A PROPOSED COMPETENCE AUDIT FOR TECHNOLOGICAL INNOVATION

6   A Competence Audit Questionnaire

This chapter will introduce many of the questions as well as reasons for including them in the audit questionnaire. It draws on literature in the field of innovation management, social behaviour, industry analysis, as well as technology to name but a few. Several studies have been done on identifying key aspects in the field of technological innovation and many of the questions find their origin here. Other questions were developed on the foundation laid by the innovation model proposed in chapter three.

The following questions were compiled for the implementation and testing in an audit questionnaire. The actual test questionnaire, illustrated in the addendum [Appendix C], was compiled for the purpose of beta testing the questions proposed in this chapter. As such the questionnaire covers many different aspects of the innovation process, touching on things such as culture, creativity, flexibility, management style, and many others. Innovation is a diverse process and no one single best avenue for success exists. It is often a coming together of many different disciplines, all effectively partaking in the innovation process, which has the greatest influence. This means that the management of innovation per sé will become increasingly important as globalisation and competitiveness increase.

The chapter will be concluded with the implementation of the test questionnaire and the discussion of some of the results obtained.

6.1 Identifying Representative Questions and Answers

Innovation consists of many linear and non-linear processes, yet ultimately it has a beginning and an implementation or end. This may be observed in innovation models as defined by Noori,[1] Twiss,[2] Utterback,[3] Marquis,[4] and Katz[5]. To represent every aspect of this process as well as possible, this thesis proposed a model in chapter three and this will form the foundation and structure for identifying representative questions.

Not all questions were considered. The focus fell specifically on publications, books or databases with strong research backgrounds and high professional standing. Other published sources with thorough research and implementation of the findings were considered as well. Few if any of the questions were simply 'thought out', but all were adapted and changed to suit the audit style and implementation methodology. Often some of the accompanying literature was used to formulate the proposed answers as included in the audit questionnaire.

Many reasons existed in deciding between including or excluding audit questions. But these were reduced by the well laid out innovation model and best practises proposed in chapters three and five respectively. The questions simply reflect these boundaries set beforehand through thorough research of the field of technological innovation. However some of the more obvious reasons for including or excluding a specific question are listed below:

Reasons for including questions in the audit:
1. Proven or thoroughly researched questions.
2. If the question targeted a key area in the innovation process without which it may easily fail.
3. If the question fell into a specific area of the proposed innovation model which lacked sufficient representation.
4. Questions aimed at competencies required for innovation in stead of metrics or steps in a process.
5. Representative questions which would be generic enough to enable a wide audit application field.
6. Questions aimed at medium to large organisations with established innovation processes, rather then small or micro enterprises (entrepreneurship questions were avoided).
7. To make sure a holistic representation of the innovation process is conveyed through the questions and their implementation.

Reasons for excluding questions from the audit:
1. Questions with poor correspondence with the audit topic.
2. If too high a concentration were found in certain areas of the proposed innovation model.
3. Questions with too much of an applied nature.
4. Duplicate questions were consolidated into single ones.
5. Questions not aimed at competencies but rather at metrics or process steps.
6. Questions aimed at small or micro enterprises.
7. Questions requiring a high degree of knowledge or background in innovation which would not be understood by the auditees.

6.2 Proposed Competence Audit Questions

Considering the above mentioned criteria as well as all the previously discussed innovation best practises in chapter five, the following questions were selected. They offer a holistic view as proposed by the audit model in chapter three and should represent its different sections. However, due to the limited nature of this masters thesis a claim of total comprehensive representation of the innovation discipline is not made.

6.2.1 Interaction with the External Environment

6.2.1.1 Technology

1. Is <u>dynamics of technological change</u> a priority for strategic and general management, in deciding what new innovations to pursue, and where the company is heading?

Yes, always	Often	Sometimes	Almost never/ not yet

2. Is there an ingrained knowledge throughout the organisation of <u>key technologies</u> and how they contribute towards strategy and core competencies?
   (Key technologies are those which the organisation's bottom-line depends on, with the greatest influence on efficiency, capabilities and are process oriented, or improve development.)

Yes, almost everyone	Most of the organisation knows and understands our technologies	Probably only senior management knows this	I don't know our key technologies or how they contribute

3. Is <u>licensing</u> of technology, in and out, actively pursued and are the criteria clearly stipulated? *(selling patents, licensing in (buying) of technology, licensing out (selling) of technology)*

Yes licensing is often used when applicable	Licensing is used only if we are unable to do it ourselves	Licensing almost never used + criteria unclear	I don't know about our licensing procedures

4. Do you use exploratory techniques to identify and predict <u>future technologies</u> for subsequent implementation into your foresight program? *(e.g. technology scanning and monitoring, scenario analysis and Delphi)*

Yes, active monitoring and scenario planning are done in conjunction with the organisational strategy	Changes are being implemented from technology scan with some positive improvements visible	A technology scan has been done yet nothing changed	Little or no technology scanning is done

5. Do your broad organisational <u>technology trajectories</u> (as outlined in the strategy for future development) foster innovation?

