

Developing a Competence Audit for Technological Innovation

Jan Cornelius Mentz

Prof. C.G.J. Pistorius

Engineering and Technology Management, Faculty of Engineering

Master of Engineering (Technology Management)

Developing a competence audit for technological innovation

By

Jan Cornelius Mentz

This thesis focuses on developing an instrument to contribute to technological innovation particularly with regard to improving the competitiveness of existing and prospective technological innovation. It aims to propose a methodology for the audit of technological innovation. A questionnaire is developed to evaluate the strengths and weaknesses of technological innovation processes.

Submitted in partial fulfilment of the requirements for the degree
M. Eng. (Technology Management) in the Faculty of Engineering

The requires the development of a competence audit for technological innovation. This audit will enable organisations to decide whether they have the required competencies to stand by technological innovation. The audit will also help to improve the innovation management of an organisation. The audit will be conducted by implementing an audit methodology in the form of a questionnaire. The questionnaire audits the competencies in the organisation by comparing them with previously defined best innovation standards. The comparison yields a set of recommendations that may be implemented further by the organisation. The audit is therefore to identify strengths and highlight strengths and weaknesses in organisations' innovation procedures.

University of Pretoria
Pretoria

November 1999

The final section of the thesis presents data gathered through the implementation of the developed competence audit for technological innovation. Five organisations were audited. The results coincide well with the expected competencies in other industries. However, the results should not be interpreted in a quantitative manner, for the aim of the proposed audit is not to derive action solutions, but rather to identify strengths and weaknesses in organisations' innovation procedures.

Key Words: technological innovation auditing, competence based process auditing, innovation assessment, identifying innovation strengths and weaknesses, innovation management procedures.

Title: Developing a Competence Audit for Technological Innovation
By: Jan Cornelius Mentz
Study leader: Prof. C.W.I. Pistorius
Department: Engineering and Technology Management, Faculty of Engineering
Degree: Master of Engineering (Technology Management)

Technology and the implementation thereof, has helped to develop the human race far beyond its fragile origins. It is technology that enables us to gather and produce our resource requirements such as food, water and other raw materials. It is technology that transforms our society and the way we interact, technology that influences our politics, economics and even in some cases our religion as well.

This thesis focuses on improving an organisation's capabilities to implement technology, particularly with regard to maximising the organisation's success at innovation and specifically technological innovation. It aims to develop a methodology for the auditing of competencies, in innovative organisations. Subsequently organisational strengths and weaknesses are identified vis-à-vis best innovation practises.

The thesis defines the terms 'innovation' and 'technological innovation', and then proceeds towards developing a methodology for improving technological innovation. This requires the development of a standard or benchmark, which will be able to guide organisations in deciding which of its own competencies are strong or weak. Equipped with such a standard in the form of an innovation model, the process of improving the innovation competencies in organisations may begin. This is accomplished by implementing an audit methodology in the form of an innovation audit questionnaire. The questionnaire audits the competencies in the organisation by comparing them with previously defined best innovation standards. This comparison yields a list of 'strengths' and 'weaknesses' that may then be pursued further by the organisation. The goal of this auditing process is therefore to identify and highlight strengths and weaknesses in the innovation competencies of innovative organisations.

The final section of the thesis contains data gathered through the implementation of the developed competence audit for technological innovation. Five organisations were audited. The results correlate well with the expected competencies of their industries. However, the results should not be interpreted in a quantitative manner, for the aim of the proposed audit is not to dictate absolute solutions, but rather to identify strengths and weaknesses in organisations' innovation processes.

Key Words: technological innovation auditing, competence based innovation auditing, innovation assessment, identifying innovation strengths and weaknesses, innovation management practises.

Titel: Die Ontwikkeling van 'n Vaardigheidsoudit vir Tegnologiese Innovasie
Deur: Jan Cornelius Menth
Studieleier: Prof. C.W.I. Pistorius
Departement: Ingenieurs- en Tegnologiebestuur, Fakulteit Ingenieurswese
Graad: Meestersgraad in Ingenieurswese (Tegnologiebestuur)

Tegnologie en die implementering daarvan het die mens vêr bo sy aardse agtergrond laat uitstyg. Dit is tegnologie wat ons in staat stel om primêre produkte te produseer, te verwerk en effektief te benut. Tegnologie verander die sosiale struktuur, die interaksie tussen mense, die politiek, ekonomie en soms selfs die mens se geloof.

Hierdie verhandeling beskou 'n organisasie se vermoë om tegnologie tot sy voordeel te implementeer, met ander woorde, om die organisasie se sukses met innovasie en meer spesifiek tegnologiese innovasie te verbeter. Dit poog om 'n metodologie vir die oudit van innoverende organisasies daar te stel, deur hoë impak vaardighede, eie aan die organisasie, uit te lig en met bewese goeie innovasie praktyke te vergelyk.

Die verhandeling begin met die definieëring van innovasie en tegnologiese innovasie om 'n basis vir die ontwikkeling van 'n innovasie oudit te skep. Om sterk en swak punte in innovasie te definieer, vereis 'n standaardmodel, waarin bewese innovasie praktyke vervat mag word. Toegerus met so 'n model, kan werklike verbetering van 'n organisasie se innoveringsvermoëns begin, deur sterk en swak punte uit te lig, waarop dan voortgebou kan word. Dit word vermag deur die implementering van 'n oudit metodologie vaelys. Die vaelys oudit die vaardighede, deur dit te vergelyk met bewese goeie innovasie standarde of praktyke. 'n Lys van sterk en swak punte van 'n organisasie, waarop dan gebou kan word, word so uitgelig.

