Technological Change in Primary Healthcare

by

RYNO WUBBELING

25033973

Submitted in partial fulfillment of the requirements for the degree of

BACHELORS OF INDUSTRIAL ENGINEERING

In the

FACULTY OF ENGINEERING, BUILT-ENVIRONMENT AND INFORMATION TECHNOLOGY

UNIVERSITY OF PRETORIA

OCTOBER 2010

Executive Summary

Throughout the world, new technologies are constantly being developed. Organisations need to stay ahead of their competitors. Part of that means keeping abreast with the latest technological developments. Problems often occur that hinder the successful diffusion of new technology into the workplace. The study will show the reason for this to be a lack of a common framework which organisations can use to ensure successful implementation.

It will be shown that failed technological diffusion is a major problem in the Healthcare Industry. The aim of the project is the creation of a generic Roadmap of Implementation which Primary Healthcare facilities will be able to use for the successful diffusion of new technologies.

Chapter 1 of this Project will give a background to the environment in which this project will be undertaken. A Literature Review is also included in Chapter 2 which will delve deeper into the problems inherent to Technology Diffusion and also explore the tools that will be used to solve this problem.

In the third chapter the roadmap will be explained in a logical, sequential manner. Chapter 4 uses the tools developed in the previous chapter to implement new technology at healthcare facilities. It also serves as the project validation phase.

The successful completion of the Roadmap of Implementation will have a tangible, positive impact on Primary Public Healthcare in this country as it will allow faster and more successful technology diffusion to an industry which desperately needs it.

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List of Acronyms

CM: Change Management

PM: Project Management

RoI: Roadmap of Implementation

PH: Primary Healthcare

PHF: Primary Healthcare Facility

TeLL: Tshwane e-Health Living Lab

DP: Digital Pen Technology

BPR: Business Process Reengineering

Chapter 1: Introduction and Background

1.1 Technology in the Workplace

Every day, new technologies are being developed all over the world. The problem facing many organisations is how to go about successfully introducing these technologies. Their failure is often the result of not realising that this implementation is a multi-disciplinary problem requiring knowledge of Change Management, Project Management, and Business Reengineering (Fisher 1998). These failures are especially well documented in the healthcare industry (Leyland, Hunter and Dietrich 2009).

This project, under the leadership of Venture Solutions, will seek to address these issues in the form of a Roadmap of Implementation (RoI) for technology. The Roadmap will limit its focus to the field of Primary Healthcare (PH) and address all issues relevant to the successful incorporation of new technology into a PH environment.

The use of the RoI will then be illustrated by employing it to generate a business case for the introduction of Digital Pen Technology to Primary Healthcare Facilities in South Africa.

The rest of the report contains the following: The remainder of Chapter 1 gives more background information concerning Venture Solutions and the environment in which this project will be undertaken. The detailed Project Aim and Scope are also included in Chapter 1. The next chapter contains a Literature Review, it delves deeper into the problems, theories, and possible techniques to be used in solving the project problem.

The third chapter spells out the proposed framework and Chapter 4 is used to illustrate the Roadmap's function. The report concludes with a bibliography and appendix.

1.2 Venture Solutions

1.2.1 Who they are

Venture Solutions is an innovation management and commercialisation consultancy. Its focus is on developing high-tech start-ups and assisting innovation support entities and corporations in the development of innovation policy, processes, and alignment with external stakeholders.

Know-how and methodologies target issues pertaining to the commercialisation of new technologies, leveraging intellectual assets for business profits, and structuring start-up businesses for sustainable growth. This last component involves the positioning of enterprises for external funding and raising outside investment.

1.2.2 The Tshwane E-Health Living Lab

1.2.2.1 The Current Situation

South Africa has a major healthcare problem where only 18% of the national population has access to industry standard private health and wellbeing services. The majority of the population has to make use of a healthcare system that is vastly understaffed with limited access to standard tools, methodologies, technologies and solutions required to provide basic healthcare services. This problem is greatly exacerbated through the fact that the population is spread over all four corners of the country.

In parallel, SA has not faired well in addressing the opportunities embedded in telemedicine and point-of-care technologies. The primary reason for this as per findings in a report to FinPro Life Sciences (Lamprecht n.d.), is that most activities in this sector are limited to research and proof of concept stages only, not progressing towards becoming sustainable and growing solutions to the sector.

The reasons for this being that the parties involved are not adequately positioned, informed and equipped to take their respective concepts through the required formal clinical trialling and approval processes.

For research and proof of concept projects to graduate to fully fledged solutions successfully used by the various players within the health sector, a nurturing environment is required where high-tech SMEs, research institutions, and industry partners can collaborate with direct access to patients.

This environment should be used to develop solutions, products, and services which speak to the immediate and unique needs of the target-market, but which does so in a clinically tested, medically safe and assured fashion in alignment with local, provincial, and national health budgets and finance. (Mars and Seebregts 2008)

1.2.2.2 What a Living Lab is

A Living Lab is both a methodology for User Driven Innovation (UDI) and the organizations that primarily use it. A Living Lab is about experimentation and co-creation with real users in real life environments, where users together with researchers, firms and public institutions look together for new solutions, new products, new services or new business models.

Living Labs are also about societal involvement, about promoting innovation in a societal basis, involving academia, SMEs, public institutions and large companies in an Open Innovation process that happens in real environments and has an immediate impact. This is how Living Labs aim to contribute to a new Innovation System where users and citizens become active actors and not only passive receivers. (ENOLL 2009)

1.2.2.3 A vision for the future

To put in place the required platform for collaboration, Venture Solutions, in conjunction with The Innovation Hub, initiated a new project to focus on the development of the Tshwane eHealth Living Lab (TeLL).

Here SME's, research and academic institutions, and industry partners can collaborate in a Living Lab to develop and rapidly implement products, services, and solutions to address the current challenges facing healthcare service delivery. Figure 1 illustrates TeLL's current areas of focus.

Figure 1: TeLL areas of focus (Lamprecht n.d.)

The Living Lab is based on the primary patient information systems provided by the start-up SME partner GeoMED, a South African biomedicine and engineering company with clinical experience and approval. This platform is to be leveraged to bring onboard additional role-players, researchers and stakeholders.

It is envisaged that the research, collaboration and development focus will be on:

- Developing solutions to improve the efficacy of service delivery at current points of care i.e. within the clinic; and
- Identifying opportunities and required solutions to improve service delivery through moving from a point of care to a home base care approach.

The TeLL will act as a collaborative innovation platform in the City of Tshwane whereby Rural and Peri-Urban Clinics for Public Health are supported through innovation so as to enhance service delivery and bring needed access to latest products and services impacting on healthcare to the people of South Africa.

The TeLL collaborative platform is initially to be developed and replicated at six such clinics in the City of Tshwane. The clinics will collectively form a Living Lab environment where different role-players are brought together to develop, trial and implement innovations (processes, technologies, systems, training, and people management). Figure 2 is an illustration of where TeLL fits in.

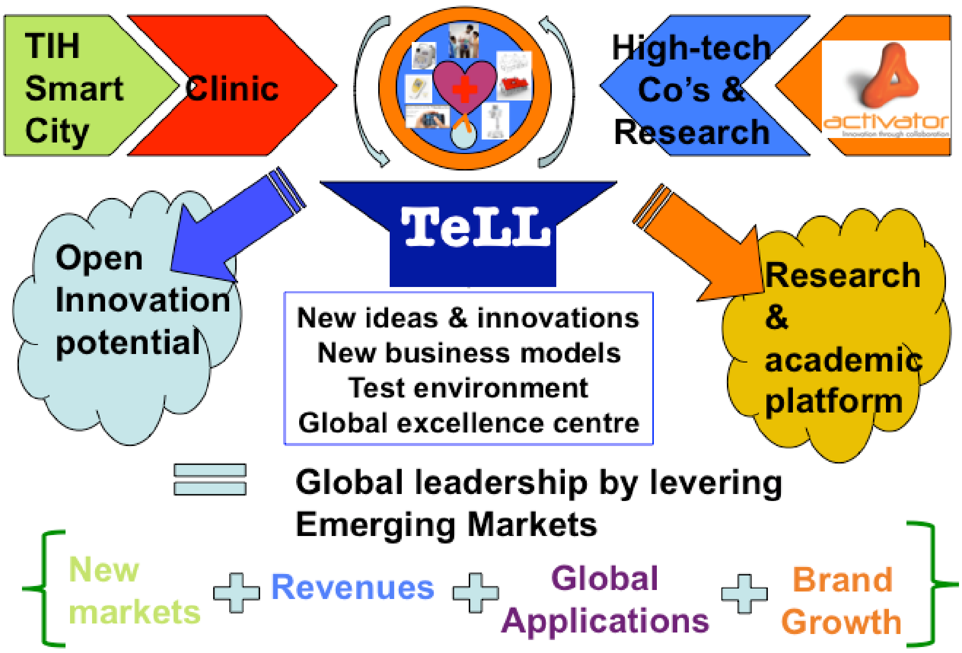


Figure 2: An Illustration of where TeLL fits in (Lamprecht n.d.)