Strong scientific R&D components + long term technology development	Some scientific and unique research yet most emphasis on scale	Future technologies focus on cost cutting and reengineering	I don't know about our future technology needs

6.2.1.2 Market and Customer

1. Is there an intimate <u>knowledge</u> of the <u>market/customer</u> and its needs, preferences or demands with every person involved in new projects/innovations? *(Each function, from R&D, to design, to manufacturing, to after sales service, knows the needs and preferences of customers and how this product will satisfy them? "These guys really thought before designing this!" "This is a well designed product!" "This is beautiful and so useful, it's just what I needed".)*

Yes, there is an intimate knowledge built through personal contact and observation of product use	A strong knowledge of market needs exists, yet products sometimes miss expected markets or initial user needs	Customer needs difficult to translate to actual work done in organisation	Market not yet well identified, yet information from marketing agency used extensively

2. How strongly does the <u>market/customer influence</u> the characteristics, introduction price, operating procedures and final outcome of the project?
(Does the customer have a say in the features of the product, its safety, its reliability and its "looks". Does a feedback system exist for customer comment on current products?)

Customers part of development team, as well use of screening with customer groups	Customer needs and preferences used throughout development, yet little direct contact between project team and customer	Customer input used, yet often irrelevant since customer doesn't know what he/she wants	Market needs used as identified by marketing department

3. Are criteria for <u>market/customer development</u> clear? *(Is the market developed before launching a new product; is advertising or similar development techniques used effectively.)*

Strong market development with design and R&D giving input to marketing	Some market development done by advertising and personal contact with customers	Little market development done, just product advertising	Little or no market development is done

4. Is the development capability of <u>lead users</u> (consumers that usually buy the first of almost everything) fully exploited? *(These consumers can give valuable critique on the product when in final development stage, since they usually have a good technical knowledge. E.g. Netscape launching a beta browser version and asking the lead users to find any bugs.)*

Yes, lead users are identified and used extensively	Some preference made between customer test groups with emphasis on technical and non-technical people	Customer test groups are identified at random	No lead users are identified

5. Do you use exploratory techniques to identify and predict <u>future market trends</u> in line with the strategic foresight of the organisation? *(e.g. market positioning and trend analysis, scenario analysis and Delphi)*

Yes, active monitoring and scenario planning are done in conjunction with the organisational strategy	Correlation between strategy and market analysis with some benefits starting to occur	Market analysis is done, yet it is not linked to strategy	Little or no future market analysis done

6.2.1.3 Industry

1. Do you encourage <u>suppliers</u> to develop their systems and products to deliver a higher quality and overall better product to you? *(Strong relationships between you and suppliers can improve delivery, quality, price, and add to the total value chain)*

Yes, direct contact and deliberation on new products with emphasis on best supplier possibilities	Lots of encourage-ment as well as pressure	Some encourage-ment	Little or no contact with suppliers on such issues

2. Are your motives for <u>collaborating</u> with other companies in the industry made explicit, and related to subsequent outcomes? *(Do industry work groups exist to develop certain basic needs for the industry. — e.g. Japan's industries stand united against the world, yet compete fiercely on national level.)*

Yes, direct contact and collaboration with clear motives and outcomes	Lots of collaboration	Some collaboration	Poor relations with competitors and other role players

3. Is benchmarking used in your industry on a national and international scale? *(how does your organisation compare with the best in the world)*

Yes, regular benchmarking used nationally and internationally	Regular benchmarking used	Some benchmarking used	Poor relations with competitors and no benchmarking used

4. Compared to your competitors, does a strategy exist that will result in your ultimate leadership in the industry (niche), through development and innovation? *(secrecy, accumulated tacit knowledge, product complexity, complementary assets, learning curve, standards, patents, lead times and product support)*

Yes, our strategy takes competitors into account and will try to lead to leadership	Some competitor trends included in strategy	Knowledge of competitors, yet their development not included in strategy	Competition's strategies not known neither our own future development

5. Do you learn from the competition, and is competitive intelligence used? *(R&D and reverse engineering, licensing, hiring, information collection)*

Yes, good intelligence of competitors available and is used as learning tools	Regular intelligence and learning activities are undertaken	Some competitor intelligence available	No or little knowledge of competitors

6.2.1.4 Political, Economical and Social

1. Do you specify and communicate your education and training needs to local and leading providers? (*Universities, Technicons, or NGOs*)

Yes, continuous contact with short courses and research programmes	Regular contact yet little input or direction given	Some contact no input	None or little contact with such institutions

2. Are all parties influential to new projects or innovation, captured by your information network? (*national and international "gurus" in the political, environmental ("green"), economical, social and government arena*)

Yes, continuous contact with strong benefits	Regular contact and some benefit derived	Some contact little benefit	None or little contact with such parties

3. Do your links with government provide early warning of relevant regulation, promotion and mechanisms that would have a positive or negative impact on your organisation?

Yes, many links with strong benefits	Many links with some benefit derived	Some links exist	Little or no such links

4. Are potential <u>advantages,</u> that may derive from the <u>national environment,</u> effectively used and implemented? *(Tax breaks, special development areas, science base, input prices, workforce skills, market demand, support industries, and other.)*

Yes, all available advantages are employed	Many advantages used	Some advantages used	Don't know of any

5. Is action being taken to <u>benefit</u> from <u>foreign systems of innova</u>tion? *(Foreign investment, joint ventures and alliances, trade agreements, suppliers and customers, licensing, reverse engineering, public research)*

Yes, all available advantages are employed	Many advantages used	Some advantages used	Don't know of any

6.2.2 Organisational

6.2.2.1 Strategic

1. Does an <u>active foresight programme</u> exist, looking five to ten years into the future, complementing the strategy in reaching the future of your organisation?

