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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Early in the 1980s, the South African Post Office identified a need to automate its counter transactions and mail centre procedures. At that stage, the South African Post Office utilised a manual financial system at corporate level that belonged to Telkom (both of them still formed part of the Department of Posts and Telecommunication), for the manual input of counter transactions performed at post offices and a manual system in the mail centres. Following a work-study investigation in 1985/6, a semi-automated system was implemented for the transactions at financial counters in various offices -- especially the larger (busier) offices in the cities.

Telkom and the Post Office were divided into two separate businesses in October 1991 with the state as sole shareholder. Due to the nature of its business, Telkom had been more technology-oriented and profitable in direct contrast with the Post Office.

During the late 1980s, in preparation for the split, Post Office management formed a special team to devise strategy plans and to determine requirements to enable the company to survive. In view of the Post Office's urgent need to become profitable, and the fact that the company paid quite a substantial amount to Telkom to use their system, one of certain strategic requirements was to implement a computerised point-of-sale system.

Comparative studies made between international Post Offices and the South African Post Office revealed that South Africa has a much wider range of counter transactions such as:

- pension payouts,
- agency services; and
- third-party payments

These entire counter transactions amounted to a total of 127 different transactions. During the 1990s, Post Offices in other countries started to automate counter transactions with automated point-of-sale systems. Due to the fact that none of them had the range of financial transactions similar to the South African Post Office, the whole exercise was less complex. All of the international Post Offices commenced automating in small increments (starting with the less complex transactions). After stabilisation, the next group of transactions was developed, and so on. The South African Post Office, on the other hand, decided to automate all the transactions on its system before implementation.

A feasibility study was done on point-of-sale systems (locally and internationally) during 1990 to find a suitable supplier. During 1991/2, tenders were invited whilst the user requirements were compiled only in 1993. As nontechnology-minded customers, the needs and business requirements were described using the Telkom system as frame of reference. The absence of the technology expertise to "translate" the requirements into technical specifications, proved to be a major disadvantage at later stages.

A task group, comprising of technology managers appointed from outside the South African Post Office with little or no knowledge of counter transactions and procedures, visited a number of countries to assess their systems. The Australian point-of-sale version was found to be a 75 per cent fit according to the then requirements. The team was of the opinion that the 25 per cent customisation was achievable. The software contract was signed and the developer started to customise the software for South African conditions.

The automation of mail centres in the international arena started in the 1980s, with the introduction of logistical systems. This gradually became a tracking system which enabled the tracking of:

- individual items;
- inventory containers (excluding mailbags); and
- transport routes.

Soon most of the international players had comprehensive Track and Trace systems, improving their service to customers while also improving on their productivity and as a consequence their profitability. The tracking systems enabled the mail centres to reliably measure and improve their delivery standards.

During 1993, a tracking system (New Zealand) was analysed and it was found to have a 60 per cent fit (operationally). Due to the outdated procedures (manual and labour intensive), it was decided to acquire the system. Operationally, it meant that most of the procedures had to be changed to adopt the system. However, the system was internationally compliant with the UPU (Universal Postal Union) requirements.

Both projects meant that the previously computer illiterate workforce had to be re-trained in the use of computers. The approach of the two projects however was different in the sense that it was headed by two distinctly different functional groups. The point-of-sale project was headed by Technology, while the Track and Trace project was headed by Operations. Furthermore, each and every change/decision required or proposed on the Track and Trace system was implemented only after ratification by all the role players. This approach led to involvement of the users from the beginning and ownership was thus immediately affected.

1.2 HISTORICAL PROJECTS

The specifics of the two different projects are discussed below (separately) not to confuse the reader.

1.2.1 Point-of-sales project

The South African Post Office has a competitive advantage over rival couriers and parcel operators in the sense of geographical coverage, especially the rural areas where the local populations are the major users of the various financial transactions offered by the South African Post Office and due to the fact that most financial institutions do not cover those areas. The POS system automates the transactions of the customers over the counter. The impact means that 1 800 post offices had to be accommodated which varied from a counter in the centre of a major city to a counter in the rural areas without electricity. The impact study was only done after the decision to acquire the system was made. The project manager was appointed by Technology (functional unit) on the basis of technical expertise. Technology personnel (without the necessary operational experience) compiled the user requirements. This led to a situation where people who "think they know what is required" compiled the requirements. No comparisons were made beforehand to establish whether it was more feasible to build a system from scratch or to buy and customise the package.

