jan-Dec)**	14,315.58	171,787.00
2010 (Jul-Dec)	32,161.83	192,971.00	**2010 (Jul-Dec)**	12,463.67	74,782.00
2011 (Jul-Dec)	13,890.00	83,340.00	**2011 (Jul-Dec)**	6,044.17	36,265.00

Based on the table the average monthly expenditure on per diems in f-yr 2011 was almost 25% of the average for the previous year. Whereas for fuel costs the monthly average expenditure in the f-yr 2011 was at 42% of the monthly average expenditures of the f-yr 2010. The reduction in costs was worth note, in both cases, as the percentages were less than 50% of the monthly average for the f-yr 2010.

However, it is difficult to completely validate the figures considering the project has very erratic field visit schedule, even beyond the difficulties of isolating which activities on theses cost centres where monitoring related. Thus establishing a general trend was difficult for travel and operations cost centres. *Refer to the figures 24 and 25 below respectively;*

Figure 24-General Trend Monthly Expenditure, Travel Costs

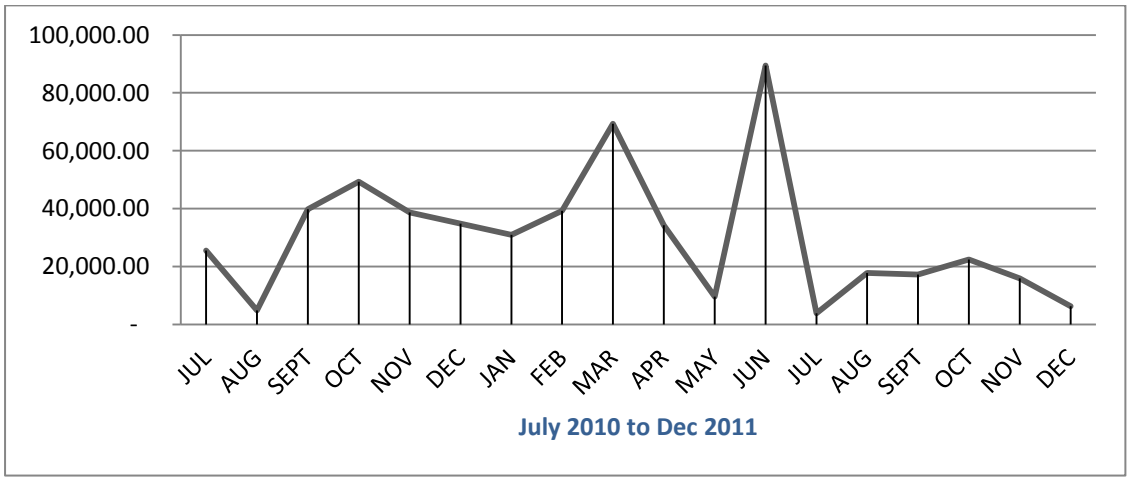
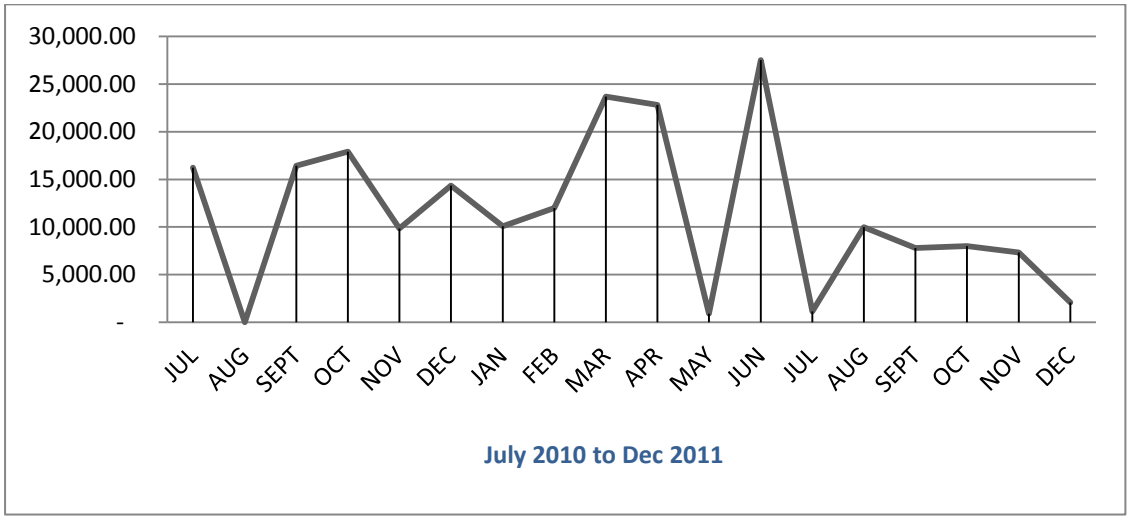


Figure 25- General Trend Monthly Expenditure, Operations Costs



Though from the next set of figures one thing that stood out was that for the months of July to December 2011 the total monthly expenditures made by the project were all substantially less than the average expenditure for the first six months and the whole f-yr of 2010. That is based on the graphs below.

Figure 26- Difference Sums of Monthly Expenditure (2011) and Average Monthly Expenditure (2010), Travel Costs

