Chapter 7

# CONCLUSIONS AND RECOMMENDATIONS

## 7   Conclusion and Summary

A golden thread runs through this thesis, with the end goal in mind of developing a competence audit for technological innovation. It starts with the development of an innovation model as foundation, and then progresses to the development of a methodology for implementing an innovation audit. The methodology, in chapter four, is followed by an extended discussion in chapter five on best innovation practises. These practises form the foundation for the final audit questionnaire. The goal of the thesis is reached in chapter six, where a number of questions are proposed to establish a final audit questionnaire.

One should be cognisant of the fact that the auditing of competencies for technological innovation, does not lie in the implementation of an audit questionnaire only, but that every part, from modelling, to implementing a methodology based on best practises, through the means of a questionnaire, constitutes an innovation audit.

Although the innovation audit proposed is probably not the best or the final version, a firm foundation in the proposed innovation model, has been set. As stated before, the heart of the innovation audit lies in identifying the most practical standards to use when auditing. In the diverse discipline of innovation, this often looks like an impossible task. However by splitting the various subjects into the areas as proposed by the innovation model, a holistic picture of the innovation process may emerge.

A lot of research is still necessary to identify which 'best practise standards' have the greatest influence on the innovation process. The audit questionnaire succeeded in narrowing some of the key aspects down, yet their ability to influence the innovation process, has not been confirmed. Through trial and error and over many years of innovation auditing, this may develop into a formal standard, to be used in all innovation audits.

## 7.1  Audit Validity

Is the competence audit for technological innovation, as proposed in this thesis, valid?

This is a very difficult question to answer from a pure academic perspective. Although field-testing has been done to improve the proposed model, audit methodology and audit questionnaire, the validity of the competence audit for technological innovation lies in its application. It is only through the application of the proposed innovation audit in industry, that the finer details will be ironed out. One may expect the same measure of competence and professionalism in innovation auditing only after years of implementation, similar to that of financial auditing practises.

Some of the current limitations to the proposed model, audit methodology, and audit questionnaire, are discussed below.

## 7.1.1   The Proposed Innovation Model (Chapter 3)

To develop a sensible audit the construction of a model for the process to be audited was found to be imperative. Although other models in the field existed, the author felt it would be unethical to use them directly in an innovation audit. A decision was made to first study many models to better understand the method of innovation and possibly reach some conclusion to its improvement.

The proposed model is a combination and adaptation of current models available in literature. Aspects from models by Twiss[1] and Utterback[2] may be directly identified in the proposed model, while others such as Tidd *et al*,[3] Marquis,[4] Katz[5] and Thamhain[6] contributed significantly. The model is therefore not without foundation and although it may look new, it actually represents many proven innovation practises, as well as some of the more recent and radical ideas.

One part of the model is new and seldom found in other innovation models. The explicit introduction of the 'individual', focuses the proposed model on the competencies and capabilities of the organisation, rather than the products or processes employed. It breaks away from the more traditional outlook on innovation as being a causal and linear process, as proposed in models by Twiss,[1] Utterback,[2] Tidd *et al*,[3] Marquis,[4] Katz[5] and Thamhain.[6] The author feels the need to explicitly include the individual, due to the clear abundance of human involvement in the innovation process. New developments in the field of knowledge management, that clearly tie in with the subject of organisational competencies, also had an impact.[7]

The model was discussed and offered for criticism to many organisation managers, and although some remarks on the inclusion of minor aspects to the model were made, not one of the individuals disagreed with its representation of the innovation process. This gave the author the reassurance to proceed with developing an audit methodology and audit questionnaire, both of which were based on the model and its possible application.

## 7.1.2   The Proposed Audit Methodology (Chapter 4)

The audit methodology was largely developed with the aid of financial audit practises and the work by Chiesa *et al*.[8] Few innovation audits have been implemented or developed up to date. Finding relevant methodologies in this area therefore proved difficult. The decision was made to base the methodology proposed in this thesis on implementing the innovation model, and then measuring the organisation against this.