Technology personnel originated from other disciplines before the company split into Telkom and Post Office. Technology relied mainly on outside parties to advise on technical aspects. The point-of-sale system was considered very favourably for a variety of reasons such as:

- third-party payments,
- pension administration; as well as
- the proposed government lottery system.

The on-line capability would not only give the customer direct access to pension, banking and financial services, it would also give feedback information to the third parties regarding income generated during that day as well as fast tracking of postal articles.

At a later stage, when the project was under way, it was found that the software was not broken down into modules, but had one huge module with intertwined connections. This meant that if a change had to be made, no one could anticipate what the impact on other parts of the module would be. The software language used for the system was outdated, which meant that it would be difficult to obtain programmers for that particular language locally. For this reason, a group of programmers was brought in from Australia to do the programming.

Conflicts were rife from the outset of the project, since there were no clear project plans or formalised procedures. The project was repeatedly postponed due to a number of reasons, ranging from technology issues to operational issues. In the meantime, the "cash register" kept turning and the management board was informed that delays were a result of changing user requirements.

In May 1999 (and an estimated R100 million further), the project was finally cancelled after:

- project managers were frequently replaced;
- three external audits on the system revealed impeding disasters;
- outdated equipment needed was replaced (purchased at the start of the project);
- technical baselines (for example network PCTCP outdated) were changed; and
- software platforms were changed.

Currently, the South African Post Office is adapting the New Zealand point-of-sale system for the South African environment.

1.2.2 Track and Trace (Automation of mail centre activities)

As mentioned in section 1.1, the system was acquired in 1993 with a 60 per cent operational fit. From the outset, it was decided to steer this project from an operations platform. This meant that a core team (from various operational disciplines) lead the project with technology personnel seconded to the project, looking after the technical aspects of the software and hardware. The final decision regarding technology issues, however, still resided with operations. Advisors from Canada Post were brought in to steer the software changes. The budget from start to finish was set on R26 million.

Part of the initial contract was a complete set of specifications, namely: functional specification, design specification and technical specification. This meant that all the role players could acquaint themselves with the relevant issues before the project was started. From the outset, the operational requirements were compared to the functional specifications. A detailed project plan was available from day one and everyone knew what was expected from him or her. Technical issues provided for the most upsets on the projects, since there was a tendency to favour the point-of-sale project (described above). Technology, on a number of occasions, created delays in order to gain control over the project and to change the software to the "flavour of the month", but the Operations people maintained control via the management board.

Even though the project manager did not possess enough clout in the organisation, tactics to persuade regional leaders and unions were used to maintain momentum. "Buy in" and user ownership was considered the

most crucial (risk) aspect of the project. Once past that stage, the "pull" effect from the end user was stronger than the "push" effect. The project was initially planned for nine months, but due to the delays, rolled out in the 13th month, R2,5 million under budget.

During the initiation process, the line managers did not understand what was required of them and therefore assigned their young understudies to the project who still had to make their mark in the organisation. Everyone who participated in the "stakeholder" meetings was given tasks (plans) to compile and submit to the steering committee for scrutiny. This, together with the fact that the group was young and enthusiastic, created an energetic environment where everyone performed checks and balances. All participants had to report back biweekly to ensure that all tasks were on track. Communication was considered high on the priority list of the stakeholder members. This in itself led to a situation where the steering committee only had to put their stamp of approval on major decisions (cost approval).

The system was implemented in June 1994 and "roll-out" was in July 1994. To date, the system is still functioning in its original state with the exception of scanning equipment (replaced with more reliable scanning equipment).

1.3 PROBLEM STATEMENT

Through the years, the South African Post Office gained a reputation for IT projects that fail. Even though the business ideas and concepts were applicable and justified, the projects still failed. Some of the projects failed completely while others were implemented but still failed the basics of project management in that timelines were overrun. Among the "completely failed" projects, there were the "shining stars" that were on track and ahead of schedule. In most cases, the Information Technology part were the main culprits.