Die laaste deel van die verhandeling fokus op resultate, na aanleiding van verskeie oudittoetse wat by vyf organisasies uitgevoer was. Die resultate is verkry deur die implementering van 'n ouditvaelys. Die meeste van die resultate het goed met die verwagtinge van die tipiese industrieë ooreengestem. Alhoewel mens geneig is om die resultate op 'n kwantitatiewe manier te beoordeel, is dit nie die doel van die verhandeling om dit so te interpreteer nie. Dit moet eerder op 'n kwalitatiewe wyse gebruik word, waar dit die sterk en swak punte van 'n organisasie se innovering beklemtoon.

Sleutel terme: tegnologiese innovasieoudit, vaardigheids gebaseerde innovasieoudit, innovasie assessering, identifikasie van sterk en swak innovasiepunte, innovasie bestuurspraktyke.

The author would like to thank the Academic Support Services at the University of Pretoria, and the assistance received from Ms. Christine Maud in the preparation of articles and information on innovation.

And last but not least, Mrs Mavis Menth for her formidable editing of the manuscript.

Acknowledgement

I wish to express my gratitude to the following individuals and organisations:

My study leader, Professor Carl W.I. Pistorius. For believing in me and creating the opportunity to find my own way through the process of researching and developing a masters thesis. I greatly appreciated his ideas, points of view, volumes of literature and advice. It was an honour to work with, and learn from him.

Debtak (Division of DeBeers)

Victor Ross

For the thought provoking discussions on technology, innovation and technological innovation, as well as the use of his organisation specific innovation model.

Grintek Avitronics

Alan Holloway (Managing Director)

For encouragement on the Proposed Innovation Model

Nedcor Investment Bank

André la Grange (Divisional Director)

For his inputs on innovation and remuneration of employees to encourage them to be more innovative.

To the following organisations for allowing me to test my ideas and a proposed innovation audit at their firms.

Kentron (Division of Denel)

Jan Mentz (Director)

Chris Haynes (Group Manager Business Development)

Gerrit Viljoen (Guidance & Control Consultant)

Spescom

Viv Crone (Technical Manager)

AMS

Christo Weder (Director)

EML

Keith Richards (Director)

KMS

Danie Saaiman (Director)

To the personnel of the Academic Information Service at the University of Pretoria, and the assistance received from Ms. Christine Mallo in the form of articles and information on innovation.

And last but not least, Mrs Wilna Mentz for her formidable editing skills.

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2.1 Defining Technological Innovation

2.1.1 Defining Technology as Innovation

2.1.2 Product

Richard Branson: *Business has only two basic functions:
Marketing and innovation.*

Elon Musk: *Marketing and innovation produce results.*

Peter F. Drucker: *All the rest are costs.*

2.1.3 Process

2.1.4 Market

— Peter F Drucker (1985)¹

2.1.5 Process versus Product Innovation

2.1.6 Product versus Disruptive Innovation

2.1.7 Market Pull versus Technology Push Innovation

2.1.8 Co-Innovation

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¹ Drucker P.F., [1985] *Innovation and Entrepreneurship*, Harper & Row, New York.

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In times of all time, unlike the many remarkable new business concepts that are often only aware of the results of their innovation, innovation is a continuous process. In order to improve, renew and change, recent advances in technology and management in business, in particular, are raising the development of improvement processes in areas such as technology management, core competence analysis, strategic alliances and many others. Innovation, although not exactly a discipline, has been neglected and left to happen on its own. Managers were never told that it is too hazardous to manage innovation, and one should be happy when the risks are positive. This thinking may be slowly changing as managers and managers in organisations better understand the process of innovation. Consider, though, to mind, the discipline of auditing the innovative process, may also play a crucial part in improving innovation.

The basic factors of improving an organization's capability to innovate are technology through the process of innovation auditing. The audit will focus on determining the organization's success at innovation and continuity and renewability of innovation by identifying key competencies in innovation. A structured methodology for the auditing of these key characteristics by comparing the organization practices, as identified within the innovation discipline, with those

proposed to do so innovation audit of any organization after defining an misconception that a measurement of the outputs of the innovation process was to make. Often audits are intended with explanations on the typical types of processes of the innovation of the organization over the past year. However, innovation auditing goes deeper than simply looking at the outputs from the innovation process. Rather, it focuses on the steps followed during the innovation process, to better understand and improve the actual process. By focusing on the steps, as well as the competencies associated with them, the innovation audit is going to improve the innovation process, by isolating the strengths and weaknesses in the organization's innovation process.

Developing a technological innovation audit is not a blunt task. The field of innovation is incredibly wide, and exacerbating this are the many different methods for classifying the field. This may be seen in the many different innovation models and proposals for improving the process, as well as in the volumes of academic and research available on certain different aspects of the process. In the process of developing an innovation audit, the thesis found it necessary to define the technological innovation process, and set a foundation upon which a questionnaire may be built. However, in defining technological innovation, reaction is immediately