1.3 The Digital Pen

1.3.1 What it can do

One of TeLL's areas of focus is the Digital Pen. The device looks and works just like its traditional counterpart, however it has the added capability of making a digital copy of everything that is written. This data can be stored on the device and manually transferred to a computer, or it can be sent in real time through a cellphone to some centralised point. (Anoto 2009)

1.3.2 Benefits to the healthcare profession

When you think of nursing, two stereotypes come to mind: a woman taking your blood pressure, and a woman filling in a chart. The first action is conducive to your health and falls nicely into the category of nursing.

The second, though undoubtedly just as important, is laborious and most importantly time-consuming. The use of a digital pen in a nurse's administrative duty will significantly reduce the time spent on such duties. Moreover because all data is stored electronically, it can be more easily accessed by other role-players as well. Figure 3 gives a typical DP workflow example.

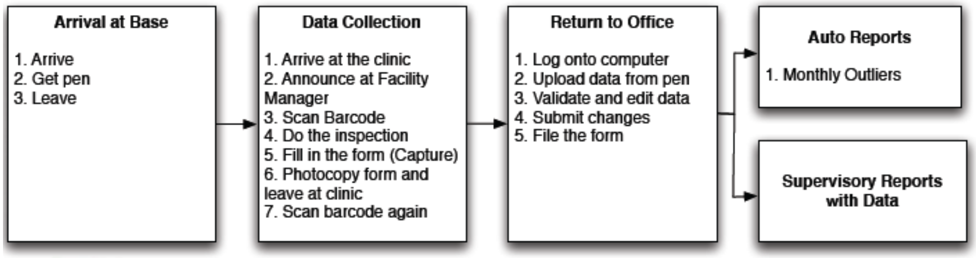


Figure 3: A DP workflow example

1.3.3 The pilot program

Two Tshwane clinics have been identified where the digital pen will be put on a test run of one month. A standardized form on which the pen is to be used is being developed with the help of the city's head matron and staff at the chosen institutions will be trained to work with this new technology.

1.4 Project Aim

Technological change is traditionally a source of both positive and negative disruption in labour markets. There exists a great amount of literature dealing with the impacts of technological change on workers, jobs, skill requirements, and employment. However, managers and policymakers have never been given a basic framework for the successful planning and implementation of new technologies in the workplace (Flynn 1989).

The project aim is to identify and address the factors that influence the successful implementation of new technology in the primary healthcare environment. A Roadmap to Successful Technology Diffusion will be created. It will address all aspects associated with the decision-making, planning, design, and implementation of new technology.

As a base-case study, this Roadmap will be used to set up a generic Business Case for the introduction and implementation of the digital pen at Primary Healthcare Institutions. This Business Case is a highly structured document wherein the reasoning behind, an overview of, an evaluation, and implementation methodology of the project is included.

1.5 Project Scope

Although Technology Diffusion is a challenge faced by a most fields of business, every discipline experiences problems unique to its domain. This project will focus its attention on the challenges inherent to the field of Medicine and more specifically to that of Primary Healthcare. The scope will be further refined by recognising the challenges unique to a developing country such as South Africa.

Chapter 2: Literature Review

The introduction of new technology to any workplace is a multidimensional problem that can only be solved by utilising knowledge and techniques from many different disciplines (Figure 4) including: Project Management, Change Management, and Process Reengineering (Fisher 1998).

This literature review delves deeper into the problems faced by companies in the implementation of new technology. Research into the different disciplines that need to be employed in order to get to a complete generic RoI will be discussed. Case studies where new technology has been successfully introduced will also be investigated.

The final part of the chapter will be used to explain which specific Industrial Engineering techniques will be used after which a preliminary overview of the project will be given.

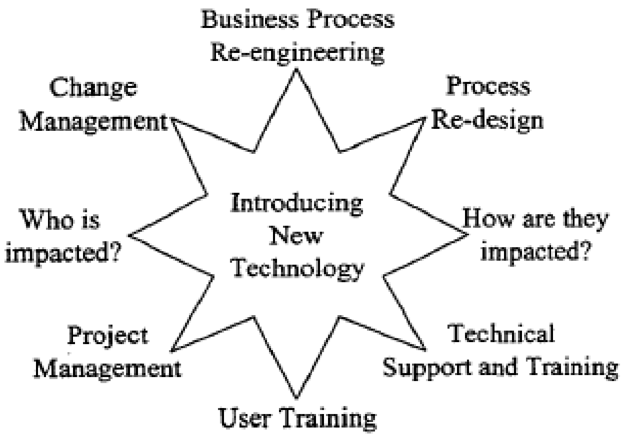


Figure 4: Elements of success (Fisher, 1998)

2.1 Obstacles to Successful Introduction

There are four key requirements to the successful introduction of new technology to the workplace: The first is the realisation that no single methodology in itself is adequate to successfully address the challenges posed by technology. For instance: the typical focus of Change Management is on staff related functions such as motivation and communication as well as organisational structures. No attention is paid to planning for process change and mastering new processes.

Process Reengineering puts its focus on process analysis and the introduction of change to maximise the effectiveness of new technology. The risk is that sometimes this results in too much change in too short a time.

Project Management deals with all the basics of a new technology, but does not recognize changes beyond the focus of a particular project. Process redesign concentrates on individual processes and does not see the effect of change in the system as a whole. Finally the training of users in the new technology normally focuses on technological features and ignores the fact of divergent learning styles.

Secondly, an overall framework must be developed that links all the relevant methodologies into a unified whole. An outline with which to ascertain the impact of a new technology on all the relevant role-players is the third requirement.

On a conceptual level, this translates to a need to know how different groups will be affected by new technology. Analytically this framework must address the particular changes that each group must make in order to accommodate the introduction of new technology.

The final requirement is the establishment of a professional association which has the purpose of assisting organisations in the introduction of new technologies in a structured and efficient way. (Fisher 1998)

2.2 Relevant Disciplines

In order to create an effective, generic Roadmap of Implementation for new technology implementation, three different disciplines will be studied. Suitable tools will be identified from each. The end result will be a structured and cohesive Roadmap in which all three disciplines have been put under one methodological umbrella to assist organisations in successfully establishing new technologies in the workplace.

2.2.1 Project Management

Project Management is the interface between general, operational and technical management. It combines all aspects of a project and causes it to happen. It is a goal oriented activity, which means that human and non-human resources are combined to achieve some specific goal. This goal must not only be achieved, it must also be completed within a certain time and with a certain amount of resources.

For any organisation to be effective, it must make every effort to adapt to the changing needs it is endeavouring to serve. Project Management is the means by which the activities needed to realize future goals are identified, scheduled, executed and accomplished.

The project can be seen as the manner with which the change is planned and realized. This field is essential when a change (technological) is needed as it is a way of controlling and overseeing the organisation's adaptation to anticipated future requirements (Webster 1993).

The specific Project Management tools that will be used will be discussed in more detail in the next section of this review.

2.2.2 Change Management (CIMA 2009)

In a sentence Change Management can be described as the perpetual process of aligning an organisation with its marketplace in a more effective and responsible manner than its rivals. It forms a critical part of any project in that it enables people to embrace new technologies, processes and systems.

According to the Beckhard and Harris CM formula, which highlights both push and pull factors, change can happen when the following is satisfied:

$$C = [A * B * D] > X$$

C = Change

A = Level of satisfaction with the status quo

B = Desirability of the proposed end state

D = Desirability of the change

X = ‘Cost’ of change

Although simple, the formula is enormously useful. It draws attention to a number of possible problems the project could have to deal with:

- Employees may not be particularly dissatisfied with the status quo and thus may not understand the need for change.
- Staff may not comprehend the potential benefits of the proposed end state.
- The proposed end state is undesirable to the employees responsible for implementation.
- The tasks necessary for implementation are too complex for those responsible, or poorly defined.

Change Management stresses the importance of effective and suitable communication. In light of this five styles of management have been identified:

1. **Education and Communication**: The preferred method when change is to be incremental. The method is based on persuasion. The reason for and the means by which change is to occur is explained in detail to all involved parties. It is a top-down approach and its success depends on employees' willingness to accept managements plan. If the plan is unacceptable to workers, negotiations must ensue.
2. **Collaboration**: Also suited to incremental change, this method brings together all affected parties and makes them part of the Change Management process. It is an ethical, but time-consuming approach.
3. **Intervention**: It is carried out by a Change Agent who delegates certain responsibilities in the change process to others, giving guidance and retaining overall control and responsibility.
4. **Direction**: A top-down method where managerial power is used based on an unambiguous future strategy. Although it sometimes leads to resistance, it is fast, clear, and suitable to transformational change.
5. **Coercion**: An extreme form of direction which uses power to impose change. This method is almost sure to incite opposition and is almost only used in times of crisis or uncertainty.

Whether the change that is needed is technological or something else, it is of vital importance that the impact that change will have on an organisation's employees is considered. Individuals react to change in varied ways and have different ways of handling it, thus change cannot be seen as a purely mechanical process.