With this frame of reference, the investigation was performed. The next chapter will deal with the results from a systems development perspective. Due to the sensitivity of the Excellpos project, project managers refused to comment, thus leaving us with the Track and Trace system. Most of the then project personnel were contractors. Therefore, extensive interviews of the technical team took place during June 2000 and September 2000 by means of the electronic mail media. The project personnel still employed by the South African Post Office were also interviewed.

The following types of questions were put to them:

Their personal experience on the different phases?

Their personal experience on the projects?

What could the team have foreseen by means of risk management?

How can risk management be implemented?

What changes can we make to our approach?

1.4 OBJECTIVES AND METHODOLOGY OF THE REPORT

Now that it is clear what has happened on the two most important technology projects during the early 1990s, it is essential for the South African Post Office to focus on the complete project life cycle and identify the shortcomings in the process. The focus of this management report is on one part of the overall life cycle, the risks in the systems development life cycle.

A project consists of various life cycles of which the systems development life cycle (SDLC) is but one. During discussions with my sponsor, it became clear that corners are cut during the systems development life cycle due to project managers not understanding the consequences. Another aspect is that project managers in the South African Post Office has no realisation of risks involved in the actions taken. It is my view that the implementation of a measure of risk (for example, formal risk management plans), will ensure that management formalise actions and steps of the systems development life cycle. The goals of this report are therefore to: define risk management (RM), discuss the reasons why risk management has to be implemented, and provide a guideline for implementation.

My sponsor has already indicated that the South African Post Office neglects the first step of the systems development life cycle, namely determining requirements in all the technology projects.

The objectives of this report are to:

- ✓ Provide a document for use by the South African Post Office project management
- ✓ Provide an outline of risk management during the systems development life cycle
- ✓ Provide an overview of a systems development life cycle
- ✓ Provide a guideline for risk management implementation

NOTE: This document will address only the internal factors (and forces) of the systems development life cycle and exclude the externalities. Externalities are those elements which do not form part of the systems development life cycle process directly, and are external forces bearing influences on the course of action.

The author would like to thank the following people:

- My General Manager, Mr Huisamen, who has given me the opportunity to compile this report
- My sponsor, Mr Larry Dalton, for providing insight into the details of technology projects
- Contributors who preferred to stay anonymous, Microsoft, ISIS, Symbol and Q-Data
- SAPO Excellpos training co-ordinator, Mrs René Pretorius, for her interpretation of Technology projects
- My family members, for their patience and support during the past three years
- My secretary, Mrs J. Venter, for her dedication in providing the necessary support

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CHAPTER 2

THE SYSTEMS DEVELOPMENT LIFE CYCLE - A PERSPECTIVE

2.1 INTRODUCTION

An information system integrates five components - people, procedures, data, software and hardware. When a system is computerised, many activities formerly performed by people following procedures are instead done by hardware executing software. The skills the people need and the procedures they perform will change, but both will be evident in a well-designed information system. Systematic, disciplined approaches to systems increase the probability that they will be developed efficiently and exhibit desirable characteristics. This chapter presents different models of system development and presents a model for the South African Post Office.

2.2 DEFINITION OF THE SYSTEMS DEVELOPMENT LIFE CYCLE

In order to accomplish any given set of tasks effectively, one must have a work plan or procedure. Without a procedure, activities are performed in a haphazard manner with little or no coordination. A life cycle is any definite period of activity that has a definite start (inception) and finish (termination). A typical cycle begins with the identification of -

- the objectives of the portion of the product being elaborated
- the alternative means of implementation
- the constraints imposed

The next step is to evaluate the alternatives relating to the objectives and constraints. Frequently, this process will identify areas of uncertainty that are significant sources of risk.

The overall work plans for a system development is called systems development life cycle and the detail plans are called methodologies. The life cycle model divides the life of a system into two phases: development and production. In the systems development phase, the system is created or revised. After the development, the system becomes part of the ongoing process of business; data is entered and reports are produced. This operational period of a system is called the production phase.

McLeod (1996:12) defines the systems development life cycle as a project with phases: initiate, determine feasibility, plan, estimate, execute, and terminate.