Yes, foresight and strategy, shape our future focus	A foresight study has been done	Some future planning is done	Don't know of any

2. Are <u>new generation products</u> and technologies planned and developed in accordance with your foresight and strategy formulation? *(number of new generations of products planned in advance)*

Yes	Most new projects are strategic and in accordance with the foresight	Some projects are strategic	No or I don't know

3. Does the overall <u>foresight and business strategy, link with innovation</u> and innovation management throughout the organisation? *(Are clear goals for innovation set, and is innovation seen as a method for gaining a competitive edge over competitors.)*

Yes, mostly	In certain cases	Marginally	No or I don't know if it does

4. Is the correct structure for a particular innovation determined, be it tiger teams, multi-disciplinary teams, functional participation, or matrix based, with strong leadership and early involvement by future members of the chosen structure.

Yes, best possible team structure chosen with early participation of all functions that are present in the team throughout the innovation lifecycle	Task team as well as good concurrent engineering practices	Some flexibility with better involvement of innovation parties	Only one formal structure with functional participation as project reaches each stage in the lifecycle

5. Do you clearly identify potential new company technological competencies — corporate visions, technical judgements, product-technology matrices, incremental trial, error and learning?

Yes, all available advantages are employed	Many advantages used	Some advantages used	Don't know of any

6.2.2.2 Implementation

1. Is your organisation able to extract the ultimate amount of advantage from available resources, and previous experiences? *(Learning (project review) and realising new possibilities for current resources, can significantly reduce an organisation's overhead costs i.e. Japan)*

Yes	Mostly	Sometimes	Not really

2. Do new innovations/ventures have a balanced repertoire of product development, production, and distribution? *(If compared to a three-legged chair, if any one is not present, consequences can be disastrous.)*

Yes	Mostly	Sometimes	Not really

3. Is there a measure of elapsed time, from the first funding of a new innovation and the time it takes to recover the investment through market sales of that particular innovation? *(Time for ROI)*

Yes, clear metrics and measurements for new developments are in place	Mostly	Sometimes, yet generally little track is kept	Not really

4. Is there early involvement (while still planning) and concurrent working by as many functions as possible, within the new product development system?

Yes	Mostly	Sometimes	Not really

5. Are there formal procedures for reviewing new product development progress against a series of stage 'gates' throughout the innovation lifecycle?

Yes	Mostly	Sometimes	Not really

6.2.2.3 Fostering Environment

1. Do career structures and skill improvement courses, include learning about creativity, core competencies, technology and innovation and how to implement it practically in each employee's working environment?

Yes, almost all employees learn of these concepts	Most management people	For some employees	Not that I know of

2. Are key individuals identified, advertised, recognised and supported by management, to make the necessary information and experience available to entrepreneurial employees, in your organisation?

Yes, we have an active key peoples network	Mostly	To a certain degree	Not that I know of

3. Is your organisation capable of actively learning, as well as learning faster than competitors, from each new product innovation, even if the innovation was unsuccessful?

Yes	Mostly	Sometimes	Not really

4. If a new product fails, is there a feeling of total dismay and hopelessness concluded in shutdown of the project, or does quick learning occur from the experience, followed by renewed vigour for succeeding and making the project work better? *(Few first innovations are immediate success stories. New product market expectations are always difficult to judge, and the only way is by actually launching a product and learning from the reaction.)*

Yes always	Mostly	Sometimes	Not really

5. Does management or leadership expect innovation and creativity, and strive's to create a truly friendly environment for new ideas and expectations to be discussed and pursued?

Yes, management leads the way through excitement and example	Innovation expected, rewarded and fostered but not by all	Innovation expected but little done to create the environment	Not really

6. Does a flexible incentive scheme exist, with rewards that have a real influence on employee innovativeness? *(Base pay with bonus opportunities doubling or even tripling the base salary)*

Yes, a good formal and informal incentive schemes exist	A formal innovation scheme exists	Year-end bonus scheme exists	Not really

6.2.3   Individual

6.2.3.1   Personality and Feelings

1. If you win the lottery tomorrow with a total prize of $10 million, would you?

Invest the money and continue working	Take a long vacation but stay on in your current position	Resign after completing immediate tasks and responsibilities	Immediately resign and do whatever you like

2. Do you feel compelled to be as creative as possible when solving problems, or starting with a new project? (*Do rules and regulations exist limiting your creativity or inhibiting controversiality.*)

Yes	Mostly	Sometimes	Almost never

3. Do you as an individual experience the strategic goals of your organisation (as set by the foresight and strategy of your organisation) as motivational?

Yes	Mostly	Sometimes	Not really

4. When pursuing or suggesting an innovative avenue, do you at any stage feel threatened (promotion wise, to be showing disrespect, being ridiculed, feel foolish, seem to be naïve, fear of failure, not wanting to stand out, being branded as different, or losing social standing) by management or colleagues?

Yes, I often feel threatened in some way	Many times especially in the company of superiors	Sometimes	Not really, the culture is very open and most things go down well

5. Do you as an individual feel like you are making a significant contribution to your organisation's strategic and foresight goals, or do you feel like a cog in a huge machine?

Yes, I often feel significant	In many projects I have felt significant	I sometimes feel significant	Not really

6.2.3.2 Knowledge, Intelligence, Experience and Background

1. When starting a new project, are you and your colleagues made aware of the common goal for the project, as well as the significance to the organisational strategy? (common goal = total project goal = successful market penetration = reaching planned strategic future)

Yes, always	Mostly, depending who is involved	Sometimes, yet depending on who is involved	Seldom or not really

2. Are you creative in new projects or do your years of experience inhibit crazy ideas, - possibly childish or ridiculous? (Do you use creative techniques in your own work and in group situations?)