Much research is still required in developing methodologies for implementing innovation audits. Aspects such as the time frame between audits, the extent of the audit, the hierarchical depth of the audit should all be addressed in collaboration with the organisation, before starting the actual audit. As the discipline of innovation becomes more critical in years to come, developing methodologies for improving innovation, will become more important as well. Although this is a slow process, the time for innovation auditing may come sooner than expected. Hopefully the methodology in this thesis illustrates some of the aspects for the development of better and more user-friendly innovation audits.

### 7.1.3 Defining Best Innovation Practises (Chapter 5)

Chapter five aims to identify and illustrate a holistic overview of current innovation practises employed by organisations. Its goal is to give a non-exhaustive, but as representative a view as possible, on the best practises in innovation. Due to the nature of innovation and its multi-faceted diversity, the chapter cannot claim to be absolutely comprehensive. It does, however capture and explore many of the aspects of the innovation process, as well as the proposed innovation model developed in chapter three.

From the many aspects addressed in chapter five, it was possible to construct questions to use in a proposed audit questionnaire. The chapter therefore succeeded in creating a foundation for the measurement of innovation and the developing of a innovation audit.

### 7.1.4 The Proposed Competence Audit for Technological Innovation (Chapter 6)

Chapter six encompasses the proposal of various key questions to the development of a successful technological innovation strategy. The validity of these questions are also tested as part of a beta test.

The questions included in the audit questionnaire possibly received the greatest amount of criticism, as compared to the proposed innovation model developed in chapter 3. Although this was expected, many truths and limitations to the questionnaire were revealed.

During the beta test phase, the lack of understanding of the questions in the innovation questionnaire, became apparent. Other aspects such as truthful answering, and rushing to finish also played a role in affecting the final results. Although the questionnaire is ideal for large groups of people, it would be much more sensible to conduct direct interviews where small audit groups are concerned. The intimacy and ability of the interviewer to explain the questions, may lead to more accurate answers. Ultimately this would ensure representative audit results.

The author does not postulate that the audit questionnaire is the ultimate or final version in developing an innovation audit. Many different possibilities such as interviewing, group sessions, facilitation and others may find application in an innovation auditing. The best way for auditing will be discovered through trial and error and may look completely different from the neat academic proposals made in this thesis.

## 7.2 Recommendations

The audit was tested in the South African environment and is therefore subject to conditions experienced in South Africa. Many of the following positive and negative aspects observed, while testing the audit, are a direct result of the South African environment. However, some of the organisations have strong foreign interests and they should therefore offer a better international perspective.

Since the proposed innovation questionnaire is greatly influenced by perceptions and human ideals, many factors may influence the auditees' answers. Although the questionnaire was developed with this in mind, therefore the four answers per question, negative or positive perceptions on innovation or the organisation, will influence the questionnaire greatly. Some of these include:

Positive aspects fostering innovation in South Africa:
- Highly creative people
- Many opportunities
- Some world class organisations
- Good background in research and development especially in the arms industry
- Improved business environment after elections (1994)
- Stable business environment with many exchange rate advantages
- Good tertiary education facilities, starting to include innovation and technology as main study directions

Negative aspects suppressing innovation in South Africa:
- A generally poor knowledge on the implementation of innovation in practise
- A poor understanding of the complexity of the innovation process
- Biases against the relevancy of innovation modelling
- The amount of research still necessary to formulate an audit discipline, as compared with financial auditing
- The difficulty in defining best of breed practises.
- The multi-faceted aspects of innovation and their required management
- Poor linkage between innovation process and strategic planning
- Not enough innovation improvement programmes
- The importance of the individual is misjudged
- The narrow focus many organisations have with regard to innovation
- Poor leadership and bad management of innovation
- Encumbering organisational structures
- The poor national market and difficult international market environments
- Lack of foresight
- Lack of importance attached to innovation
- Diversification away from core competencies

One of the greatest stumbling blocks facing the successful development of a innovation culture in South Africa, is the lack of education. Innovation absolutely requires higher education and without even basic education being a standard in South Africa, many years of difficulty may be expected. South Africans should realise that when they try to sell their products in the international market, they are in direct competition with the best in the world. And competing with the best in the world means the organisation requires a workforce equal to, or better than, the best in the world. Therefore the country with the best-educated population will ultimately be the most prosperous. Unfortunately the World Competitiveness Report indicates South Africa as the country with the lowest score in the field of population,[9] clearly illustrating South Africa's enormous disadvantage to other first world countries.