2.2.3 Business Process Reengineering (CIMA 2009)

This discipline is used to fundamentally change the manner in which an organisation functions with the purpose of improving performance measures such as cost, speed, quality and service.

Seven fundamental principles for BPR exist: processes should be customer focused instead of task-oriented; the people who use the process output should also perform the process; information production should be accompanied by information processing; geographically-dispersed resources should be treated as if they were all centralised; similar activities should be linked rather than integrated; employees should exercise greater autonomy over their work and be almost self-managing; information should only be acquired once, at the source.

The successful execution of Business Process Reengineering is based on a five step approach:

1. Development of a Business Vision and Process Objectives
2. Identification of processes
3. Measurement of existing processes
4. Identification of change levers
5. The building of a prototype or the implementation of a pilot program

These three disciplines will be integrated to create a new framework with which it will be possible for organisations to successfully implement new technology. The framework will verify the relevance of changes suggested and ensure implementation in such a way as to ensure positive participation by all role-players.

2.3 Case Studies of Success

The accounts that follow are incidents where technology implementation has happened smoothly and successfully with all the role-players being onboard with the changes made. These organisations did not follow a particular roadmap but rather cobbled together a plan tailored to their specific situation.

These cases will be thoroughly analysed to identify areas of common success and failure. The base project in which the developed Roadmap will be used is in the healthcare industry.

2.3.1 Healthcare Information Technology for Primary Care Clinics

Prof David A Dorr (Dorr and Behkami 2009) of the Oregon Health and Science University and his team set out to find an adequate way in which to introduce Healthcare Information Technology (HIT) to primary care clinics in Canada. They soon realised they would have to take a multi-disciplinary approach (Figure 5). They came to a solution by incorporating Healthcare, Medical Informatics and Engineering and Technology management.

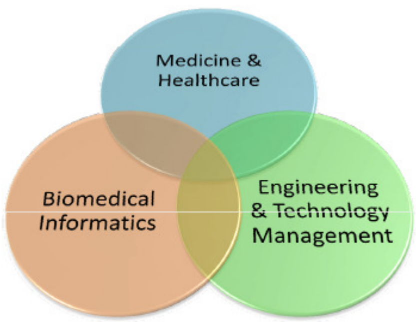


Figure 5: A Multi-Disciplinary approach (Dorr and Behkami 2009)

The first step they took was to define HIT and to identify the potential benefits of implementation on the patients. An adequate version of HIT was found and next the expected Return on Investment and other indicators were calculated to ensure the project's profitability using the selected system.

To ensure success, Engineering and Technology Management principles were employed: the team utilized User-Centred Innovation which emphasises end-user participation during several stages of the innovation process; system dynamics, a powerful computer simulation modelling technique used for framing and understanding complex issues; Technology Road Maps, a tool that matches short and long-term goals with specific technological solutions in an effort to meet those goals; and Technology Transfer, a process of sharing technologies, knowledge, skills etc among government organisations and other institutions. (Dorr and Behkami 2009)

2.3.2 McMaster University Study (Leyland, Hunter and Dietrich 2009)

The research team from this Canadian University found that despite more than adequate funding, many Clinical Heath Information Technology (HIT) projects continue to fail.

According to them this was as a result of the fact that too much emphasis was placed on risk management. It was found that neither Project Management nor Change Management alone could adequately address the problems facing HIT. The team differentiated between hard and soft Change Management. The Hard CM is closely linked to PM while the Soft CM focuses on the emotional aspects of change. Figure 6 shows how Hard and Soft CM fit into PM.

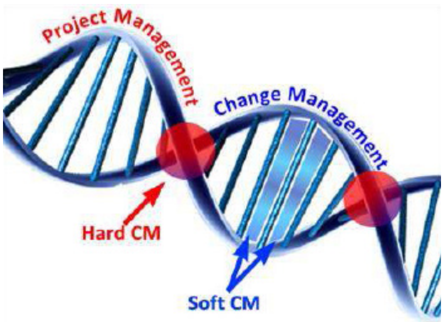


Figure 6: The CM-PM Helix (Leyland, Hunter and Dietrich 2009)

It was agreed not to focus on the differences between CM and PM, but to rather extend the meaning of PM to include social processes, project intricacy, value creation and a broader conceptualisation of projects.

Thus projects should be seen to have a knowledge and emotional side (Sauer and Reich 2009). Three categories of resistance to change were identified:

- Rational or behavioural resistance occurs as a result of misunderstanding between the implementers of change and the end-users. The reasons for change are often not communicated effectively to the end users. Such misunderstandings often lead people to assume that the change is redundant and that it will have negative personal consequences (Van Dam, Oreg and Schyns 2008). Rational Resistance can be effectively dealt with through the use of common PM and Hard CM tools.
- Emotional or Psychological resistance occurs because all human beings share general biology and similar psychology. In the event of any sort of change, the brain's amygdala senses a threat and sends out 'imminent danger' hormones. This instinctively causes fight, flight or freeze reactions in people. One can characterise these reactions as resistance (Petouhoff 2006). To address this type of resistance, Soft CM principles need to be applied.
- The third category deals with Cultural Resistance. The study was done in the field of healthcare. The authors realised that Medicine is a profession steeped in tradition and indoctrination. Change, but especially technological change, is universally seen as a threat to their long-standing methodologies and traditions.

  Although this study focused on the culture inherent to Medicine, any organisation which proposes change in whatever field must take the particular culture and traditions of that field into account and make use of soft CM strategies to deal with such resistance. (Leyland, Hunter and Dietrich 2009)

2.4 Development Techniques

In order to create a RoI which will be used in setting up a Business Case for the digital pen in PH, the following techniques will be utilised:

2.4.1 Capability Maturity Model

A CMM describes the different stages of process improvement by providing an order in which improvements are to be dealt with. It is divided into five stages and any process can be categorized into one of them: Level 1 describes unstable and chaotic processes; a Level 2 process is managed, designed, measured and controlled; at Level 3, processes are well defined and use methods, standards and procedures; a Level 4 process can be regarded as quantitatively managed and at Level 5 processes are optimised and in a state of constant improvement. (Team 2002)

2.4.2 Technology Road Mapping

TRM is a flexible technique used in tactical and long range planning. It provides a structured approach to exploring the relationship between developing technologies, products and markets. It is a means of tracking the performance of individual, potentially disruptive technologies. (Phaal, Farrukh and Probert 2003)

2.4.3 Gantt Charting

This is planning and control technique designed in the 1940s which indicates the anticipated completion times for various project activities in the form of a horizontal bar graph. It is a means by which a project planner is compelled to develop an action plan ahead of time. It is also a useful gauge of how on schedule any project is at any given time. (Niebel and Freivalds 2003)

2.4.4 PERT Charting

The Program Evaluation and review technique is a graphical portrayal of the optimum way with which to attain some objective. On the chart, the start and completion times of a certain operation are shown as events/nodes. The minimum time for the completion of a project is defined as the longest path between the first and last node. (Niebel and Freivalds 2003)

2.4.5 Method Study

As the name suggests, it is the measurement of the amount of time it takes to complete some task or process. Three elements are used to determine time standards: Estimates, historical data and work measurement. This technique can be used to compare different methods of carrying out a process, or to improve an existing process. (Niebel and Freivalds 2003)

2.4.6 Cost Benefit Analysis

According to (Niebel and Freivalds 2003), Cost benefit analysis is a quantitative approach to deciding between two or more alternatives. The approach includes five steps:

1. Determine what has changed due to the introduction of new technology
2. Quantify these changes into either monetary units or percent changes
3. Determine the cost of implementation
4. Divide the cost by the benefit to create a ratio for each alternative
5. The smallest ratio determines the desired result

2.4.7 A Business Case

This tool presents the reasoning behind the initiation of a project in the form of a well structured document. It is seen as a necessity on any Public Sector projects. It is presented in a cost/benefit form, including non-financial and financial aspects. Thus societal benefits, for instance, are also illustrated. (PMHUT 2009)

2.4.8 Business Analysis

The discipline that determines solutions to problems and identifies business needs. It is used in systems development, process improvement and organisational change. The ultimate goal of this technique is to: reduce waste; create solutions; complete projects on time; improve efficiency; and document the right requirements. (Hass, Van der Horst and Ziemski 2008)

Chapter 3: Solving the problem

The literature study clearly shows that to successfully introduce new technology to the primary healthcare environment in South Africa, an approach is needed which encompasses many disciplines and is able to understand the entire lifecycle of the implementation process.

The discipline which by definition takes a top-down, interdisciplinary approach to projects is Systems Engineering. Its main focus is on identifying what is to be achieved and then working on every structure that will be affected from the top down. All stakeholders are identified and kept in the loop throughout the entire lifecycle.