Yes, I always try	Mostly, if time allows	Sometimes, depending on the project	Seldom, I just try to finish the project on time in 'spec'

3. Do you often study inside and outside your field to improve your knowledge base, enabling you to adopt different approaches, when solving problems? (Self motivation to grow and learn)

Yes, I try to broaden my knowledge on many aspects	Mostly if time allows	Sometimes	Not really

4. Are you aware of the key people (champions, gatekeepers, entrepreneurs, mentors) in your organisation to contact if a new idea occurs to you, even if it is completely outside your department's field of expertise?

Yes, I know all the key people and how to get in contact with them	I am aware of most key people	I am aware of some key people in my department	Not really

5. Do your family and home environment support you in entrepreneurial efforts you make at the office, even if it may result in a negative outcome?

Yes, my family is part of my work and is prepared to adjust as I am for them	Mostly	As long as the changes do not impact to severely	Work and home do not mix

6.2.3.3 Social Environment

1. Do you have a <u>relationship</u> of communication and understanding with at least one person in each of the functional departments of your organisation?

Yes, I have a relationship in each of the functions and it always broadens my perspective when discussing new projects with them	I know most relevant people in the different functions	Some relationships, yet they are not specifically in certain departments	Not really, I am not that social

2. Does a spirit of <u>innovation and dedication</u> prevail throughout your organisation, recognising and celebrating employees brave enough to propose new innovations or whom are creative and resourceful in their daily tasks?

Yes	Mostly	To a certain degree	Not really

3. Is it possible that everybody in your organisation <u>essentially thinks in the same way</u> (is the workforce predominantly engineers/ economists/ lawyers/ doctors) or are diverse thinking really present? *(Do most employees follow and agree with the leader or manager and form a sort of herd around a single person, without giving their opinion, or sometimes not even having an opinion of their own?)*

Yes, it is quite possible	It is mostly possible	To a certain degree, yet we are quite diverse	No, we are an extremely diverse group of employees, ranging from many different countries, as well as occupations

4. Are there any <u>mavericks or 'weirdoes'</u> in your organisation, and are they sort of accepted in the social structure of your organisation. *(They are often catalysts for different thinking and breaking the herd mentality)*

Yes, mavericks are purposefully hired and made to feel welcome, as any other employee	Some mavericks are hired, yet they seldom fit in	Most new employees are hired to fit in, yet the few who slip through, are accommodated	Not really, no weirdoes

5. Is there a person or persons in your organisation that tells and embodies powerful and purposeful <u>stories</u>, with the aim of imbedding in the identity of the organisation's past legends, faiths, myths, and stories relating to innovative activities and highly successful past and future activities?

Yes, we have many storytellers	Some do exist, yet their value are not recognised by management	Few active story tellers, but stories in the form of rumours do occur	Not really

6.3 Conclusion to Audit Questions

The aim of the audit questions is to extract a representative view from the auditee on the competencies seated in his/her organisation. By arranging the questions in sections as proposed by the innovation model in chapter three, this was accomplished.

The diverse nature of the innovation process may require many more questions than the ones proposed above. However, by balancing the advantage of adding more questions to the audit questionnaire against the supposed improvement they may introduce, should limit the number of audit questions. Making the questionnaire as user friendly as possible and not too long, also impose a severe limit on the amount of questions that may be asked. These two factors were the determining factors in limiting each section in the questionnaire to five or six questions only.

By asking generic and holistic questions the audit is able to identify strengths and weaknesses in various areas of the organisation. The results from the audit questions and the identified strengths and weaknesses may be included in a threat and opportunity analysis, with subsequent strategy formulation for the organisation.

6.4 Testing the Proposed Competence Audit

To test the proposed innovation model, the proposed audit methodology and the audit questionnaire, a number of South African technology based organisations was approached. Successful audits were completed at a total of five organisations in the regions of Pretoria and Johannesburg. Various hierarchical audit depths including management level audits, operational level and disciplinary level audits were tested at the audited firms.

The following paragraph will illustrate the procedures followed to beta test the audit questionnaire. Some of the results from the beta test process will be discussed, as well as their significance for the innovation audit methodology. The chapter will conclude with remarks on the implementability of the questionnaire, and proposed audit methodology as discussed in chapter four. The innovation model and the best practise standards discussed in chapters three and five respectively, will be reviewed on the basis of the beta test as well.

6.4.1 The Beta Test Procedures

To test the audit questionnaire the decision was made to follow a beta test methodology. Beta testing offers the advantage of testing a relatively new process or product in an undefined and unstructured discipline or industry, through a limited number of tests. Since innovation auditing is still in the development phase beta testing seemed the best option.

The audit questionnaire was developed from the innovation questions discussed in the first section of his chapter and the best practise standards discussed in chapter five. The questionnaires were then presented to the organisations by means of the following steps:

Beta Test Audit Procedure:

Select organisations where innovation is, or should be, a core process.
There is no sense in selecting organisations where innovation barely exists. These organisations are often so busy with other business

practices, that they would not think innovation auditing could help them.

Contact the MD or technology manager of the selected organisations.
   Innovation auditing is a strategic management tool. It therefore requires management approval, before implementation is possible.

Explain innovation auditing and its advantages.
   Many organisations implicitly manage innovation, and have not yet thought of measuring their own innovation capabilities. The notion of innovation auditing must therefore be explained, in effective yet understandable terms.

Explain the audit implementation procedures.
   Managers need to judge the impact of the innovation audit process on their business, and the procedures for auditing therefore become necessary. Time allocation and the depth of the audit, contribute to the duration of auditing.