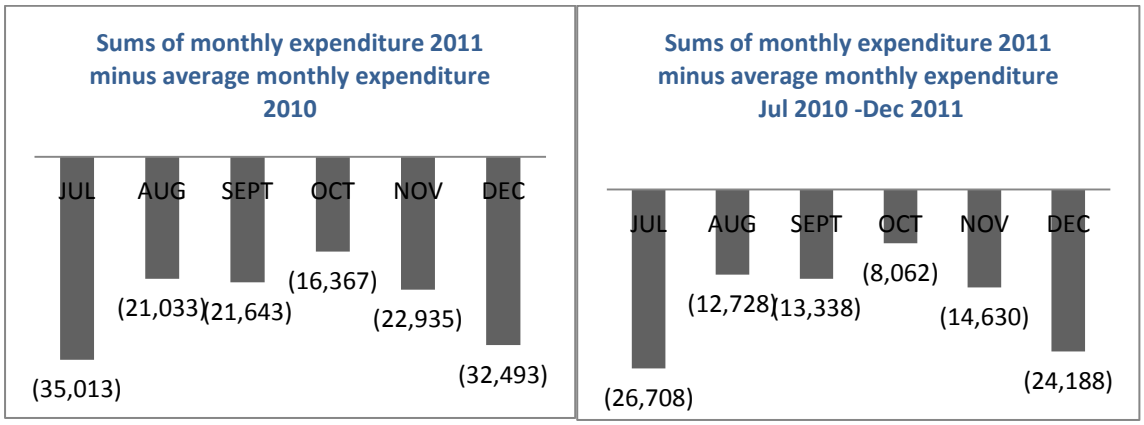
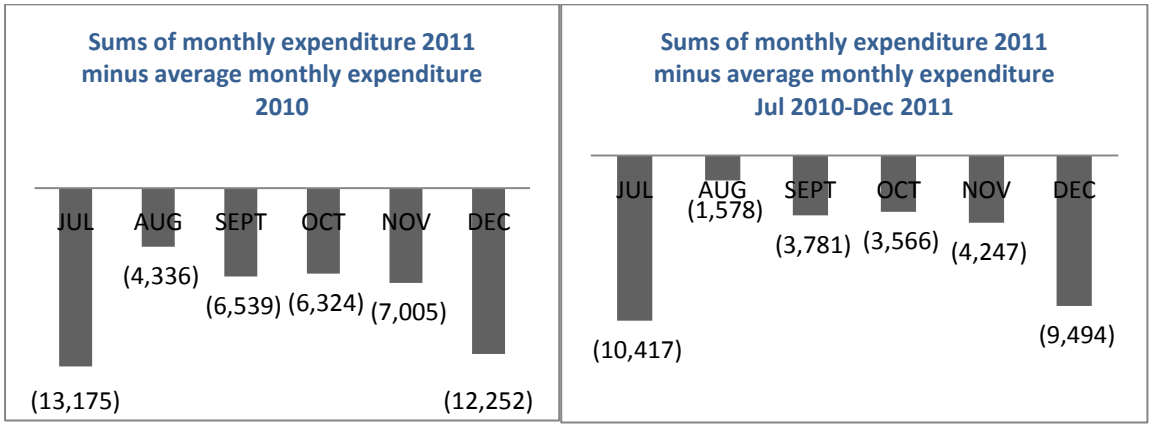


Figure 27- Difference Sums of Monthly Expenditure (2011) and Average Monthly Expenditure (2010), Operations Costs



On the other hand, these figures on travel and even those on communication cost could have been affected by the reduction in staff of TNVS which was effected in July 2011, when the project's budget was cut by donors. That is less fuel and communication costs were being incurred as the project had less staff and fewer vehicles.

4.4.3.3 *Personnel Costs*

As stated earlier external factors such as budget cuts had an impact on the reduced expenditure. The personnel were reduced by half according to the Finance Manager, however, when considering the aspects of inflation and temporal employment of persons under the project such as data collectors for an evaluation, the actual personnel costs (including allowances) were not cut by 50%. Thus the general trend for total monthly expenditure on personnel was quite erratic, but, also showed a notable drop after July, 2011.

Figure 28-General Trend Monthly Expenditure, Personnel Costs

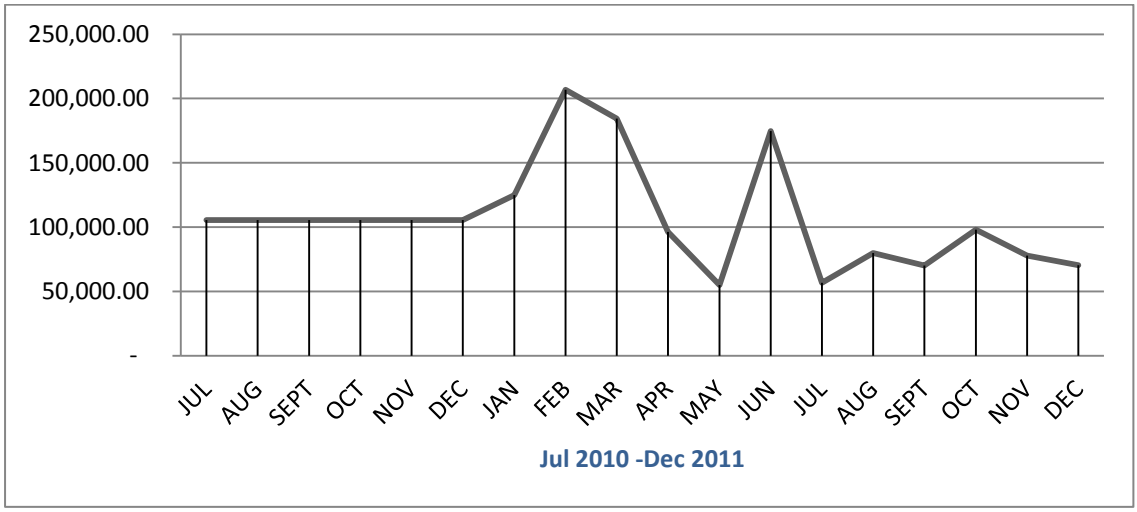


Figure 29 -Average and Sum, Personnel Costs

Period	Monthly Average USD	Sum USD
2010 (Jan-Dec)	122, 879	1,474,548.00
2010 (Jul-Dec)	105, 458.00	632,748.00
2011 (Jul-Dec)	75, 478	452,868.00

Based on calculations using the monthly averages above the real cuts in personnel expenditure were established. In reality the project spent 39% less on personnel per month of the first six months of the 2011 f-yr than in the previous year. Additionally, in terms of the identical period of July to December in both f-yrs the project spent 28% less in the 2011 f-yr.

Calculation based on the average monthly Expenditure 2010 f-yr

$$39\% = \frac{122{,}879\ (\text{Av } 2010\ \text{fyr}) - 75{,}478(\text{Av Jul} - \text{Dec } 2011\ \text{fyr})}{122{,}879\ (\text{Av } 2010\ \text{fyr})} \times 100$$

Calculation based on the average monthly Expenditure Jul-Dec 2010

$$28\% = \frac{105{,}458\ (Av\ Jul - Dec\ 2010\ fyr) - 75478(Av\ Jul - Dec\ 2011\ fyr)}{105{,}458\ (\text{Av Jul} - \text{Dec } 2010\ \text{fyr})} \times 100$$

Nonetheless, despite the evidence of the drop in personnel cost, the bigger issue was whether those involved in monitoring were fewer in number, but based on applying RTMS the project could cover the same geographical area as before. That is looking at whether monitoring activities with less staff and using RTMS is cost effective. This, however, a topic for further investigation due to the limitations of the setup of MEDA's financial structures and that the technology was in use for a short period.

4.4.3.4 *Conclusion*

RTMS' implication on costs was that the project experienced lower expenditures on cost centres that were related to monitoring activities. These cost centres being communication, travel and operations. For each of the six months that the project had been operating with RTMS in the 2011 financial year expenditures was less than the average monthly expenditure of the same cost centre in the previous financial year. However, no general downward trend between the years could be established for each costing centre.