One of the ways with which Systems Engineering approaches a project, is with the “V” process model. First introduced by Forsberg and Mooz the model starts by identifying user needs in the upper left hand and ends with a user-validated system on the upper right hand. (Benjamin S. Blanchard 2006)

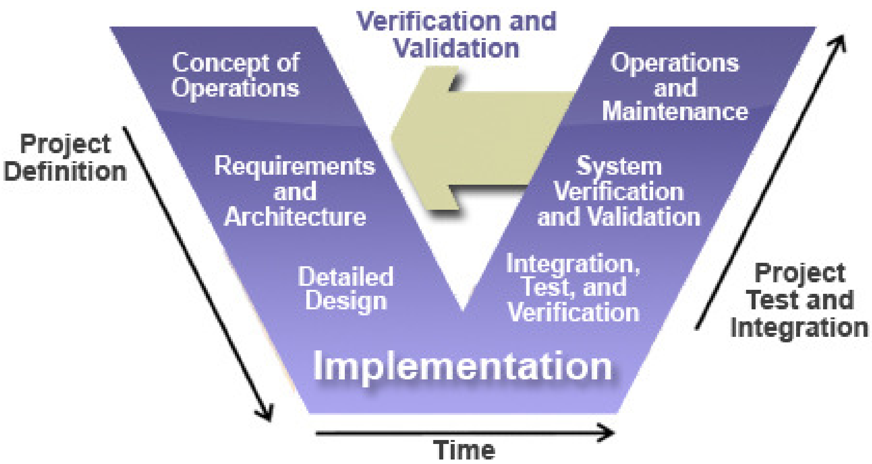


Figure 7: The "V" Process Model (Vector Technology Incorporated n.d.)

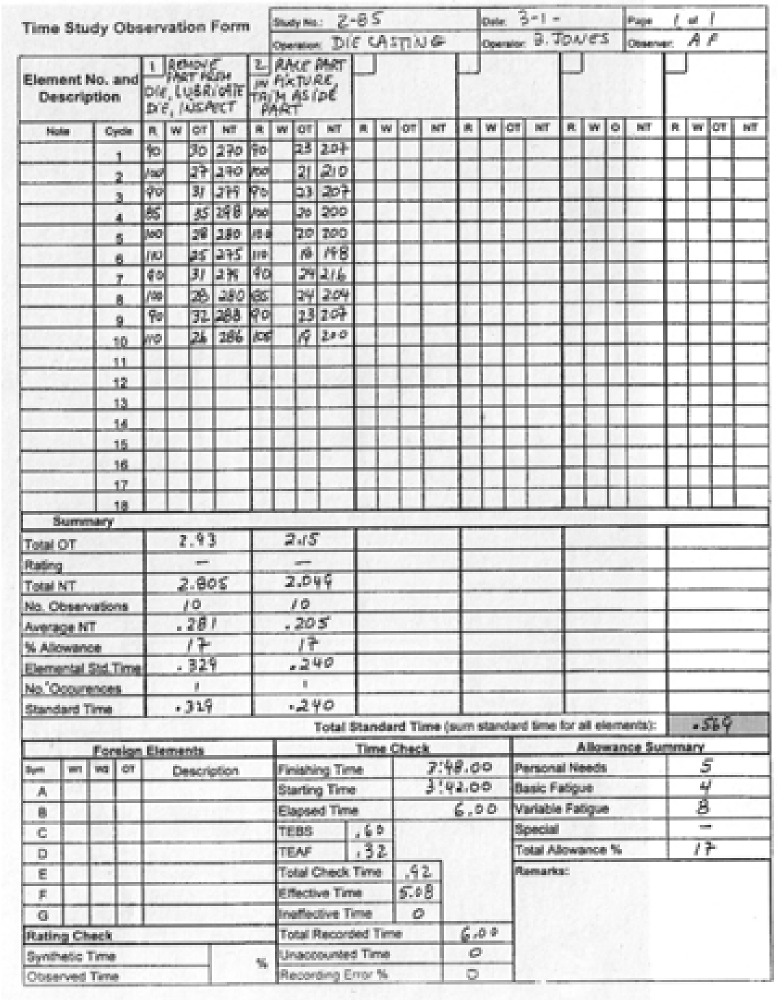
Before we can look at how to implement any new technology, be it IT related or otherwise, an analysis must first be done of how things function now.

3.1 Analysis of the Current Environment

In order to conclude whether or not introducing a new technology will have a tangibly positive impact on an organisation's productivity; one must have a clear understanding of exactly how things function prior to any introduction (Lientz and Rea 2000). Luckily, process analysis is something for which industrial engineering provides plenty of tools.

The RoI is however, meant to be a generic framework usable by people with a varying level of skill. For this reason, it was decided to keep the technique used simple yet effective. Method and Time Study has been around since before Industrial Engineering became a profession. As the name suggests, it is the measurement of the amount of time it takes to complete some task or process.

Three elements are used to determine time standards: Estimates, historical data and work measurement. This technique can be used to compare different methods of carrying out a process, or to improve an existing process (Niebel and Freivalds 2003). Figure 8 below shows the template time study form proposed by Niebel which can be used for any process.



Time Study Observation Form

Study No.: 2-85	Date: 3-1 -	Page 1 of 1
Operation: DIE CASTING	Operator: B. JONES	Observer: A F

Element No. and Description		1 REMOVE PART FROM DIE, LUBRICATE DIE, INSPECT				2 PLACE PART IN FIXTURE, TRIM ASIDE PART			
Note	Cycle	R	W	OT	NT	R	W	OT	NT
	1	90		30	270	90		23	207
	2	100		27	270	100		21	210
	3	90		31	279	90		23	207
	4	85		35	298	100		20	200
	5	100		28	280	100		20	200
	6	110		25	275	110		18	198
	7	90		31	279	90		24	216
	8	100		28	280	85		24	204
	9	90		32	288	90		23	207
	10	110		26	286	105		19	200
	11								
	12								
	13								
	14								
	15								
	16								
	17								
	18								

Summary	1	2
Total OT	2.93	2.15
Rating	–	–
Total NT	2.805	2.049
No. Observations	10	10
Average NT	.281	.205
% Allowance	17	17
Elemental Std Time	.329	.240
No. Occurences	1	1
Standard Time	.329	.240

Total Standard Time (sum standard time for all elements): .569

Foreign Elements				
Sym	W1	W2	OT	Description
A				
B				
C				
D				
E				
F				
G				

Time Check	
Finishing Time	7:48.00
Starting Time	7:42.00
Elapsed Time	6.00
TEBS	.60
TEAF	.32
Total Check Time	.92
Effective Time	5.08
Ineffective Time	0
Total Recorded Time	6.00
Unaccounted Time	0
Recording Error %	0

Allowance Summary	
Personal Needs	5
Basic Fatigue	4
Variable Fatigue	8
Special	–
Total Allowance %	17

Remarks:

Rating Check		
Synthetic Time		%
Observed Time		

Figure 8: Generic Time Study Form (Niebel and Freivalds 2003)

The process being considered for change will be analysed with the method and time study technique. The result will be compared with an estimate time study of the new proposed process. Chapter 4: The Roadmap in Practise features a time study of the current process used in capturing data from public clinics and hospitals which is then compared to the new proposed process used best estimate times provided by technology specialists. After this step is completed, a general concept about how and where the new technology will fit in must be developed.

3.2 Determining the effect of the new technology

As no implementation has occurred at this stage, no physical time study can be done using the new technology. The current process can, however, be analysed to determine which processes will be changed or replaced. With the help of technology specialists (usually the people selling the product) best estimates can be ascertained to be compared to the old process.

When the time comes to present your case to decision makers, you can show the old process next to the new proposed one. This simple method clearly shows possible benefits and removes the need to astound them with technical jargon.

Public Healthcare in South Africa is not renowned for its operational excellence. Talking to people in the industry, a conclusion has been drawn that this is not for lack of funds. It is for this reason that so much emphasis is placed on the time it takes to complete any process.

All operations done in primary healthcare has an impact on the citizen lying in a hospital bed at Folong clinic or another getting his ARV medication at Chris Hani. Thus, decreasing the time it takes to finish some process or improving the quality of some other process will almost always have a tangible impact on someone's life.

Before any project can proceed though, key people in an organisation need to be convinced of its benefits.

3.3 The Justification Process

Whether or not to adopt new technology happens within the framework of the capital budgeting process within an organisation. Thus available capital is rationed between competing projects. Requests for capital usually originate from the lower levels of an organisation and then needs to be approved by management higher up.

In general, the larger the amount of capital required the higher up you have to go in the chain of management for approval.

The people participating in the innovation decision process can be broadly categorised into four groups:

1. First are the lower level technical personnel. These people are usually the ones responsible for the initiation of the decision process. Often times these people are young and fascinated by the possibilities that new technology has to offer their workplace.
2. The next group can be defined as technical management. They have to take a balanced view between technical and business factors. Sometimes they have been found to be the initiators as well.
3. The third group consists of senior management who are almost wholly financially oriented. They consider the potential implementation of new technology from the position of overall company strategy. In terms of primary healthcare and depending on how large an impact the proposed project will have,
4. The fourth group responsible for decision making will be either the provincial or national departments of heath or both.

The impression one gets is that these types of decisions are comprised of a number of independent sub decisions at successively higher levels of an organisation's hierarchy. In reality the process is much more holistic then that.