Theoretically, the life cycle phases of a system can be defined as follows:

- Conceptual
- Definition
- Production
- Operational
- Divestment

The first phase, the conceptual phase, includes the preliminary evaluation of an idea as well as the risk analysis and resulting impact on time, cost, and performance requirements. Therefore, the systems development life cycle includes both hardware and software development. In the next section the phases are broken down further to provide an overall framework.

2.3 THE SYSTEMS DEVELOPMENT LIFE CYCLE MODEL

2.3.1 INTRODUCTION

Before we can determine what type of model to apply to project management, one has to determine the type of system. Hughes and Coterrel (1999) have categorised systems as follows:

- *Information systems versus embedded systems*. The difference is that the information system interfaces with the organisation, whereas the embedded system interfaces with the machine. An example of an information system is SAP while an example of an embedded system is an air-conditioning system for a building.
- *Objectives versus products.* A project to meet certain objectives means that the method of reaching the objective is flexible as long as the objectives are met. In contrast, a products-driven project which has certain requirements on "how to" develop the product.

Many system development projects have two stages. The first stage is an objectives-driven project, which results in a recommended course of action and may even specify a new software application to meet identified requirements, for example, systems where hardware and platforms have been part of the requirements.

2.3.2 SYSTEM CLASIFICATION

Hughes and Cotterrell (1999) identified four types of system namely:

- *Open systems* are those that interact with the environment, which are nearly all systems
- *Closed systems* are those systems that have no interaction with other systems.
- *Suboptimisation systems* are those that as a subsystem works at its optimum, but have a detrimental effect on the overall system.
- *Sociotechnical systems* are those that require both a technological organisation and an organisation of people. For example, software projects where the project requires the project manager to be technically equipped as well as have people skills.

2.3.3 COMPARISON MODELS

Systems development can be explained in the form of a life cycle. Some system life cycles suggest that there are a number of identifiable and discrete stages, each of which is completed before the next stage commences in earnest (Example: Waterfall Process Model). Other models suggest that the process is interwoven and highly complex and although the stages are identifiable, they each form part of a continuous process.

The next table summarises the most popular systems development life cycles.