Further putting into consideration that there were the limitations of the data based on the difficulties of defining a suitable comparative, timeframe and a financial system that clearly outlines inputs and outputs related to monitoring activities the data basically provides implications on cost. However, there is room for further research to be conducted on the cost effectiveness of the technology using a robust experimental design. This design could be based on a comparison of two similar projects over a substantial period of time, in the same vicinity with the same monitoring targets and financial backing.

5 DISCUSSION

This section endeavours to give commentary of the methods applied in the research and the implications of the findings on other scholarly work. That is by bringing out key issue that surfaced from the findings that question assumptions, contradict or refine theory. Therefore through the commentary opportunities for learning and future research will inadvertently be put forward.

The major topics that will be discussed after the reflection on methods include in the interplay of technology capacities, intended uses and actual use. Further the role of (proxy) designers in demand articulation for innovation, RTMS' limitations as the single fix for complexity oriented management, the role of bureaucracy in complexity oriented management and the importance of interpersonal interaction in organisation.

5.1 Reflection on Methods

The starting point of the discussion is the underlying assumption of the study upon which the problem statement was based. The statement problematized the use of reporting hierarchy in monitoring and problems solving activities in organisations. These thoughts were partly founded on the researchers experience with the organisation as a former employee under PTI and theory. However, based on insight from the research these thoughts were later found to be simplistic. Simplistic in the sense that organisations can apply different means to acquire feedback and solve problems depending on the situation, where in certain situations reporting layers are useful.

The insight was gained partly through triangulating sources interpretations. These sources were at different locations, levels and had different roles in the organisation or were former employees. Additionally in regard to the interview process the researcher being a former employee also had advantages. This was especially in relation to understanding the organisation structure, building rapport with and gaining trust of interviewees. Though some interviewees responded in interviews in a manner that expressed the researcher was asking questions they already have answers too

Beyond interviews, observation was applied within the organisation to triangulate this with interpretations of sources. Triangulation of sources and methods was therefore applied to reach a consolidated "truth" (internal validity). It was through this "truth" that the researcher was made aware of their limited understanding of the organisation they had worked for and further their idealism of bottom up innovation, which has its own shortcomings. Furthermore, based on triangulating sources and methods (Interviews, observation and content analysis) the research provided evidence on the functioning of RTMS in MEDA without imposing external meaning or preconceived ideas of it.

However, there were limitations in observing the organisation. Firstly the fact that PTI was closed made it impossible for observation to occur at that site, secondly the limited time frame under the master's programme and for which the researcher was at TNVS were other contributing factors. The researcher was only at TNVS for less than a month due to delays in gaining access to the site, this made it difficult to establish the full picture of relationships in the organisation. Lastly the lack of physical contact with staff at MEDA headquarters, due to financial constraints and no opportunity to experience, for instance, a planning meeting where a representative of headquarters was present,

further limited the researcher's full experience of the organisation through observation. Nonetheless, this being said a lot of insight was still gained through interviews and content analysis, though issues such as power dynamics could have been elaborated better through wider opportunities for observation. Preferably as a participant or having participants at all levels of the organisation feeding into the research, considering power struggles and resistance to change around identities are not easily expressed through interviews due to fear that the information may get into the wrong hands.

Further the research being a case study makes it just that, therefore external validity in the statistical sense is limited. Though beyond the statistical perspective replication of theory developed from the research can foster external validity. Nonetheless, insight on the workings of RTMS is provided, as well as insight on the current wave of management thought in the development sector.

However, in terms of the technology cutting costs only indicative information could be provided to the effect that the cost centres that related to monitoring activities showed drops in expenditure with regard to the average monthly expenditure for the previous financial year (2010). Further indicative information could only be provided due to the limited comparative and time frame to define the impacts of the system on costs from a before and after scenario. Furthermore the limits of the financial systems in clearly defining costs related to monitoring activities in terms of input and output also had a bearing on the type of information collected on cost implications. Therefore this being a limitation of the research there is room for more research to establish the cost effectiveness of the RTMS, through a robust experimental design, despite MEDA staff stating introducing the technology was a major cost reduction strategy.

In addition to borrow from the conceptual framework another limitation of the research was that despite, there being strong understanding that technology is not static, the research provided a screen shot of what was happening to the technology during the period of data collection. Therefore the findings of the research should be taken as screen shot to learn from and a realisation made that RTMS in the same organisation could be used in a different manner two years from now.

Further based on the conceptual framework sensitivity to complexity was taken into account during the research to avoid falling into to the trap of only focusing on why the technology did not achieve the advanced capacities of RTMS as an MC device nor intentions of MEDA. That is to avoid glorifying these capacities, intentions and progressiveness of technology. As such in MEDA's case focusing on understanding how the technology was developed, used and why this was so in the context. Therefore, what emerged from the findings was that the relationship of technology and organisation is far from simple.

5.2 Interplay of Technology Capacity, Intended Uses and Actual Outcomes

Therefore the findings provide evidence that the interactions of technologies (beyond their capacities) with their designers, users, infrastructure and institutions to reach a final use are multifaceted.

At the first stage of technology design in this case organisational choice (Williams, 1996) plays a major role in defining the design based on the organisations intended outcomes of RTMS versus its

capacities (Gomez, 1997; Pepper, 1995; Robbins, 1999). MEDA's incentives for adoption excluded complexity oriented management and included issues such as managing voucher liability and controlling fraud. Further at this stage of design a middle management actor was a key, wearing the boots of a user sensitive to other users demand, even donors and controlling the design to prevent goal displacement. This scenario contradicting the concept of mutuality (Scarbrough, 1992) that fore goes reigns in innovation and requires an adaptive social process for technology to be useful (adoption).

Then another glimpse of complexity came in when according to mutuality (Scarbrough, 1992) technology shapes organisation and vice versa, but in this case co-evolution did not reflect completely, because despite the technology bringing in a new reporting dynamic organisation choice resurfaced to panel beat the technology towards the organisations intended use. Though it should be put forward that the study being a screen shot could have limited insight on the evolutionary path of the technology.

Nonetheless, the concept of organisation choice reflected in the case as the RTMS ended up filling in an information gap in the multiple reporting trajectories, where the sum of the trajectories reflected complexity oriented management. This brings into perspective another issue that the capacity of the technology was being under-utilised in enhancing complexity oriented management, despite being an open access system. This situation further reflecting on the limits of the MC device to change structural relationships (Pepper, 1995; Stone, 2010). Therefore pointing to a conclusion that social factors have more to do with how a technology will be used.