Rather the process consists of lower level participants trying to convince the higher levels of an organisation to approve a project. These "proponents" have already made up their minds and they are simply trying to justify their decisions to the higher-ups to get final approval. (Francis 1986)

In the end, for any project to gain approval, it needs analysis through the lens of three different business components:

3.3.1 The Strategic/Financial Component

To get approval, proponents must demonstrate that the proposed investment will improve the organisation's financial position and ability to satisfy customer needs. Once again there is an Industrial Engineering Tool suited to this task.

According to (Niebel and Freivalds 2003), Cost benefit analysis is a quantitative approach to deciding between two or more alternatives. The approach includes five steps:

1. Determine what has changed due to the introduction of new technology
2. Quantify these changes into either monetary units or percent changes
3. Determine the cost of implementation
4. Divide the cost by the benefit to create a ratio for each alternative
5. The smallest ratio determines the desired result

As an illustrative example, a cost benefit analysis will be done in Chapter 4 to determine the appropriateness of introducing the digital pen to Gauteng healthcare facilities

3.3.2 The Social Component

This component involves the reputation and track record of the proponents. This is where the benefits of a living lab environment such as TeLL become extremely important. The more successful your track record, the more likely management is to rule in your favour, even if the financial component initially seems less than ideal.

3.3.3 The Political Component

This refers to the fact that in order to succeed, a project needs approval from organisational actors who are neither proponents nor decision makers. In the context of Primary healthcare in South Africa, this entails that end users of the technology, trade unions and other employees affected by the change should form a part of the technology diffusion process. (Dean 1987)

3.4 Choosing the Right Approach

After the project has been given the go-ahead, it is usually management's job to make sure it is implemented successfully. The approach a manager uses to do this will, to a large degree, determine the success or failure of the endeavour.

In South Africa, a country where the greater part of the workforce and certainly most healthcare workers, are unionised, adequate planning is mandatory. No project will succeed without satisfying the following requirements (Francis 1986):

- Secure the commitment of the relevant Trade Unions to the change
- Secure the unions agreement on the operation of any new equipment
- Ensure adequate time and resources are available to successfully train employees to use new equipment
- Make plans to avoid compulsory redundancy
- If necessary, recruit people with the necessary skills to operate and maintain new equipment

Management's approval of the project is just the beginning. Four critical questions should now be asked. First it must be ascertained who should be involved in the project, who should be in charge of the planning, whether all personnel aspects have been addressed should be explored, and lastly who should have the final should be clearly outlined.

3.4.1 Who should be involved

The most common problem with this type of investment is that initial decisions are made by finance and technical staff. This often leads to the project not meeting the above-mentioned requirements. The solution put forward by the Institute of Personnel Management in their guide titled: How to Introduce New Technology: A Practical Guide for Managers (IPM 1983) suggests the introduction of a "sign off" system.

This system identifies all the functions in the enterprise that would be affected by the project, a senior specialist from each affected function is then identified and each specialist must then "sign off" on the project before implementation begins.

With the personnel function part of the process from the beginning, adequate planning can happen for training, job design, work organisation, pay, and health and safety issues. (Francis 1986)

3.4.2 Who should do the planning

The next question to be asked before implementation can commence is: who should be in charge of drawing up the plans. The choice suggested by the IPM is between giving the responsibility to an inter-functional management team and delegating the duty to a specialist management function.

An inter-functional management team should include experts from the personnel, technical and finance departments as well as representatives from those employees who will be directly working with the new technology.

Choosing to use a specialist management function entails using industry experts to do all the planning and implementation. Obviously this route is faster because all the involved parties would be experts who know what to do. Success is, however, less certain when using this approach as such a team would have a much narrower perspective on the whole project and may not adequately understand employee and union perceptions.

In the context of primary healthcare in South Africa and taking into account the fact that the workforce in this area is almost completely unionised, the IPM suggests that success would most easily be achieved if we go the route of using an inter-functional management team comprising of many key role-players. (Francis 1986)

3.4.3 Personnel Aspects

Once the team has been established, its first task should be to look at the personnel aspects of the project. Attention should be paid to the following areas:

- Training and manpower policy
- Job design
- Employee relations
- Remuneration
- Health and Safety aspects

On the subject of training, (Lientz and Rea 2000) suggest following a five step approach.

Table 1: Five important steps for training (Lientz and Rea 2000)

In the area of Job Design, attention should be given to two areas: the need for greater flexibility and efficiency within the organisation and the need for employee satisfaction.

With regards to employee relations, the IPM has identified six approaches an organisation may take.

The list begins with an approach that ensures managerial decisions are obeyed to the letter and ascends (or descends, depending on who you are) to the strategy which is most radical in terms of power sharing between union and management.

1. Introduction by management decision
2. Communication
3. Direct employee involvement
4. Consultation
5. Negotiation
6. New joint structures

As stated previously, introduction of new technology by managerial decree is not something which is often successful in a unionised society such as South Africa. The flipside is that trying to do it in total partnership with workers and particularly unions is often a failure because of politics and all unions tendency to want to keep the status quo.

This leaves us with the middle four options. The IPM suggests that new technology should be introduced into a service based environment such as primary healthcare by pursuing a path of consultation. This approach fits in well with the overall strategy of employing a systems engineering outlook, where interfacing with all relevant business divisions is encouraged. The key aspect here though is that the initiative remains firmly in the hands of management. (Francis 1986)

3.4.4 Who has the Power

From the above, two main questions can be extrapolated: Who should participate in the design and where should the decisions be made. The possible answers to these questions can be summarised by using the following matrix:

		Who Participates	
		All designs done by specialists	Users participate in system design
Where Located	Centralised	**A**	**B**
	Decentralised	**C**	**D**

Table 2: Possible Approaches

- Option A represents the method of using a single functioning specialist team for planning. New technology is introduced by management decree alone, with no worker participation.

  Advantages:

  - Central control
  - Simplified design mission

  Disadvantages:

  - System may be rejected by users
  - Design unsuitable to user requirements
- Option B emphasises the need for user commitment while ensuring that decision making is centralised. Joint consultation committees are to set up which include representatives from all affected departments. The authority still remains with management however. This can be translated as a socio-technical approach.

Advantages:

- More user commitment
- Job-needs more adequately met

Disadvantages:

- Users require knowledge
- More designer and user time needed

➢ In Option C activities related to design are decentralised but specialists are contracted to carry them out. This enables designers to be more aware of user and job needs.

Advantages:

- Departmental control of outside expertise
- Responsive to local needs

Disadvantages:

- Costly
- Could lead to insufficient user input

➢ Option D is an approach that emphasises local participation and decentralised decision making. This approach is used where workforce commitment to the proposed changes is vital.

Advantages:

- Less specialist effort required
- User commitment

Disadvantages:

- Dependant on no threat to jobs
- Users require knowledge
- Requires careful consideration

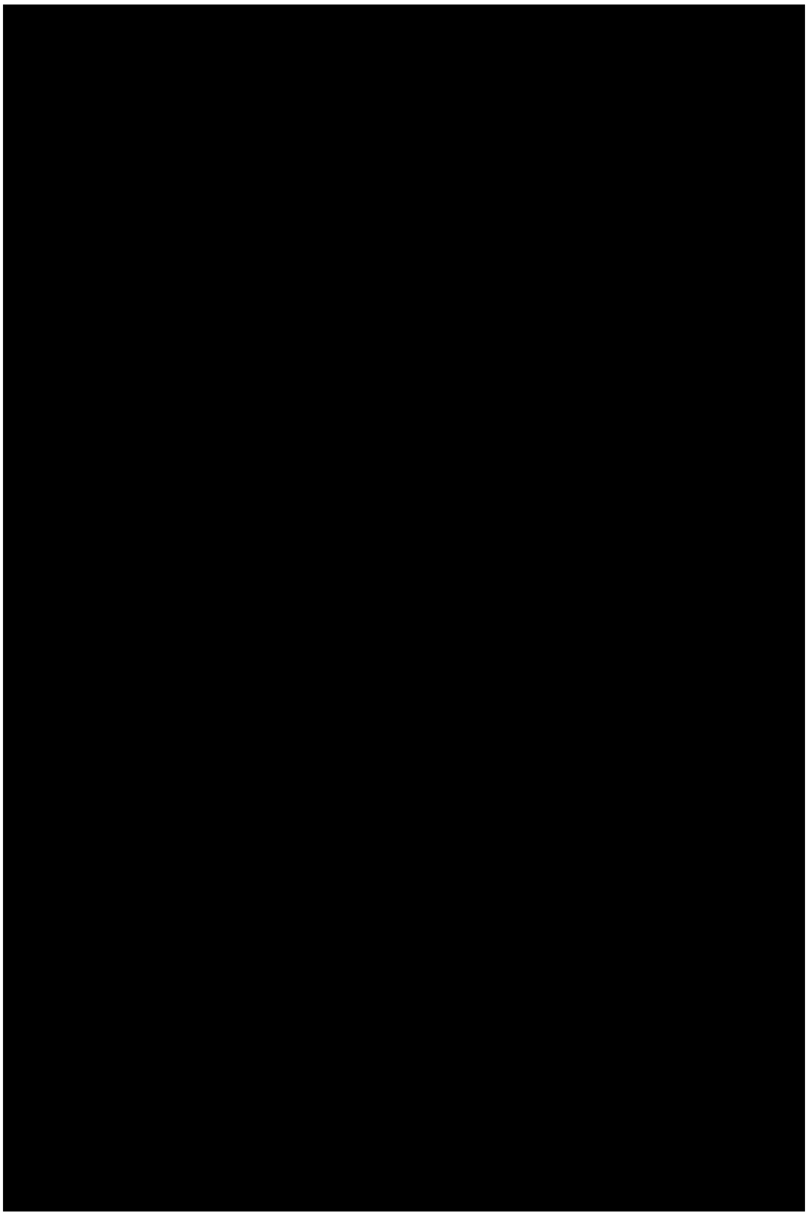
3.5 Conduct a Pilot Program (Lientz and Rea 2000)