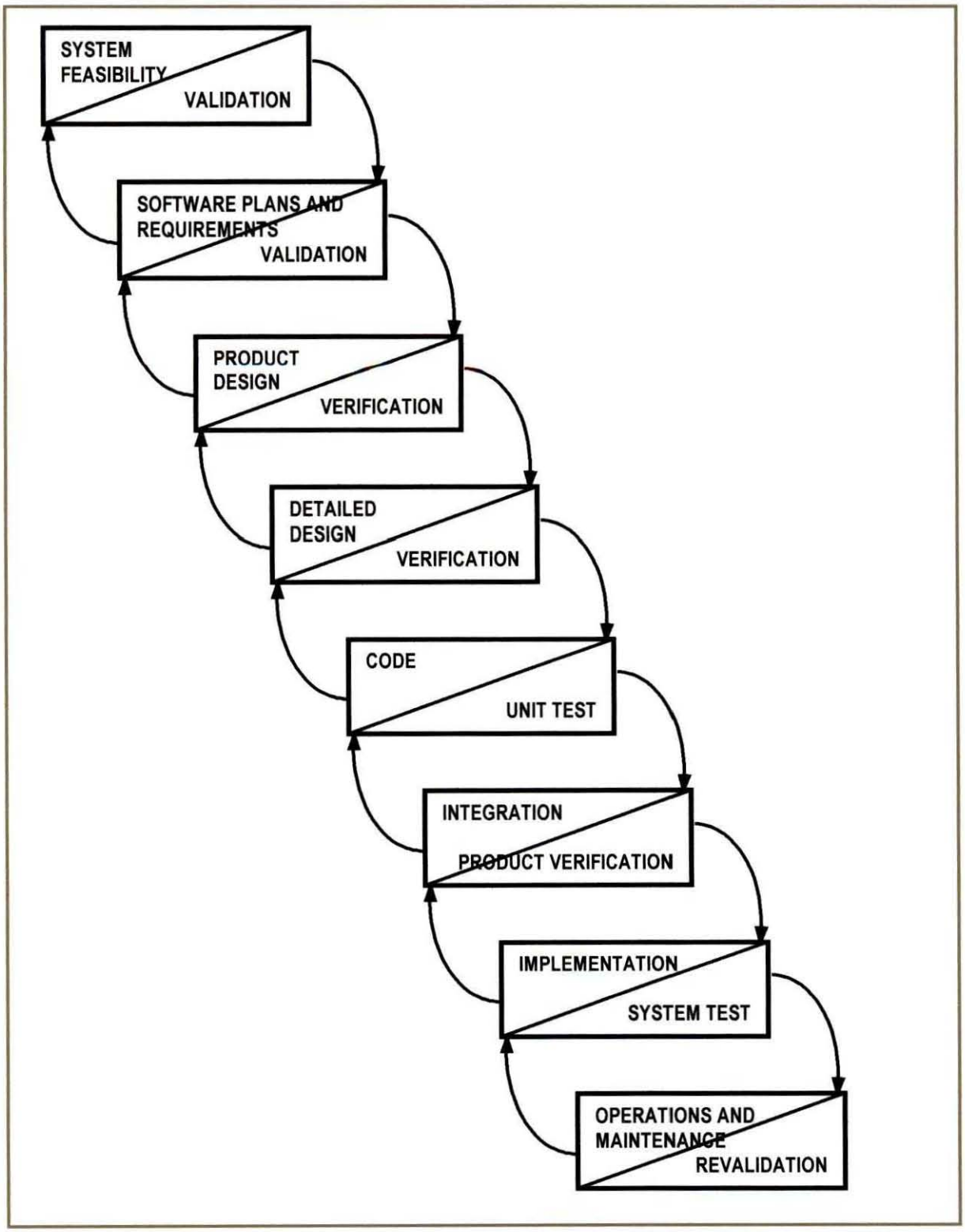
Systems development (Ahituv and Neuman 1990, p 268)	**Waterfall model** (Humphrey, 1989, p 250)	**Structured life cycle** Yourdon, 1989, p 89)	**Socio-technical** (Mumford, 1981, pp 7-18)	**Spiral model** (Boehm, 1989, p 29)
Preliminary analysis	System feasibility	Survey	Describing organisational system	Concept of operation
Feasibility study	System requirements			System requirements
Information analysis	Analysis	Analysis	Analysis of existing system	Evaluation and analysis
Systems design	Program design	Design	Design organisational system	Design, validation and verification
Programming	Coding	Implementation	Implementing the system	Coding
Procedure development		Acceptance test		Testing
Conversion		Database conversion Installation		Implementation
Operation and maintenance	Operations			Operations
Postaudit				
Termination				

2.3.4 THE WATERFALL MODEL – A PERSPECTIVE

The waterfall model was a highly influential model in the 1970's. It provided two primary enhancements to the previous (popular) model – stagewise model:

- Recognition of the feedback loops between stages, and a guideline to confine the feedback loops to successive stages to minimise the expensive rework involved in feedback across many stages.
- An initial incorporation of prototyping in the system life cycle, by means of a "build it twice" step running parallel with requirements analysis and design.