Then again beyond projecting social factors as the major determinants of technology use another dynamic that came into play to limit the use of the technology, based on the organisation incentives of adoption, was infrastructure (Mante-Meijer, 2011). A lack of infrastructure support affected how real time the system was for the organisation. So beyond organisation choice other factors stepped in to limit the use of the technology to the organisation desired outcomes and underutilise its capacities as an MC device.

Nonetheless, despite this complicated scenario what can be said to back up theory with certainty is that technology determinism is limited in explaining the full functioning of a technology when it is exposed to multiple social agents in context (Scarbrough, 1992; Williams, 1996). Further that Orlikowski (2006) concept that technology materiality should not be limited to determinism or only referring to the social factors, but that the inherent capacities of technologies interact with other factors for their actual use to be determined, is closest to reality.

5.3 The Role of (Proxy) Designers in Demand Articulation for Innovation

To return to MEDA's intended uses of the MC device, it should be put forward that they were of interest to different organisation staff from different angles. They even satisfied donor requirements such as fraud control and managing voucher liability, these issues reflecting in the core incentives for adoption by management. This scenario reflects the concept of a boundary object making insight from Star (1989) relevant to the case.

Nonetheless, what is more important about these variegated needs is the process of innovation that led to a product that co-opted all of them. Considering in this case the technology was designed by a middle management actor, the proxy designer, who managed to include latent demand from other sectors of the organisation in the blue print. In this case the design is called a blue print as the initial and the final design of the technology were the same.

This scenario, where the designer inherently articulates demand and the technology is static contradicts the concept of mutuality (Scarbrough, 1992; Stewart, 2008; Hoes, 2011) that puts forward strong requirements for user-producer interaction and the negotiations of contradictory needs around a design to facilitate its shape shifting until it reaches one that is useful to all the actors.

Therefore, the insight from this case is that top-down innovation (in a broader sense) may produce desirable results likened to those of an interactive and adaptive process of technology development. This paradoxical relationship surfacing if the designer is a user themselves, is well connected to other users, can therefore listen in social situations to detect latent demand and uses this insight to perform a cognitive user-producer interaction.

On the other hand, it should be put forward that this situation is plausible in an organisation such as MEDA, because RTMS served the internal processes of a development project, where firstly actors are in constant dialogue, such that demand can be articulated by a proxy (designer). Secondly, unlike a mobile phone company driven to meet demand in the global market, projects have less room to experiment in innovation for fear of goal displacement based on policy constraints.

5.4 RTMS Limitation as 'THEE' Fix for Complexity Oriented Management

To return to the assumptions of the research one issue that requires attention is that RTMS had the capacity to foster complexity oriented management. It was put forward that this could be by the organisations intent (Williams, 1996) or as an outcome of interactions between the organisation and the technology (Scarbrough, 1992). However, what emerged from the findings is that the organisation was already operating in line with complexity oriented management. This was the culture of the organisation.

Based on the description of the culture above there is evidence that MEDA was operating in line with complexity oriented management. This scenario then questions Burnes (2005) scepticism of applying complexity theories in management principles. This is because MEDA actually was operating on the edge of chaos.

Nonetheless, what is more important is to express the limitations of RTMS in facilitating complexity oriented management. In this case based on the findings that complexity oriented management can exist without RTMS the edge of chaos is given more clarity. This is because, when Burnes (2005) puts forward that the edge of chaos requires '*alternative interaction patterns in communication trajectories'*, the idea of '*alternative'* should not be limited to a singular technology fix. That is RTMS is not the single fix required to facilitate complexity oriented management, but there other ways in which this can be achieved. The *'alternative interaction patterns in communication trajectories'* in

this case reflecting in MEDA's multiple reporting and problem solving trajectories of which RTMS was only one.

Furthermore, in terms of Smircich (1983) reflections that defining a culture is much easier than cultivating one, another issue comes out. This is that prior to the introduction of RTMS the organisation was already operating in line with complexity oriented management. The question then is how was this cultivated?

5.5 Bureaucracy and Complexity Oriented Management

Moving to another issue, based on the findings of the research what emerged was that hierarchy in a development organisation setting is not only required to prevent chaos with any member of staff performing any function (Sayer, 2000), but this hierarchy is based on a certain knowledge or experience tied to and qualifying people to a certain positions in the division of labour. Therefore reporting layers serve to add value to reports and decision making processes. The importance of upholding these bureaucratic principles reflected in the organisations formal reporting trajectory and had implications on the use of RTMS. This placed RTMS in a situation where its capacity as an open access system and that of neutralising hierarchy were not taken advantage of. This was because information from the system was naturally regulated by division of labour; therefore the system did not bring much connectivity between levels in the organisation.

This condition also brings more clarity to the concept of the edge of chaos (Burnes, 2005). The insight from the case being that the concept does not demonise bureaucratic principles of division of labour favouring an organisation, which operates solely on flexible terms with only bottom up innovation. This is despite this statement contradicting (Robbins, 1999) thoughts that technology advancements and shifts to empowering employees renders specialisation and the chain of command less relevant or bureaucracy's tense relationship with informal organisation and democracy (Garston, 1993). What was established, however, is that on the contrary these principles of bureaucracy are very relevant to keep balance in an organisation and facilitate complexity oriented management. The balance serving the purpose of continually creating space for emergence and continually feeding this new information into planning to avoid goal displacement. So that an organisation can be in the state of stability and change at the same time, where ignoring the structure of bureaucracy is falling over the edge of chaos, a dangerous place for an organisation to be.

In addition the reality is that the organisations, such as MEDA, have goals tied to donor funding. This leaves less room for extreme exploration of alternative solutions (even bottom up innovation) as management has to keep these goals in mind sometimes to the point of turning down good alternatives to solving problems. These policy constraints are the realities of donor funded projects; donors want to see what they paid for.

Nonetheless this does not reduce Funtowicz (1993) views that the inclusion of more actors in innovation does not bring about wider alternatives to choose from or form synergies to solve problems better, but to realise that in a development organisation setting reporting hierarchy is important for specific reasons. An elaboration of this is that for instance, a research organisation

mandated to collect information for its sake with a large budget, unlike a development organisation, can open up as much as possible to get farmers views on technology advancement.

5.6 The Importance of Interpersonal Communication in Organisation

The last issue for discussion in this section delves further in to the variation of anticipated and actual technology uses. This builds on Dant's (1999) and Alexander's (2008) weariness in glorifying technology and its capacities. The first based on the role of social actors shaping them, considering technology is an extension of human desires and the latter by considering that old systems can work as efficiently as new systems.