To ensure estimated results translate into real world savings, the new technology should be implemented on a small scale. A few individuals who will be end-users once the technology is fully installed should be trained in its use and tasked to use the technology for a set period of time so that motion and time studies etc. can be done. The benefits of conducting a pilot program include:

- The establishment of credibility in the new process
- Lessening the feeling of intimidation employees might have toward the new technology
- The realisation that the new technology is just a part of a greater, familiar system
- End-User feedback
- A growth in enthusiasm

3.6 Implementing the change

The project has been approved, the team assembled, its time for implementation. Along with the traditional project management strategies, Kotter's Approach for successful organisational transformation should be followed (Kotter 1995). He proposed the following eight steps:



[redacted]

Figure 9: Kotter's eight steps (Kotter, 1995)

The performance of the system functioning with the new technology should be observed and analysed with the help of a Capability Maturity Model. A CMM describes the different stages of process improvement by providing an order in which improvements are to be dealt with.

It is divided into five stages and any process can be categorized into one of them: Level 1 describes unstable and chaotic processes; a Level 2 process is managed, designed, measured and controlled; at Level 3, processes are well defined and use methods, standards and procedures; a Level 4 process can be regarded as quantitatively managed and at Level 5 processes are optimised and in a state of constant improvement. (Team 2002). A graphic representation of a CMM follows in Figure 10:

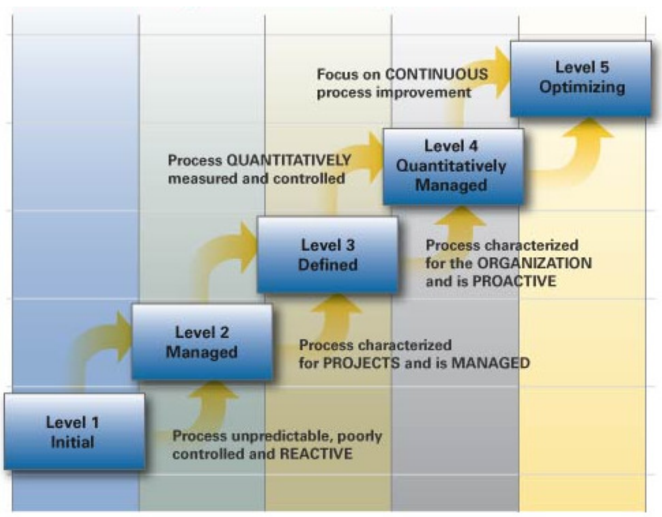


Figure 10: A graphic representation of a CMM (Miralles 2007)

3.7 Summary of the Roadmap

The steps to be followed for successful implementation of new technology will now be summarised to give a clearer picture of what needs to be done.

Step 1: Analyse the current environment

- > Method and Time Study

Step 2: Determine the effect

- > Method and time study
- > Organisational changes

Step 3: Justify the change

- > Financial component
  - Cost/benefit analysis
- > Social Component
  - Reputation
- > Political component
  - Unions
  - Other stake-holders
  - Government

Step 4: Choosing the right approach

- > Who should be involved
- > Who should do planning
- > Personnel Aspects
  - Five Steps
- > Who has the power
  - Centralised/Decentralised
  - Specialists/Users

Step 5: Conduct a pilot program

- > Trained Staff
- > Feedback

Step 6: Implement the change

- > Eight step process

Figure 11: Summary of Roadmap

3.8 Chapter Summary

This chapter has given a broad outline of the steps one has to take in order to successfully implement any new technology in a primary healthcare facility. Much attention was given to the pre-implementation phase. This was done in accordance with the System Engineering principle of ensuring that one has the right specifications to fix the right problem with the right solution. (Benjamin S. Blanchard 2006)

In the next chapter, the methods discussed in Chapter 3 will be used in the implementation of digital pen technology in public healthcare institutions in the greater Tshwane area which will also serve as project validation.

Chapter 4: The Roadmap In Practise

As an illustration of the benefits of using the Roadmap when implementing new technology, Chapter 4 is devoted to employing the methods discussed in the previous chapter in putting into operation Digital Pen technology in primary healthcare facilities in the greater Tshwane Metropolitan area. In the following sections the process is broken down into the six steps identified by the roadmap.

4.1 Analysis of the current environment: Tshwane

All provincial healthcare facilities in the greater Tshwane area are regularly visited by certified personnel with the purpose of assessing each facility's compliance with rules and regulations with regards to Drug Supply Management. A time study was performed to record the as-is environment (See Appendix A: Time studies). A summary of the current process is shown in the figure below:

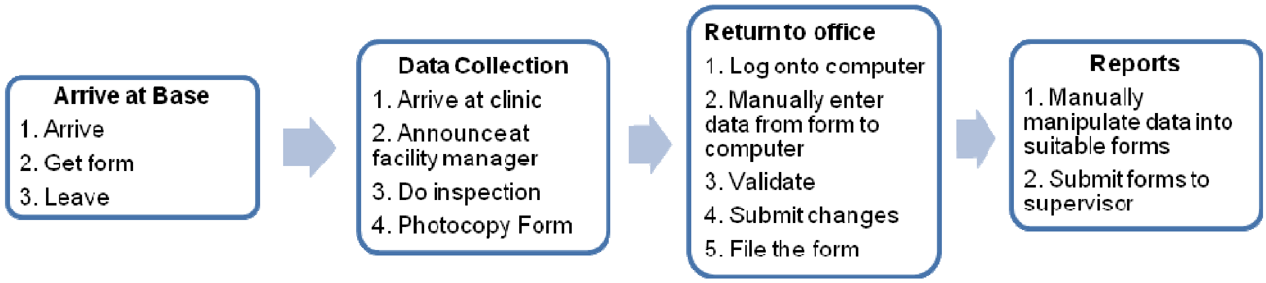


Figure 12: As-is environment

From the time study it was seen that a great deal of time is spent converting written data into digital data. Translating that data into logical reports is again something that takes an unreasonable amount of time.

4.2 Determining the effect of Digital Pen technology

As previously stated, the digital pen looks and works just like its traditional counterpart, however it has the added capability of making a digital copy of everything that is written. This data can be stored on the device and manually transferred to a computer, or it can be sent in real time through a cellphone to some centralised point (Anoto 2009).

The fact that this device functions exactly like a normal pen, means that users will not have to learn a whole new process; they will simply have to change certain aspects of an already well-known procedure. The process using the DP was planned out and best estimate times from the suppliers were used in correlation with the real world measurements already taken in the first time study. This was used to produce an estimated total process time. An illustration of this procedure is given below:

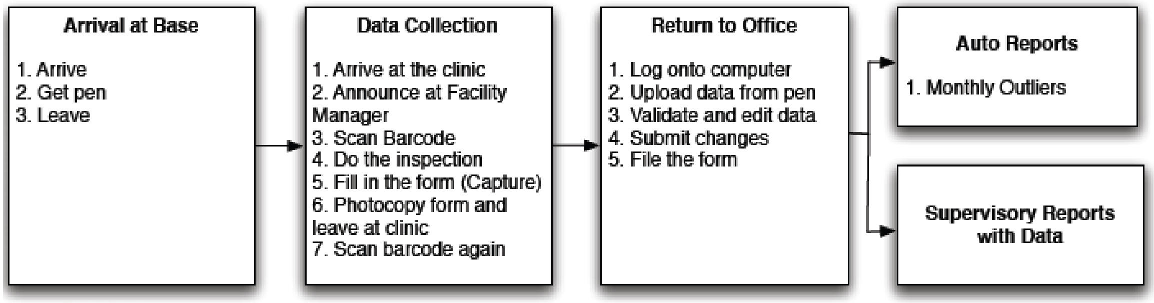


Figure 13: Process flow using the Digital Pen

Comparing the time it takes to perform these two procedures, it was found that it takes a considerably shorter time to complete the process when using the Digital Pen (See Appendix A: Time studies). With it, tedious hours digitising written data is eliminated. Reports are compiled at the touch of a button and validation time is greatly reduced. These findings will be used in the Justification process.