Obtain the go ahead to proceed, as well as the hierarchical audit depth allowed.
   Strategic management approval will enable the auditing process to proceed, and empowers it to schedule meetings, and audit sessions.

Subdivide the organisation into audit groups.
   Before auditing can start, manageable audit groups should be identified. These could be business units, disciplinary units, teams, departments or any divisions made inside the organisation. At this stage the depth of the audit should be made clear, and the number of employees taking part, identified.

Briefing of leaders to each audit group.
   Just as the strategic management needs to know the purpose of the audit, so should the audit group leaders or managers.

Explain innovation auditing and its advantages.
   To introduce the concept of innovation auditing, a model of the innovation process inside an organisation will be discussed.

Explain the audit implementation procedures.
   Auditing is done in groups on the same social and employee level. Innovation involvement also plays a key role in selecting the groups. Each person in the group completes an innovation audit questionnaire. The auditor should be present to facilitate the audit process, and answer any questions if uncertainties arise.

Conduct sessions of auditing.
   Introduce the innovation audit to the group, and ensure they understand the innovation model as basis for the audit. Answer any questions on the questionnaire. Create an environment where honesty and personal perceptions may be measured.

Collect and digitise data from each audit session.
   Enter the answers to the audits into a database.

Analyse and integrate data with the innovation model.
> Divide and modify the data from the groups if necessary.
> Integrate the data into sensible outputs that illustrate the 'strengths' and 'weaknesses' clearly.

Construct audit outputs for the organisation as a whole, as well as for each audit unit.
> Create any number of bar charts or strength and weakness charts, applicable to the organisation's need.

Hold discussion sessions with senior management.
> Discussion on the findings of the audit with senior management, may be the first step in revealing the audit scores. More discussion with audit groups may be required if senior management queries the reasons for the findings, or would like more information on certain strengths and weaknesses.

Hold discussion sessions with audit groups (management backing auditor up).
> Report audit findings formally in the form of a document, including audit procedure, results and actions taken, as well as timeframe for next audit

Evaluate positive and negative aspects highlighted by the beta test procedure.

Beta testing excels in test situations where many uncertainties still exist. It requires direct contact between the tester (auditor) and the tested (auditee) to facilitate comments and queries on the test. By following a beta test methodology, the audit questionnaire was successfully tested in various organisations with good response by all. Some of the comments and queries on the proposed innovation questionnaire will be discussed next.

6.4.2 Audit Test Selection

To test the proposed audit questionnaire different industries were considered. Due to the high technology nature of the electronic business environment, as well as the availability of these industries in the Pretoria/Johannesburg area, most of the tests were done at electronic and information technology related organisations. One of the audit tests was conducted at a medical development facility to add a measure of diversification.

The first audit was done on management level at an arms manufacturing organisation.

Nature of Business
The organisation in question is involved in the manufacturing of guided weapons for the South African National Defence Force, as well as the international market. After the trade embargo against South Africa was lifted its once stable market disappeared. This lead to downsizing and numerous retrenchments, negatively affecting the morale of the whole organisation. Their current trade consists of international and national contracts, but an uncertain future in the arms industry looks likely.

Innovation Practises and Competencies

The organisation consists largely of highly qualified engineers and scientists. They are involved in various projects with enough freedom to be creative and innovative within the parameters of the project. To try and stimulate innovation, top management allowed new ventures to be started. However, these often diverged from the core business and failed miserably. Currently focus falls on the core business and formal innovation in identified fields where new technology paradigms are forming.

The Audit

One to one contact was possible between the auditor and the four auditees. The audits were done in the form of interviews to enhance the preliminary questions through explanation. Since this was the first audit, unnecessary questions were still part of the questionnaire. These were removed afterwards. This led to some inaccuracy of the results in the first audit. The auditor noted the poor understanding of many facets of innovation during the audits. Other aspects such as a lack of trust in leadership, a poor outlook on the future and a generally negative atmosphere were quite obvious in some of the older auditees. The only positive auditee was quite young and still full of ambition. This led the auditor to the conclusion that the organisation was finding the adjustment from mainly national to international trading, strenuous. The audit results will be discussed later in this chapter. The raw data from this audit is included in the addendum [Appendix E, Table E.1 and E.2].

The second audit was performed at an electronics/software systems engineering organisation.

Nature of business

The organisation was formed by systems engineers with the aim of providing high technology systems solutions to defence and commercial clients, nationally and internationally. They specialise in defence systems, energy systems and security systems. Some of their competencies include, artificial intelligence, digital electronics hardware design, software design, computer vision, aeromechanical services and weapon guidance. The organisation consists of scientists as well as systems engineers and computer programmers.

Innovation Practises and Competencies

The approach to innovation is from the 'rationalist' perspective as proposed by Tidd *et al.*[6] It focuses on design and development on a systems engineering methodology on a reactive basis. The organisation develops systems for clients to their specification, rather than free-standing products to be sold into the market. This enables the organisation to concentrate on developing and testing the product, until it meets every standard or specification required.

The Audit

It was possible to audit a large group, incorporating individuals from scientists to management level. The industry in question is well positioned for growth in the future and innovation related activities and employee perceptions were expected to be highly positive. The audit took the form of a group session and less direct interaction between the auditor and auditees were therefore possible. A highly professional environment, as well as positive responses to the innovation audit created the impression of a highly effective organisation, based on strong leadership.

The third audit was done at a small software company, which forms part of a larger holding company listed on the Johannesburg Stock Exchange.

Nature of business
Knowledge management is becoming an important aspect of successful business management. The organisation in question specialises in the development of software and systems in this field. It is a newly formed unit and with the backing of its listed holding company, could reach great hights. Currently the organisation produces and sells to the national and international knowledge management market.