These views are consolidated in this case because, despite the wider opportunities for RTMS as a MC device existing the technology was under-utilised based on organisation choice and further the design (Williams 1996). RTMS could have facilitated formation of bridging capital by linking levels in the organisation, learning or even solicited alternatives views from the '*bottom*', if the design was more interactive. However, the technology only filled in a quantitative information gap and these aspects were facilitated through other means. Which it should be mentioned worked even if they were not hi-tech mechanisms.

Furthermore, what is important to note here is that these findings brought attention to the concept of connectors being dynamic personalities who form bridging capital (Gladwell, 2000) to reflect on the limits of technology in undertaking certain activities. Meaning the research refines the concept to emphasise that interpersonal communication versus mediated communication is necessary in activities that have goals of learning and negotiating. The findings that point to this are the use of face to face interaction, despite technology advancements, in planning meetings which were the major learning and negotiating foray of MEDA.

6 CONCLUSION

The starting point of the research was that RTMS, as an MC device, had the inherent capacities to facilitate structural changes in an organisation to open up space for more inclusive intervention innovation to solve the complex problems of under development. That is through neutralising the reporting hierarchy to create open communication lines and therefore facilitate social learning and bottom up innovation. However, this condition was not facilitated by the technology. The reality was the organisation was already operating in this manner and in fact balancing this with bureaucratic principles to operate in line with complexity oriented management. RTMS only served to fill an information gap in the organisation and was one of the multiple reporting and problem solving trajectories in the confines of complexity oriented management.

In addition based on the organisation running in line with complexity oriented management it was established that the those in power did not place any barriers on use of the system to facilitate democracy. That is the use of power by managers to protect their identities and the positions of power they enjoyed was brought down to a conspiracy theory. Instead the scenario was that; in order to safeguard the organisation identity, all levels of staff had a role to play in setting natural barriers and enablers for use of RTMS in line with complexity oriented management. For instance using the according to division of labour, but then again using it to respond to issues disregarding reporting hierarchy.

Further in line with RTMS providing quality information, by neutralising the reporting hierarchy to prevent information decontextualisation (through distortion and aggregation), it was established that the reporting hierarchy added value to reports instead. Furthermore it was established that RTMS only provided contextual information to a certain extent and therefore was not a standalone reporting tool as qualitative information and that concerning other indicators (beyond numeric voucher information) was still channelled through the monthly reports that followed the reporting hierarchy. This leading to the conclusion that distortion of data through the hierarchy to paint a rosy picture is a conspiracy theory considering management valued contextual information on all its reporting trajectories. Secondly that the aggregation of information does not necessarily decontextualise it and lastly the system was limited in providing contextual information.

Furthermore, the other capacity put forward for RTMS as a MC device was that in could facilitate faster and real time communication to further impact on the organisation response to issues. The technology did reduce on desk delays or rather the time taken in reporting, but this was limited to voucher performance information, whilst comprehensive information was provided in the monthly report that moved from desk to desk through the reporting hierarchy. Further in line with the technology being real time it was so within reasons as the mobile service infrastructure played a role in slowing down the system.

Lastly in regard to the capacity of the RTMS to be a cost effective method of conducting monitoring activities, though indications of saving on communication and field travel were established as mentioned earlier this assertion requires further investigation.

In the final analysis based on this overview of the capacities and actual workings of the technology the take home point is that the capacities of technology are not the only factors that determine their

how they will be used. The reality is this that their use (fullness) is a culmination of ideas of how people want to use them, further how those who are involved in the development process respond to demand (latent or solicited) and model the design to meet these needs, as well as enabling and constraining factors of the organisation and wider environment technologies are embedded. Therefore, RTMS did have the capacity to facilitate or enhance complexity oriented management, provide real time and contextual information, but this was within limits of the organisations culture, blue print of the technology, donor requirements and the availability of supporting infrastructure.

Additionally the process of technology development was top down with an actor from middle management at the centre of the process as the (proxy) designer. The initial design of the technology was not very different from the final design of the technology. Despite the process not being adaptive or involving negotiations around the design of the technology the results were favourable in that it met the needs of the different types of staff and they expresses satisfaction with the design. This leads to a conclusion that a top down innovation can lead to the same results as an adaptive process. This is in smaller organisation where dialogue is intimate, in which the technology serves internal processes and in the case that the (proxy) designer is a user as well. This is because these factors enable the (proxy) designer to tap into latent demand as the actor has inherent knowledge of the needs of the staff.

Another important issue is that the analysis of organisation requires sensitivity to complexity. This is because the organisation required multiple communication and problem solving trajectories to resolve different kinds of issues. This was the case for MEDA which had a channel to respond to emergent issues and another to collect comprehensive information through value addition by actors in the reporting hierarchy. The others included foray for dialogue, learning and negotiation of solutions in which reporting hierarchy was not essential and the last was RTMS which was used to provide up to the minute coverage of happenings on the ground. These activities run simultaneously showing that, for instance, bottom innovation or even technology is limited as a single apparatus to enhance organisation efficiency.

What is more is that whether these multiple trajectories are facilitated by technology or more traditional systems is immaterial. This is because the “old” systems may work just as well as new systems. Therefore this leads to the point that full bureaucracy or full flexibility and completely computerising or conducting all activities interpersonally is limited in enhancing organisation efficiency. Synergies are therefore required as all systems have their pros and cons. Thus there are organisational activities in our hi-tech modern society that still require human interaction, for which technology cannot compete. Furthermore, classical concepts such as bureaucracy are still fundamental in organisation to keep order and prevent goal displacement. The characteristics of bureaucracy also serve as a check for idolising bottom up innovation and complete flexibility as the epitome of organisation. This is because this democratic scenario gives way to a sea of solutions of which a person with some form of skills is strategically required to define a way forward. In connection to this since what should also be considered is that authority cannot be shared there is always someone accountable and they make the final decision.

All in all the insight from the case reflects on emergence in open systems. This is from two angles firstly that the inherent capacities of technologies do not define their use (fullness,) but their

interaction with processes in their context. Secondly, that development organisations, such as MEDA, cope with their dynamic environment by having multiple reporting and problems solving trajectories. These trajectories use synergies of old and new systems and space is provided in them to respond to emergent issues and then filtered into planning to prevent goal displacement.

7 RECOMMENDATIONS

7.1 Action Points MEDA

The insight from the research has implications on the problem statement. This is because the organisation was operating in line with complexity oriented management and reporting hierarchy was only applied in one of MEDA's feedback and problem solving trajectories. Therefore remedial action should be applied on another problem emerging from the research and that is the underutilisation of the MC device. The organisation could therefore take advantage of the wider opportunities of the technology based on modifying the design to be more interactive and facilitate non-numeric forms of information sharing, as well as adding a qualitative reporting aspect relating to more indicators.