4.3 Justifying the technology to stakeholders

For any project to gain approval, it needs to be scrutinised through the lens of three different business components: Financial, Social, and Political. We begin by analysing the first one:

4.3.1 The Financial component

Using the five step approach discussed in 3.3.1, we begin by determining what changes due to the implementation of this new technology. Looking at the time studies, we see that the process essentially stays the same until the facility assessment is complete and the assessor is back at base. It is here, where data needs to be digitised and reports compiled, that man-hours are saved.

The first benefit in investing in this new technology is thus a saving in man-hours spent assessing all facilities. Personnel spend less time in front of the computer leaving more time for patient care. Secondly, because reports are automatically compiled, supervisors have quicker access to summarised information. This makes them more able to address shortcomings and problem areas.

The next step in cost/benefit analysis is to quantify these changes. This is where some difficulty arose as it was found to be next to impossible to get the relevant financial details from the provincial department of health. To illustrate the benefits, however, best estimates were used in performing the analysis.

It was decided that for every ten minutes saved using the pen, productivity for one person for one month would rise 1%. This results in a saving of R5300. For the supervisor, receiving a report immediately results in a saving of R2000 a month. Cost was estimated as indicated below:

Method	Productivity	Report	Total	Cost	Cost benefit
2. Digital Pen	5300	2000	7300	6900	0.945205479

Figure 14: Illustrative Cost/Benefit Analysis

The point that needs to be made is that a project can only be worthwhile if the cost/benefit ratio is less than one.

4.3.2 The Social component

It is in this component where the benefits of a living lab such as TeLL come forward. For new technology to be successful, it needs to be launched from a reputable platform. TeLL provides that. It documents all successful implementations and presents these as case studies to prospective clients. With regards to the DP project, it is also backed and partly funded by SAFIPA (South Africa Finland Partnership) which gives it more credence.

4.3.3 The Political component

The workforce of Primary Healthcare in South Africa is almost totally unionised. To ensure success unions were notified and kept in the loop from the first. Government representatives within the healthcare portfolio were also involved throughout because of SAFIPA's involvement.

4.4 The right approach

Management approval is just the first step in ensuring success. Four critical questions should now be asked: Who should be involved, who should do the planning, have all personnel aspects been addressed, and lastly where should the power of decision-making lie. The following paragraph addresses the first question.

4.4.1 Who should be involved in the DP project

Following the advice given by the IPM as stated in 3.4.1, a sign-off system (IPM 1983) was employed in the DP project. It was ascertained that the assessment team, their supervisors, admin personnel, and head nurse would all be directly or indirectly affected by the introduction of this new technology.

A representative from each group was chosen and along with the union representative, was given full disclosure on the scope and purpose of the project. The representatives then went back to report to their respective groups and another meeting was scheduled.

At this gathering the concerns that each group had about the project were raised and addressed. Fortunately there were no major roadblocks and the project was able to progress.

4.4.2 Who is responsible for planning

The success and positive mind-set experienced at the preliminary meetings led to the formation of an inter-functional management team consisting of the head nurse/supervisor, a representative from the assessment team (the end-users), an industry expert on DP technology, and a facilitator from Venture Solutions.

This group was given full power to plan the entire project and was tasked to strive for consensus on every issue.

4.4.3 Personnel aspects of the project

The planning team was established and the next task was to look at personnel aspects. The area of training and manpower policy was addressed first. The five step approach suggested by (Lientz and Rea 2000) was used:

Step 1: Define Requirements

- There are currently seven assessors working for the department who will all have to be trained in the new technology.
- All have a tertiary qualification as pharmacists.
- It was decided that the industry expert, Phil Fong, would do the training along with Eloise Swart, an Industrial Engineer working for Venture Solutions.

Step 2: Prepare Training Materials

- Mr Fong is an Industry expert with regards to this technology and has a wide variety of materials and media available.

Step 3: Remove ambiguity

- Luckily the DP is such a simple device that there is little chance of ambiguity.

Step 4: Set up for training

- It was decided that training would be conducted at Steve Biko Academic Hospital in Pretoria in normal working hours.

Step 5: Conduct Training

- Training was started on the 28th of May 2010 with all users in attendance. Phil Fong was replaced as industry expert by Eloise Swart because of a previous engagement.

Issues pertaining to Job design, Remuneration and health and safety were adequately addressed because of the consultative approach followed by management.

4.4.4 Who is in charge

The four possible approaches with regards to the power of ultimate decision-making on the project were illustrated by (Francis 1986).

The approaches were analysed and a set of criteria was extrapolated which was converted into a questionnaire. This was given to industry experts and role-players affiliated with TeLL. With the help of Value Engineering (See Appendix B) the conclusion was reached that Option B would be most appropriate to the environment being investigated.

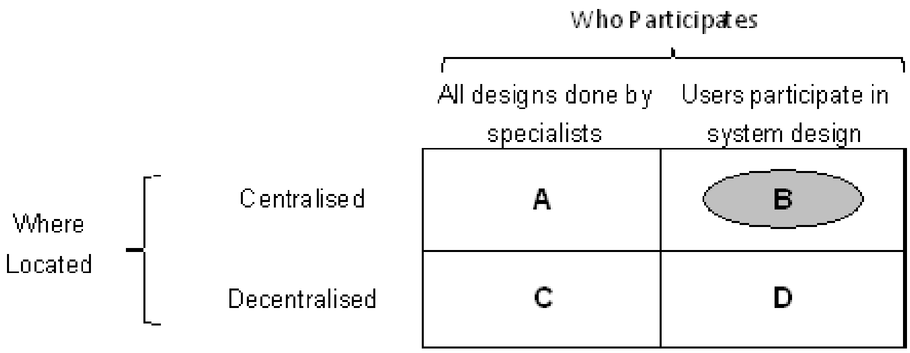


Figure 15: The approach chosen

Option B emphasises the need for user commitment while ensuring that decision making is centralised. Joint consultation committees were set up which include representatives from all affected departments. Initiative still remains with management however. This Socio-technical approach means that while the path of consensus is always the preferred one, only the head nurse, Ms Ria Pretorius, has the final say.

4.5 The Pilot Program

To ensure that the technology delivers on all that was promised and identify any problems the end-users might experience with it, a pilot program was launched at the beginning of July. In this pilot, three end-user pharmacists were chosen to start assessing facilities with the help of the DP and the specially made form.

The pilot proved its worth from the start when it was discovered that the reporting function did not work as expected. Expert Phil Fong was promptly made aware and he made the necessary adjustments. An example of a filled in form is given in Appendix C.

The pilot program dispelled any lingering doubts the end-users had about the viability of the technology and the feedback from the entire group was wholly positive. The program also revealed that the expected time savings with regards to digitising data and compiling reports were realised and thus initial estimates were vindicated.

4.6 The Implementation

Using Kotter's Approach as a framework (Kotter 1995), we see that the first four steps: establish a sense of urgency, form a powerful guiding coalition, creating a vision, and communicating the vision were all successfully completed by employing a process of consultation with all role-players throughout the entire lifecycle. Everyone was aware of the plan and fully educated as to the advantages. This resulted in a great sense of optimism for the project and perhaps even the birth of a sense that change can be a good thing for all involved.

The last four steps are all about not losing momentum and the speed at which this project was successfully completed showed all involved that using a collaborative approach is the surest path to success. It was decided that using an inter-departmental team along with outside expertise would be the path taken for all future projects.

With regards to the Digital Pen, it has impressed so much that the team is already exploring other areas within Primary Healthcare where it could be used effectively.

4.7 Chapter Summary

This chapter has shown how the generic Roadmap of Implementation can be used to assist in successfully implementing new technology into the primary healthcare environment. Using this framework not only led to fulfilment of the initial project scope, it also revealed possible new applications for the technology.

Chapter 5: Conclusion

This Project has delved deeply into the problems an organisation is faced with when trying to implement new technology. It has explored ways in which others have achieved success and investigated the relevance of those solutions to the project scope. It has identified the most common obstacles and has sought to counteract them.

Through thorough research and the use of Industrial Engineering techniques a Roadmap of Implementation was created. This generic guideline seeks to negate the most common obstructions to successful implementation and to provide primary healthcare organisations a framework by which to steer their implementation projects.

Chapter 4 of this report illustrates the use of the Roadmap with the implementation of DP technology in Primary Healthcare facilities in the Greater Tshwane area. The Roadmap not only assisted in the success of the project it also helped pave the way for the possible expansion of the project scope to include even more areas.

The conclusion to be drawn is that this generic framework can be an asset to technology implementation projects.

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Appendix A: Time Studies

Two time studies are shown below. The process was broken down into four elements: arrive at base, data collection, return to office, and compile reports. For the process without the DP, Arrive at base entails getting the relevant assessment form from Steve Biko Academic Hospital and confirming which clinic is to be visited that day.

Data collection includes arrival at a particular clinic, meeting with the head of facility, and doing the inspection. Return to office includes arriving back at Steve Biko, logging on to the computer and physically uploading all information collected at a particular facility onto the computer system.

Compile reports comprises of the assessor manipulating the digitised data into logical reports to be handed over to the supervisor. What follows is the time study (in minutes) of the process as it worked before the Digital Pen.