Some other aspects of the innovation audit that have to be developed further, may include the following dichotomies:

### Open Ended versus Set Questionnaire Auditing

The above mentioned influences on the perceptions of the South African population have to be factored into the innovation audit in some way, or otherwise removed from the responses by the auditees. In this regard a more open-ended audit may work better. If a process of asking open-ended questions, rather than set questionnaire questions, was followed, auditees may be asked to motivate their answers. This would then indicate any negative biases or other influencing factors, which could be factored out at a later stage. This may result in more truthful answers to the key points on innovation. However, how does one quantify open ended answers and is it therefore possible to sensibly perform an open ended innovation audit? This has to be researched in further development of innovation audits where the advantages between formal questionnaire based audits may be weighed against informal open-ended audit methodologies.

### Qualitative versus Quantitative Auditing

Even though the audit methodology proposed in this thesis focuses on the qualitative aspects of the innovation process, some valid reasons exist for focussing on quantitative measures. Control, clear unbiased standards, efficient measures, and reproducible answers are the measures traditional auditing are based on. To be able to say unbiasedly that an organisation produced this number of innovations, or that amount of time was spent on a certain task, is highly valuable to the management of any process. Unfortunately innovation is not a 'defined' subject and few if any quantitative measures, or metrics, are available.

### One Audit Versus Many

Innovation is a vast discipline. To audit such a discipline one can not expect a single audit questionnaire containing approximately fifty questions, to master the task. To attempt this would result in unnecessarily complicating the questions, when trying to incorporate innovation's complex parts. Rather a path including a master audit followed by several in-depth, but specialised audits, may be followed. Such a master audit may identify the key areas of weakness in the organisation, which may then be investigated by more specialised audits afterwards. The proposed audit in this thesis may be regarded as a master audit, to be used in identifying the key strengths and weaknesses in the organisation. As such it does not focus on specifics, but rather the common foundations of innovation.

### Formal versus Unplanned Innovation

The assumption of the audit in this thesis is that the innovation process in an organisation is formal and not left to happen at random. Two different viewpoints on innovation propose that innovation is intrinsically unmanageable and may be encouraged but not expected. On the other hand this thesis follows the viewpoint that innovation is manageable and may be improved through the formal structuring thereof. Rather, it is the 'creativity' part of innovation that may be classified as random. Although an argument may be made that even creativity may be formalised by systematically searching for new ideas and entering them into a storage system, for later application if not immediately valid. However, by ultimately giving a formal structure to the innovation process and including it into the organisation's strategy, it is brought to the fore and may be managed to the advantage of

the organisation. This immediately opens the door for 'normal' employees to take a direct interest in innovation and follow the examples set by management and organisational strategy.

Innovation is a complex discipline but by exposing the necessary capabilities, methodologies and structures for improving it, more employees and organisations may feel comfortable to try their hand at it. Innovation has for too long been the subject of the 'weird or creative', and educating organisations to the advantages of a better structured process, should be of paramount importance to academics and industries with the necessary knowledge.

## 7.3 Conclusion

The time for innovation to become a major part of every organisation's business is nearing at an alarming speed. Although not every organisation in South Africa may be of that opinion, the seeds of such a discipline is germinating in traditionally high innovative countries such as the United States of America, Israel, and even some European countries. Developing methodologies for improving innovation is of utmost importance for the future survival of South African organisations, and with the recent trade agreements between South Africa and the European Union, it will increasingly surface as one of the best methods for creating competitive advantage and growth.

## 7.4 References

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