Innovation Practises and Competencies
Since the organisation was just recently incorporated they have yet to form tradition bound procedures. This enables them to be free and creative, as often expected from software development organisations. Strong leadership and good interaction between the employees and management seem to improve the possibility of strong innovation practises being established.

The Audit
Individuals with high involvement in the innovation process were identified and asked to complete the questionnaire. An environment of excitement, dedication and innovation was found to be present in the organisation. Direct interaction between the auditor and auditees was possible. Five individuals completed the questionnaire, including the managing director.

The fourth audit was conducted on a one to one basis with employees at a medical research facility.

Nature of business
The institute in question provides testing and research services to private as well as governmental institutions. It is currently part of the University of Pretoria but might be transferred to the government. This may lead to disruption in their ability to perform their services.

Innovation Practises and Competencies
The medical research institute plays mainly a role of service and has a low product development priority. The institute does basic research on various chemical, virological and other medical ailments. It may therefore be classified as a research organisation and should not be compared with the other audits performed during the beta test phase. Some of the differences will be quite apparent in the discussion of its results later in this chapter.

The Audit
The auditor experienced a mixture of emotions from hostility to exuberance. This may be ascribed to the uncertain environment at the organisation since its future operations hung in the balance of government downsizing. Direct interaction between the auditor and auditees was possible, and a total of six questionnaires was completed.

The fifth and last audit measured the capabilities of a large group consisting of engineers, managers and marketing employees.

Nature of business
This was possibly one of the most successful organisations which formed part of the beta test group. The organisation is involved in the development and

distribution of pre-paid electricity metering devices. They have contracts both nationally and internationally with a strong presence from Africa and Australasia to South America and Europe.

Innovation Practises and Competencies
Since the organisation claims to be the leader in their field, the auditor perceived them to be quite innovative. A strong view of the future exists with emphasis on new development and improvement in the product. Since the product and related technology are still in the growth phase, it is expected that the organisation would be continuously busy redefining and developing the product. A definite dominant design has yet to be established, but the organisation in question has a good chance of setting current and future standards.

The Audit
A bright future is expected for the organisation, although their current working environment may lack some amenities. The general social climate was tense and could be ascribed to a high priority on time management. Due to the large group, there was limited interaction between the auditor and the auditees. However, since this was the last group in the beta test process the auditor had gained some previous experience in discussing the topic. It may therefore be seen as the most reliable results obtained.

The interaction between the auditor and the audit firms was valuable in teaching the limitations of academic ideas and the implementation thereof. It became clear to the auditor, while in the process of auditing, that a large amount of knowledge and understanding needs to be settled in the auditor himself/herself, since he/she has direct influence on the outcome of the innovation audit.

On the organisation side, the beta test process showed the lack of strong and well-developed innovation strategies, a fact which will have to be addressed in the new South Africa.

The following section will discuss some of the findings from the beta innovation test. The organisations' names are omitted as requested by them, but they are identified by their industry type. The raw data from the audits is included in the addendum [Appendix E, Table E.1 to E.10].

6.4.3 Beta Test Findings

Before discussing the results from the beta test audit, some comments made by the auditees will be discussed. This improves the understanding why the results are what they are and calibrates the reader's perceptions to a degree. While auditing the auditor noted many positive and negative aspects, which might influence the audit results. These will be discussed in this section as well.

The audit questionnaire included a sub-section where the auditees were given the chance to review the questionnaire. Some of the comments they made are listed below.

The response to:

Does the audit, to your experience cover every aspect crucial to the innovation process?

What about technical competence we often appoint somebody without a full appreciation of technical skills?

— Divisional Manager

To a certain context, yes.
Are salaries market related?

— Project Manager

The questionnaire does not address the relationship between innovation and meeting mindset constraints.

— Defence Systems

In our industry there is no time to really innovate, due to massive pressure to meet milestones so that more can get generated. Management, especially MBL/MBA managers don't, or seldom understand engineers/technical people/intellectuals and their needs. This affects motivation, which in turn affects innovation.

— Systems engineer

More contact with outside world

— Systems Engineer

Management skills and attitude towards innovation

— Systems Engineer

Innovation requires time (often company time), how it is allocated and how much. Innovation requires exposure, are the right tools in place or available (Internet, etc.)

— System engineer

Feelings on effectiveness of management. Feelings on practical approaches used to solve serious problems / crisis.

— Engineer

Ability to work flexitime as most ideas happen when there is silence.

— Software design engineer

Pretty comprehensive, maybe too much emphasis on the technical (development) side. Innovation = Product + commercialisation

— Director & Business Manager Defence Systems

Yes - touches issues crucial for innovation but sometimes not seen as crucial. Bringing your background/networking and experience with in an organisation that aids innovation i.e. have the guys in the teams "been around" done things, experience + gone through a few innovation cycles. Therefore innovating people create innovative atmosphere but some should be old hands otherwise the young guys just fall around.

— Senior design engineer

It appears to cover most of areas, but there are a couple of apparent deficiencies. Difficult to choose a one to four answer. A scale from 1 to 10 would have been easier. No account has been taken of the respondent's experience or length of service.

— Project manager

The audit seemed to cover all aspects of the model and I was able to relate nearly all of the questions to our organisation quite easily.

— Manager

Suggest you talk people through each question. Questions need to be more user friendly or need to be talked through. I am not confident that my answers will be as meaningful as possible.
Informality, lack of rigid structure and rules.