Element number and description		1/ Arrive at Base		2/ Data Collection		3/ Return to office		4/ Compile Reports			
Note	**NO**	**W**	**OT**	**W**	**OT**	**W**	**OT**	**W**	**OT**	**W**	**OT**
Folong Clinic	1	6.50	6.50	43.75	37.25	73.75	30.00	107.35	33.60		
Cehla OC	2	8.00	8.00	53.00	45.00	89.50	36.50	132.50	43.00		
Summary											
Total OT			14.50		82.25		66.50		76.60		
Rating			100		100		100		100		
Total NT			14.5		82.25		66.5		76.6		
No. of observations			2		2		2		2		
Average NT			7.25		41.125		33.25		38.3		
Standard Time			7.25		41.125		33.25		38.3		
									Total Standard Time		**119.925**

Table 3: The as-is Time Study

With the introduction of the Digital Pen we see that the process elements can remain the same. The 'arrive at base' element now includes signing out the DP and receiving the special form. The 'return to office' element now only entails downloading the captured data onto the computer. This results in a substantial time saving.

The same can be seen at the 'compile reports' element where the need to laboriously manipulate data into logical reports is replaced by the push of a button. What follows is a picture of the time study done during the pilot program.

Element number and description		1/ Arrive at Base		2/ Data Collection		3/ Return to office		4/ Compile Reports			
Note	**NO**	**W**	**OT**	**W**	**OT**	**W**	**OT**	**W**	**OT**	**W**	**OT**
Folong Clinic	1	10.00	10.00	51.00	41.00	56.50	5.50	63.50	7.00		
Cehla OC	2	12.50	12.50	59.00	46.50	53.50	4.50	60.50	7.00		
Summary											
Total OT			22.50		87.50		10.00		14.00		
Rating			100		100		100		100		
Total NT			22.5		87.5		10		14		
No. of observations			2		2		2		2		
Average NT			11.25		43.75		5		7		
Standard Time			11.25		43.75		5		7		
									Total Standard Time		**67**

Table 4: Time Study done during the Pilot Program

The time study alone paints a compelling picture of the possible time savings that could be realised with the introduction of this technology.

Appendix B: Decision Methodology

In Section 3.2 of the report possible approaches with regards to how the project team should be set up and who should have the final say. To make sure that user needs correlate with academic perspectives, industry specialists affiliated with TeLL and provincial and local healthcare were asked to rate a list of criteria out of ten on relative importance to the successful introduction of new technology to the workplace.

Results of the survey were then used in setting up a Weighted Decision Matrix in order to ascertain the best approach.

B.1 Using Value Engineering

Niebel and Freivalds describes value engineering as a simple way with which to evaluate alternatives by applying numbers to form a payoff or weighted average matrix. Each solution is given different values with respect to desired benefits. A weight is determined for each benefit (between 1 and 10) after which a value (between 1 and 5) is assigned to reflect how well each solution produces the relevant benefit. (Niebel and Freivalds 2003)

B.2 Methodology Used

The questionnaires that industry experts and relevant stakeholders completed were examined and the average weights assigned to each criterion was calculated. The relevance of each possible solution to each benefit was determined by examining to advantages and disadvantages by Francis (Francis 1986). Table 2 on the next page shows the result of the decision analysis and the fact that Solution B, centralised control with active employee participation, seems to be the best route to follow

Questions	Weight	A	B	C	D
Multiple business areas will be affected	**9**	2	4	2	4
Gaining union support	**8**	1	3	1	4
Final say should rest with everyone	**4**	2	3	2	5
Final say should rest with management	**6**	5	4	3	1
Employee satisfaction with changes	**6**	1	4	2	5
Management satisfaction with changes	**9**	5	3	4	1
Adequate employee training	**9**	2	4	3	5
Management/Employee relations	**7**	1	4	2	4
There are enough resources for specialists	**3**	1	4	1	4
Employees are used to change	**3**	2	3	2	4
Employees embrace change	**3**	2	4	2	1
Employees are highly skilled	**2**	1	3	2	5
Employees are moderately skilled	**6**	3	4	2	4
Employees are low-skilled	**4**	5	2	4	1
Totals		**195**	**282**	**188**	**271**

Table 5: Results of weighted decision matrix

Appendix C: An example of the form

Documented Visit to Clinic Dispensaries Checklist Tshwane/Metsweding

Start

Facility Code: Maria Rantho

Date of Report: 30/06/2010

Pharmacist: C. Underhay

Date Report Submitted: DD/MM/YYYY

INDICATORS	CHECK ONE BOX	COMMENTS
A. Drug Supply Management		
1. Security today		
1.1. Bulk storeroom/ medicine room locked	YES (checked)	
1.2. Dispensary locked	N/A (checked)	
2. Stock in bulk storeroom/ medicine room kept in original containers or brazier bins	YES (checked)	
3. Bulk storeroom/medicine room neat and clean	YES (checked)	
4. Room temperature recorded	YES (checked)	Not up to date
5. Temperature in the storeroom kept below 25°C	YES (checked)	
6. Cold chain maintenance		
6.1. Food in the fridge	NO (checked)	
6.2. Enough circulation between items	YES (checked)	
6.3. Stock stored in fridge door	NO (checked)	
6.4. Packed correctly according to policy	YES (checked)	
6.5. Rattling ice packs policy followed in cooler boxes	YES (checked)	
6.6. Temperature recording done in all medicine and vaccine fridges	YES (checked)	
6.7. Temperature in the fridges kept between 2 - 8°C	YES (checked)	
7. TRACER drugs available and recorded	NO (checked)	Form to be handed next time
8. Weekly out of stock report submitted every week	YES (checked)	
9. Drug book at the facility		
9.1. Items recorded	YES (checked)	Book .
9.2. Drug book balanced on a quarterly basis	YES (checked)	
10. Do you find any discrepancies in the drug book	YES (checked)	Will balance on next visit
11. Does the facility have stock cards for all pharmacy items		
11.1. EDL items	YES (checked)	
11.2. Fridge and Vaccines	NO (checked)	To be ready on next visit
11.3. Surgical items	NO (checked)	To be ready on next visit.
12. Stock cards updated		
12.1. EDL items	YES (checked)	
12.2. Fridge and Vaccines	NO (checked)	
12.3. Surgical items	NO (checked)	
13. Recording done, of items issued to rooms	YES (checked)	Bincards / Order forms
14. Any expired stock on shelves	NO (checked)	
15. Expired items on the emergency trolley/cupboard	NO (checked)	

INDICATORS	CHECK ONE BOX			COMMENTS
	YES	NO	N/A	
16. Expired items returned to regional pharmacy/Sammy Marks on a monthly basis on the correct forms	X			
17. Min max/re-order levels for all pharmacy items		X		ROL to be calculated for next visit.
18. Min max/re-order levels been revised and captured for the period Jan - June AND July - Dec (remains NO until target reached for the 6 months)		X		
19. Electronic stock control system being utilised by clinic staff		X		
20. Stock count been done the previous month?	X			
B. Administration				
21. Invoices filed in an easy retrievable manner	X			
22. Discrepancies reported	X			
23. Discrepancies reconciled and filed with original invoice		X		Seperately
24. Expired items documentation filed		X		
25. Does the facility know the value of the expired items of the previous month		X		Informed of whom to contact at Regional.
26. SOP's available in pharmacy/storeroom		X		No SOP's available
27. Memo's and circulars available in an easy retrievable manner	X			
28. Dispensary stats collected, recorded and filed?	X			
29. Medicine budget known and adhered to?		X		Not specific.
C. Dispensing				
30. General appearance				
30.1 Dispensary neat and clean	X			
30.2. Broken packets properly managed			X	
31. Personal presentation				
31.1. Name tag		X		
31.2. White jacket		X		
31.3. Neat, clean and tidy	X			
32. Background music/ear phone music interfering with pharmacy activities		X		
33. Dispensing done according to Good Dispensing Practice	X			
34. Availability of reference books				
34.1.SAMF/MDR	X			
34.2 EDL	X			
34.3 Formulary		X		

COMMENTS: O/S : Spironolactone; Bismuth Subgulate Cream.
Doxycycline; Enalapril 10 mg
Metformin 500 mg; Gliclazide
Aqueous cream; Rimcure Paed.
Hydrocortizone cream. Will fax emergency order 01/07/10

Stock controller/PBPA/Pharmacist	Facility Manager	Pharmacist doing visit	
JOE	[illegible signature]	[illegible signature]	Finish

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Appendix D: Gantt Chart Depicting Project Schedule

ID	Task Name	Start	Finish	Duration
1	Project Proposal	2010/03/24	2010/03/26	3d
2	Literature Review	2010/04/05	2010/04/23	15d
3	Pilot Run Review	2010/04/20	2010/06/04	34d
4	Preliminary Project	2010/04/15	2010/06/18	47d
5	Presentation and Oral Exam	2010/05/31	2010/06/18	15d
6	Data Review	2010/06/22	2010/07/01	8d
7	Business Case Formulation	2010/07/01	2010/09/30	66d
8	Final Presentation	2010/10/01	2010/10/29	21d