Another remedial action would be for the organisation to conduct research on the cost effectiveness of the technology. That is based on clearly defining and tracking activities relating to monitoring costs in comparative sites. These sites should have the same budget, conditions, but one should be a control group for the purpose of internal validity.

7.2 Research Opportunities

There is an opportunity for research in relation to the assumptions that RTMS could affect the structural relationships of organisation. This is because RTMS did not facilitate organisation change to the ends of complexity management. Based on this scenario a question that surfaces is how was complexity oriented management cultivated in MEDA? The answer to this would be of interest to scholars who have an interest in application of complexity theories in management.

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ANNEXES

Annex 1-Interview/Observation Guide

	Interview/Observation Guide	
	Incentives for adoption 1. What was the purpose of the RTMS when it was being designed? (relate to aspects of OE) 2. What were the factors influencing the initial design?	
	Technology Innovation Process 1. Who was involved in designing the technology? 2. Why were these actors involved in the design? 3. Who was the (proxy) designer? 4. What did the final design look like? 5. Was the final design different from the initial design?	
	Organisation Culture 1. What does the structure of the organisation look like? 2. What does the current feedback/monitoring system look like beyond the RTMS? 3. Is there commitment to the hierarchy in reporting? 4. How are decision made in the organisation? 5. Why are decisions made in this way? 6. To what extent do field operatives get involved in developing intervention strategies? 7. Why do field operatives want to be (not) involved in developing intervention strategies? 8. Why do field operatives think they should be (not) involved in developing intervention strategies? 9. Why do top managers want field operatives involved developing intervention strategies? 10. Why don't top managers want field operatives involved developing intervention strategies? 11. What are middle managers views of how development intervention strategies should be developed? 12. What are the reasons behind middle managers views of how development intervention strategies should be developed?	
	Factors influencing adoption of technology 1. Why is adoption of the technology an improvement on how the organisation functions? 2. Is the infrastructure available to support the application? 3. What infrastructure is required to support the application? 4. Why is the infrastructure required to support the application lacking? 5. What skills are required to successfully use the application? 6. Are the skills required to successfully use the application available? 7. Is the application user friendly? 8. Why is the application user friendly? 9. Are field operatives willing to use the application? 10. Why are field operatives willing to use the application? 11. What are the (dis) advantages of adopting the application?	

	12. Is it cost effective to apply the application in comparison to the preceding methods? 13. How can the technology be improved with regard to technical aspects?	
	Technology adaptation and actual use 1. How was the technology adoption (innovation) process? (open or top-down) 2. How was the technology developed? (static or dynamic) 3. Who was involved in the technology development process? 4. Why were these actors involved in the technology development process? 5. How was the final product design negotiated (arrived at)? 6. What are the limitations of the technology design? 7. What are the possibilities/benefits of the technology design? 8. How is the technology being used with regard to the organisation incentives for adoption? 9. How is the technology used in regard to aspects of organisation efficiency? 10. To what extent are the technologies capacities taken advantage of? 11. Which aspects of organisation efficiency were achieved intentionally? 12. Which aspects of organisation efficiency were achieved unintentionally? 13. What are the emergent uses of RTMS beyond its capacities (organisation efficiency as operationalized) 14. What conditions enabled the aspects of organisation efficiency achieved to be achieved? 15. How did the organisation culture/power influence achieving outcomes with regard to organisation efficiency?	

Annex 2-Prosperity through Innovation Log Frame

March 21, 2010 PROSPERITY THROUGH INNOVATION PROJECT-PROGRESS SUMMARY

IMPACT				
RESULTS	PERFORMANCE INDICATORS	PERFORMANCE TARGETS	PROGRESS	COMMENTS/NEXT STEPS
Reduced poverty amongst hard to reach rural women and men in Zambia who participate in more secure, equitable and prosperous markets and communities	increase in incomes for women and men	**Income demonstrates an increase of 10%**		
	Improved quality of life indicators , standard of living indicators (proxy indicators) including change in assets; consumption; and vulnerability: exposure to and the capacity to manage risk.	**Improved ratings by targeted farmers on their standard of living**		
OUTCOMES				
RESULTS	PERFORMANCE INDICATORS	PERFORMANCE TARGETS	PROGRESS	COMMENTS/NEXT STEPS
Suppliers and retailers are strong, efficient, innovative and growing and reach many previously underserved rural communities effectively and sustainably with reliable and consistent support for growing their enterprises	Target smallholder farmers reached by suppliers and retailers	**Ten (10) suppliers and retailers reaching target smallholder farmers**		
Suppliers and retailers meet the needs of the rural, previously underserved communities with a robust supply chain offering a range of appropriate products and services using innovative delivery models	Appropriate agricultural technology products offered to women and men in the targeted communities;	**3000 technology products and other services i .e retail network expansion, spares)developed in targeted communities**		
	Clients satisfied with products and services	**60% of clients surveyed express a level of satisfaction**		

Source MEDA

March 21, 2010 PROSPERITY THROUGH INNOVATION PROJECT-PROGRESS SUMMARY

Supply chain stakeholders demonstrate sustained local capacity to design and deliver products and services in an environmentally responsible and gender sensitive manner	Suppliers and retailers aware of gender sensitive and environmentally sound business practices	**Training provided to ten (10) suppliers and retailers.**		
Learning applied in the design of replicable models	At least 2 replicable models designed	**Documentation of lessons learnt and replicable models**		
Increased awareness of and responsiveness to development issues in Zambia by target Canadians	Level of awareness and engagement of targeted Canadians	**Documentation and dissemination of lessons learned made available**		
OUTPUTS				
RESULTS	PERFORMANCE INDICATORS	PERFORMANCE TARGETS	PROGRESS	COMMENTS/NEXT STEPS
Completed analysis describes the key issues in the supply and demand side of water technologies in the project region	Analysis document with key supply and demand issues	**Survey reports**		
Needs assessments show partner capacity building requirements	Needs assessment document with findings	**Benchmarking profiles on inventory, sales & marketing strategies of participating suppliers/retailer** **Training modules developed based on Benchmarking profiles**		
Partner businesses exhibit increased operational efficiencies through increased sales and capacity to serve farmers in the technology supply chain	Suppliers and retailers trained (sex disaggregated) participating in supply chain;	**Ten (10) trained suppliers and retailers (sex disaggregated) participating in supply chain.**		