— Engineering Manager

Is there time to be innovative?

— Software development manager

Go/no go decisions and the decision making process

— Business development Manager

The audit appears to be well structured and at first pass addresses most I can think of.

— Managing director

General comments

We live in a vertical market and as such follow one path. The current path is for reliability based on experience. Innovation is therefore not so much at the forefront. Innovation is however extremely valuable

— Product management

Once a product is designed developed and implemented there is an innovation process, which should happen in the actual production of the product. I.e. processes and systems are put into place or improved to make it cheaper and more cost effective to produce the product. This aspect is not covered very well. A large part of staying ahead with a particular product is in how smartly do you produce the product.

— Manager

Trends may be identified in the aggregate of comments received from the auditees. For instance the comment/question: '*Is there time to be innovative*' occurs in various forms in several of the comments. It relates to the question of how an employee perceives his/her everyday task, and to what extent it forms part of an innovation process. If the employee does not feel involved with innovative processes, his/her perception may be faulty or there may actually not be any innovative activities in process. Creativity is not innovation and employees should not think since they were not very creative in their task that they did not innovate. Innovation has many non-creative parts yet employees have to be made aware of this.

However, without a persuasive drive for innovation including allotted time and resources, management may not expect employees to innovate on their own. On the other hand employees should not expect an hour every other day when they may sit around 'innovating/idealising', although they might think this is how it should be done.

Another recurring comment which ties in with: '*enough time for innovation*' is the competency of the organisations' management. If the employees do not feel management is competent in innovation or even in their other management tasks, the process of innovation will immediately suffer. Innovation is a process, which

absolutely requires leadership. When such a person is not involved, the process seldom reaches its goals and reverts to a state of mediocrity.

The comments also seem to indicate that the proposed innovation model (on which the audit questionnaire was based), is valid to a certain extent and since few negative comments were made, may be designated as a valid innovation model. Although further development of the proposed innovation model is necessary, this 'validation' enables further research to concentrate on detail and not question the basic foundations laid by the model.

The true meanings of the comments are often obscured by the many different sources they refer to. It is difficult to qualify a comment when the true context of the comment is not understood. For this reason the above mentioned comments will be regarded as guidelines for improving the innovation audit, but will not effect fundamental change.

Many lessons and a greater understanding may be gained from the proposals above. The aim of the innovation questionnaire is to extract innovation related information from the individual, as effectively as possible. By heeding the proposals made against the questionnaire, it may be improved to be more user friendly and understandable.

Due to the depth and complexity of the innovation process the above quoted comments on the validity of the innovation questionnaire are not as influential as they might appear. The organisations, which were tested, do not research the methodologies of innovation and may therefore have a narrow-minded approach to the subject. To expect in-depth comments in such a short period does seem a bit unfair and one should not be too harsh on some of the responses.

It is clear that the most appropriate test for the validity of the proposed questionnaire may be found through the application thereof, as part of an innovation audit. Secondly, the total proposed innovation audit model, methodology and questionnaire may only show its validity once implemented. If actions taken due to the audit proposals result in organisational improvements, the audit will be validated, however if actions taken result in poorer performance, the audit may not be so accurate. Thus the only way to truly test the innovation audit, is to measure the advantages derived after its implementation.

6.4.3.1 Findings Noted by the Auditor

During the beta test process the author learned much about the behaviour and characteristics of small and large groups of people. The applicability of the questionnaire, was also reviewed. The following conclusions were reached:

1. Direct involvement (person to person) between the auditor and the auditees improves the understanding of the questions and therefore the answers. While less interaction (auditor to group) may give results without any of the biases from the auditor influencing the auditees. It is therefore difficult to determine which of the two will ultimately give the best audit results.
2. A serious drawback to questionnaires is that questions are open to individual interpretation and often misunderstood if on difficult subjects.
3. Few individuals in the organisation are knowledgeable enough in the discipline of innovation, to understand the questions and their implications. This severely limits the validity of the answers, as they are based on limited understanding. Clearly to

answer a question sensibly, one requires background knowledge on the field in question. Education in the field of innovation is therefore a crucial aspect of building strategies for innovation.

4. There are so many aspects to a successful innovation process that one audit questionnaire could not possibly cover them all. Fitting complex concepts and processes into a limited number of questions, complicates the questions and degrades the results of the innovation audit. It would be better to split the audit into a master audit with several sub-audits, enabling the organisation to audit their weak spots and find the areas where improvement would offer the largest advantage first.

It is clear that much applied research is necessary to define the different methods for implementing an innovation audit, and defining where and when they should be used. This thesis found that an audit questionnaire offers some advantages, yet many disadvantages are apparent as well. Through future years of innovation auditing, these methodologies will however be resolved.

To illustrate some of the results from the beta testing of the innovation audit questionnaire, they are discussed in the following section.

6.5 Results From the Beta Test Process

The results will be discussed in two main categories. Firstly, the results for each organisation may be compared with other organisations inside, as well as outside the industry, if they completed an innovation audit of their own. For the purposes of this discussion, the five organisations which completed the beta test audit questionnaire, will be compared. The sections that may be compared includes overall industry analysis, organisation analysis and innovation sub-section analysis.

Secondly, a single organisation will be examined and some discussion on its strengths and weaknesses provided. By representing the audit data in this way, the organisations are not only able to judge their own strengths and weaknesses, but also how they compare to other organisations. The data from the audit questionnaires are included in the addendum [Appendix E].