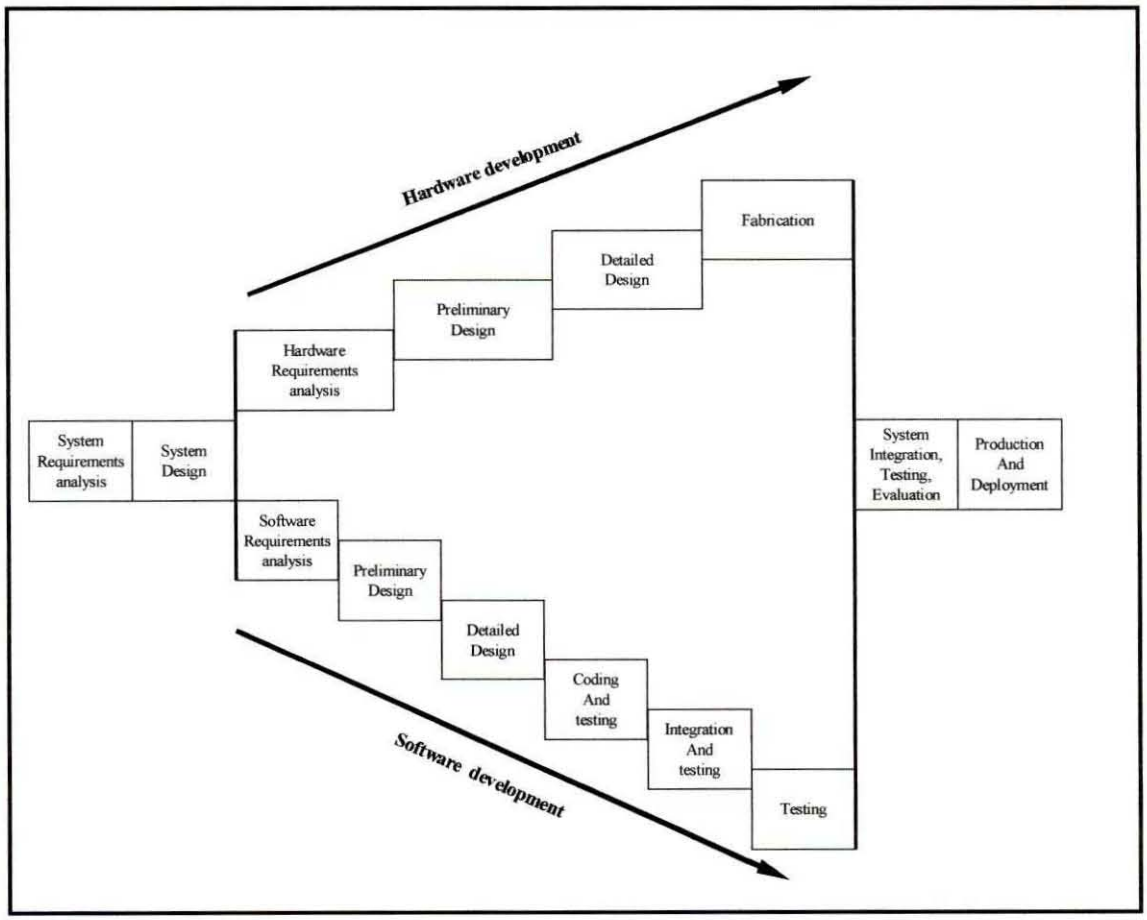
Hughes and Cotterel (1999:65) describe this model as a "classical" model. They also name the model the *one-shot* approach. They describe the model as a series of activities, in sequence, working from top to bottom. The waterfall model, in contrast, (see below) shows arrows pointing upwards and downwards. This indicates that at a later stage there might be scope for rework of the previous activity. Hughes and Cotterel also see the limited scope for iteration as one of the strengths of the waterfall model. On large projects, iterations might be problematic since the rework might change the course of action.



Source: Boehm W.: 1981; *Software Engineering Economics*, Prentice-Hall, Englewood Cliffs

Given this model, it can be argued that for different types of project, different activities are required. The waterfall model leans itself to customisation. In the event of a system encompassing designing new hardware as well as software, the activities can be customised to suit the needs. The sequence still stays the same.

For example, the military standards for developing defence systems in the United States of America prescribe this approach in their documentation (DOD-STD-2167A). The figure below is an example of a system development whereby hardware and software have to be developed.



Variations in different types of system development are as follows

- Complete system development
- Software development only
- Hardware development only
- Software modifications
- Hardware modifications
- And combinations of the above

Yeates (1991:p22) states that the standards for the development of new systems vary. However, the basic building blocks are the same in all cases and are

- Feasibility study
- Analysis
- Design
- Programming
- Testing
- Implementation
- Postimplementation support

Once the different steps have been finalised, the phases are broken down into activities that are inputted on a project management software tool for easy tracking. A brief outline of the various activities is listed in Addendum A.

But, the model lacks a clear definition of risk management and how to apply it. The question arises on which part of the model should risks be managed? Should the project manager deal with all the risks up front or should the risks be spread out over the complete life cycle? The next section deals with risks in the systems development life cycle.

2.4 CONCLUSION

I have argued (in chapter 1) that information technology projects in the South African Post Office are inherently very risky and provided reasons why the management report is focused on the systems development life cycle. In this chapter, I further provided the necessary background on the various terminologies and encompassing concepts of the systems development life cycle. The next logical step in the process is to deal with risks. All Information Technology projects bear risks that need analysis and management, though, in practice, formal risk analysis seems to be distinctly a minority pursuit.