March 21, 2010 PROSPERITY THROUGH INNOVATION PROJECT-PROGRESS SUMMARY

	Increase in sales for businesses	**20% increase in sales for businesses In measurement**		
Businesses actively participate in growing supply chain for water technologies through innovative technology delivery mechanism	**Appropriate, low-cost water and other agricultural technologies available and being utilized;**	**Two(2) types of appropriate, low-cost water and other agricultural technologies available; 12,000 vouchers are issued with a redemption rate of 30% (sex disaggregated 30% female) utilizing technology acquisition schemes**		
Suppliers and retailers are sensitized to benefit of, increase their capacity to apply and promote sensitive business practice	Businesses that have participated in gender sensitivity training; records of training	**Ten (10) businesses have participated in gender sensitivity training**		
Partners are sensitized to benefits of, and increase their capacity to apply, promote and communicate sound environmental practices	Businesses that have participated in environmental training; records of training	Businesses that have participated in environmental training; records of training		
Project learning are consolidated and disseminated by MEDA in external publications, conference presentations, training material, electronic	# of publications, conference presentations, other media material, quality of material produced; level of knowledge of constituents	**Dissemination of information to wider public**		

Source MEDA

Annex 3-RTMS Site Map

1

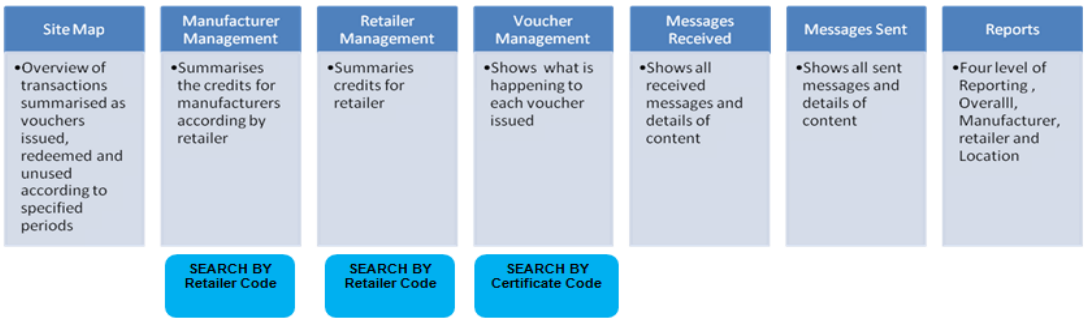
MEDA INNOVATION FUND- ZAMBIA
SMS Application on the Discount Voucher System[1]

Description

The SMS Application will work on a MENU system whether either placed on a SKT Sim card or handset. All the transactions and information passing through the SMS facility automatically updates a web interface. The web interface provides information in real time and therefore an excellent monitoring tool.

Web interface

The web interface has the following key menu

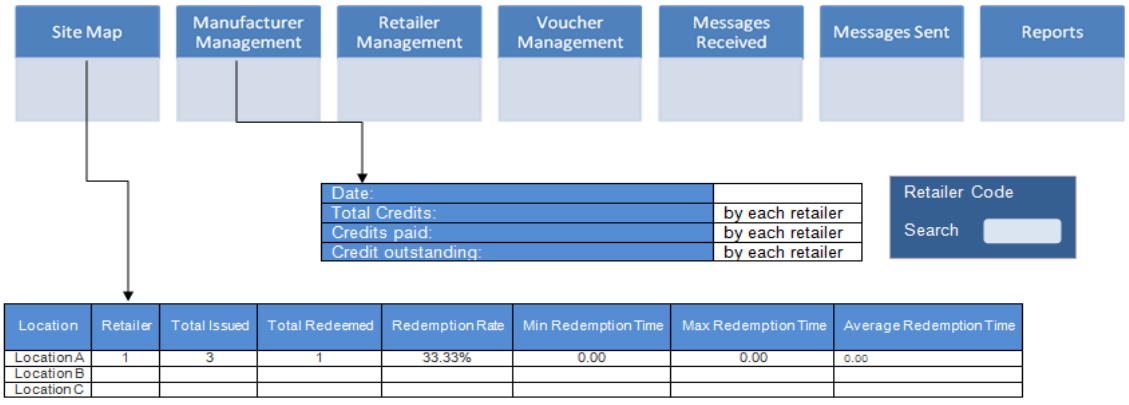


[1] This document is based on work achieved with SELCOM in Tanzania

2

The web interface details including search functionality will be as follows:

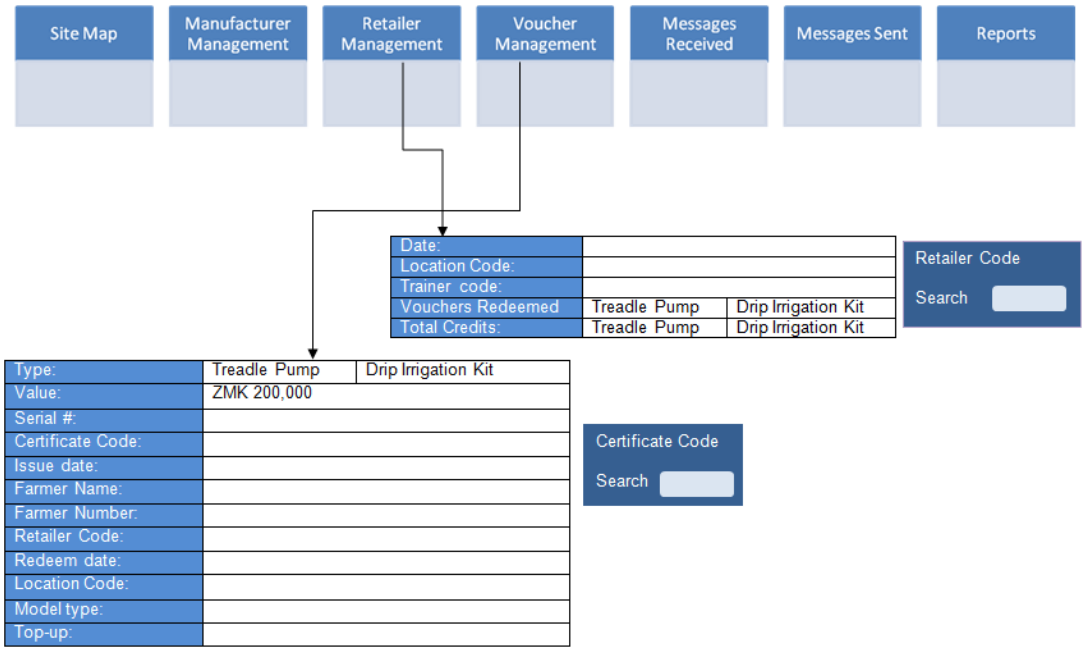
1. Site Map and Manufacturer Management



Location	Retailer	Total Issued	Total Redeemed	Redemption Rate	Min Redemption Time	Max Redemption Time	Average Redemption Time
Location A	1	3	1	33.33%	0.00	0.00	0.00
Location B							
Location C							

5

2. Retailer Management and Voucher Management



4

3. Reports

Four (4) reporting levels also categorized by type of irrigation model

Treadle Pump / Model **Drip Irrigation Kit / Model**

Overall
Location
Manufacturer
Retailer

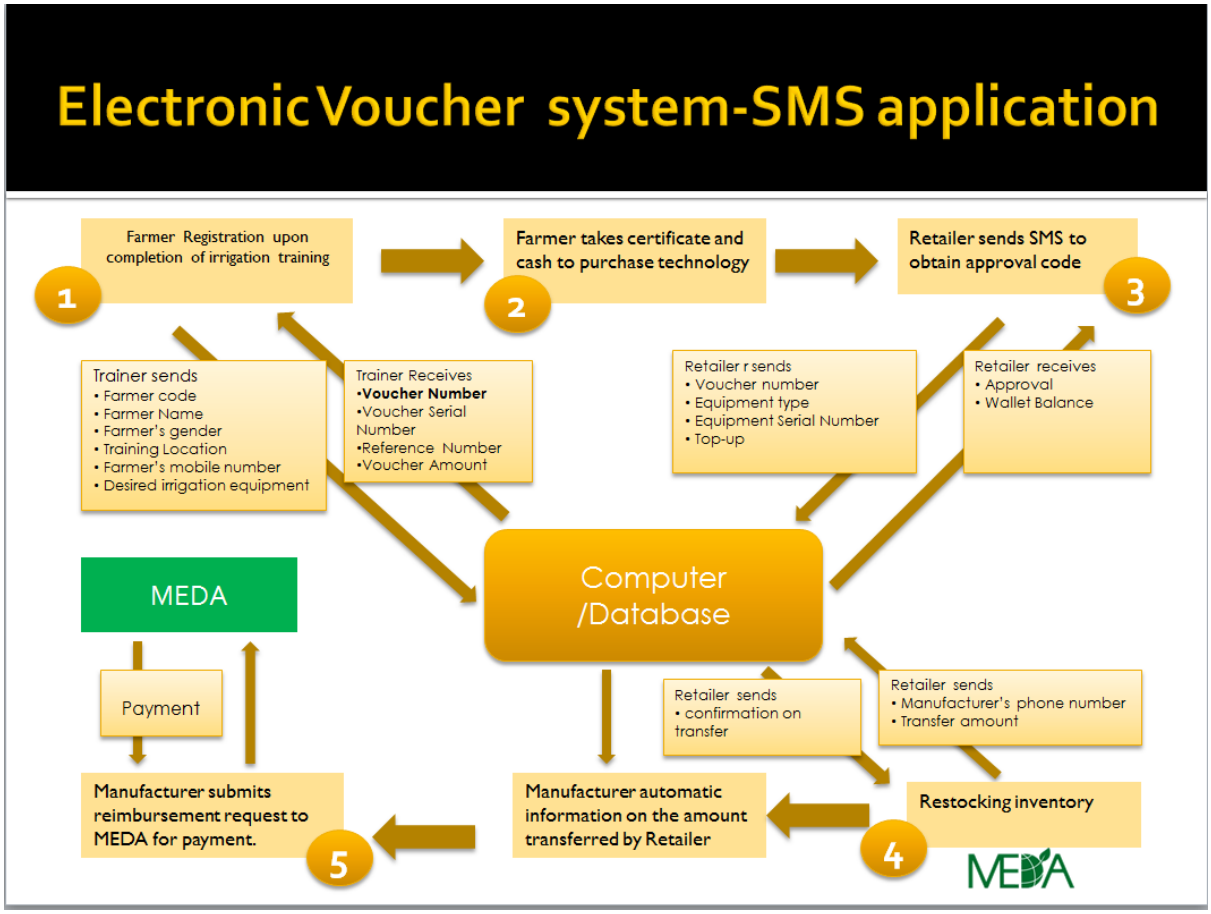
Sample report- Retailer

Retailer	Total Issued	Total Redeemed	Redemption Rate	Min Redemption Time	Max Redemption Time	Average Redemption Time
Name 1	3	1	33.33%	0.00	0.00	0.00
Name 2	7	6	85.71%	0.00	9.00	2.67

Notes:

- One of the main additions to initial design is that the retailer will be required to also send the top up amount. This will be a feature on the SMS MENU. This will be a good monitoring feature; to determine how much smallholder farmers are topping up by retailer as well as location
- Sub categorization will not be done for the initial design (as we agreed), but provision will be made for the future.

Annex 4 -Functioning of RTMS'



Source MEDA

mHealth Initiatives at MEDA Tanzania

Data Collection and Supply Chain Management Tools for the Tanzania National Voucher Scheme (TNVS)

MEDA Tanzania is currently working on the implementation of the following mobile technology projects.

1) Data Collection

To support data collection in the Tanzania National Voucher Scheme (TNVS), MEDA developed a java application specific for the Blackberry platform. The application houses a series of forms, used by the bed net supplier, for retailer sign up, net delivery reports, and gathering GPS data. Each time a form is filled, the results are sent via SMS to MIS database. Note: This application is customized to Blackberry devices to meet requirements of net supplier.

2) Inventory orders via SMS

To enable insight into the retail chain demand, MEDA will enable net orders to be sent to the supplier via SMS. Participating TNVS retailers can do so by entering their identification number, the number of nets being ordered, and their current stock level in an SMS. The orders are centralized and accessible through the MIS.

3) Web-based Management Information System (MIS)

All TNVS data – inputted by the net supplier, MEDA staff, and retailers – will be centralized in a web-based MIS. Stakeholders each have unique access levels and reports based on their role in the program. The bed net supplier can plan delivery routes based on the SMS orders they receive. MEDA Regional Managers can monitor retailer inventory levels and delivery activity in their districts. The platform is built using open-source code (RapidSMS framework).

4) Future Initiatives – The TNVS e-voucher

As the next progressive step for the TNVS, MEDA is currently moving towards the gradual introduction of mobile phone technologies into the voucher issuing and redemption activities in the TNVS cycle. The e-voucher will allow the program to activate a voucher upon issuance to beneficiary at RCH clinic level and to further validate the voucher at retail shop before the net is issued. The initiative is expected to address current program challenges such as timely voucher redemption, lack of real-time data, liability of unredeemed vouchers, and voucher theft and fraud.

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