6.5.1 Comparative Analysis

Benchmarking has found large implementation and application in the business environment.[7] Most organisations realise the advantage of benchmarking their processes against the others in their industry and so learn about their strengths and weaknesses. In the discipline of innovation this has not been possible, and developing measures to enable the benchmark process to include innovation, is important. This thesis and the proposed innovation audit, may be a step in this direction. By comparing the audit results from different organisations in the same industry, their innovation competencies may be benchmarked. The following graphs from the innovation audit testing procedures, may serve as examples.

Due to the perceptive nature of the innovation audit (it is based on perceptions), discrepancies might occur between an organisation's innovation output, and its ranking as obtained from the innovation audit. It should be remembered that the results from the beta test audit questionnaires represent general organisational perceptions and may be influenced by many factors. Factors such as audit group size and composition, successfulness of current practises, the organisational culture, and many more have a direct influence on the human perceptions and feelings of the innovation process, thus colouring their responses on innovation. The results should

therefore not be seen as absolute, but rather as a measure whereby the organisation's perception of its innovation capabilities, is compared with others in the same industry.

Three graphs will be discussed, ranging in explanation and audit depth. The first illustrates the total innovation audit results, while the others include more detail on innovation specific competencies.
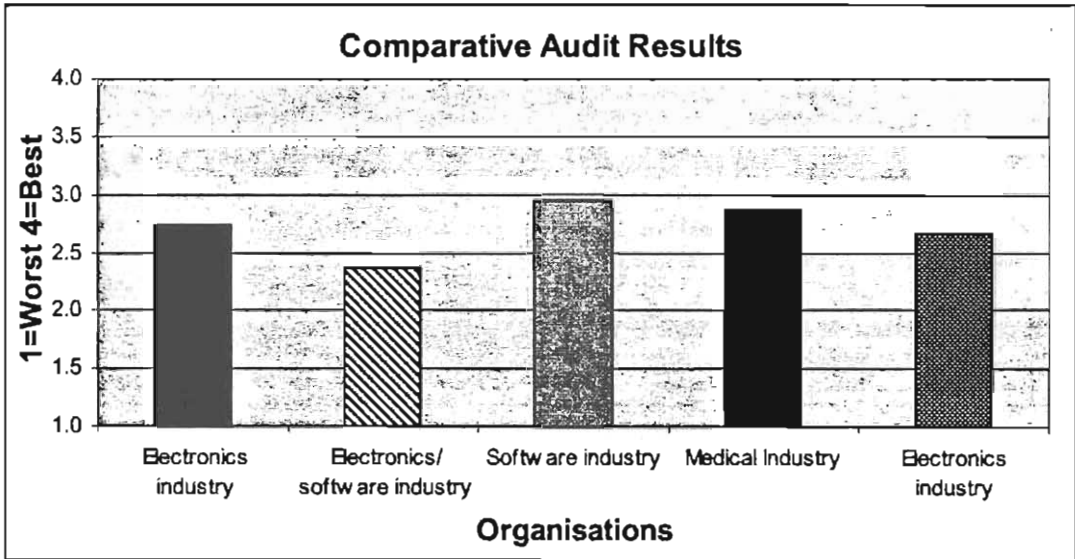

Figure 6.1: Comparative Organisational Analysis (The competence audit's combined results)

The calculations displayed in the bar-chart in Figure 6.1 entailed summing and averaging the respective answers from each question of all the questionnaires. This created one master questionnaire for each of the five organisations audited. By summing and averaging each of the master questionnaire's questions in the sub-sections, averages for each of the sub-sections were obtained. The sub-section averages were then summed and an average for each of the sections calculated. By summing and averaging the sections a final score for each of the organisations was determined. These scores are illustrated in the bar-chart in Figure 6.1. All the relevant data is incorporated into the Addendum in Appendix E, as well as a more detailed explanation of the calculations.

Figure 6.1 shows the five organisations which took part in the beta testing process. It illustrates five separate organisations active in the electronics, software and medical industries. The graph was constructed by finding the average of all the questions in the innovation questionnaires completed by each of the organisations. The bars represent the average score for each organisation, with a score of one being the lowest and four the highest. As discussed in paragraph 6.4.2 the first bar, on the left, in Figure 6.1 represents the first audited organisation, the second represents the second audit, and so forth, ending with the last bar, on the right, representing the fifth audit. These shades and patterns will continuously represent the results from the same organisations in the next paragraphs.

In Figure 6.1 the organisation in the software industry, third bar from left, perceived their competencies as very innovative, while the electronics/software integration organisation, second bar from left, was found to be less competent at innovation. It is interesting to note the high score in the medical industry, second bar from right,

which may be due to the large development component of that particular organisation. Both the most left and most right bars illustrate an average score which may be ascribed to the underlying organisations' formally developed innovation processes.

The results in Figure 6.1 give a measure of the perceived innovativeness of the organisation. As such it may be used to fuel ideas and look deeper into the reasons why certain organisations are more positive on their innovation capabilities than others. This may also be correlated with the amount of new innovations in the product range, to calibrate the innovation audit findings. For instance, 3M's management set the goal that 30 percent of all sales has to come from products that had been around no longer than four years, possibly resulting in making them one of the worlds most innovative organisations.[8]

The results from the innovation audit may therefore be treated as the 'inside' information on why certain organisations are more innovative than others. And the innovation outputs as the outside or visible results from the organisation's innovation efforts. By using both these measures organisations may be accurately compared with one another on their innovative ability.

To understand the reasons why certain organisations score higher than others in the comparative analysis, one may consider some more detail. The sectional analysis and comparisons are able to reflect differences between organisations in the environmental, organisational and individual sections of innovation.
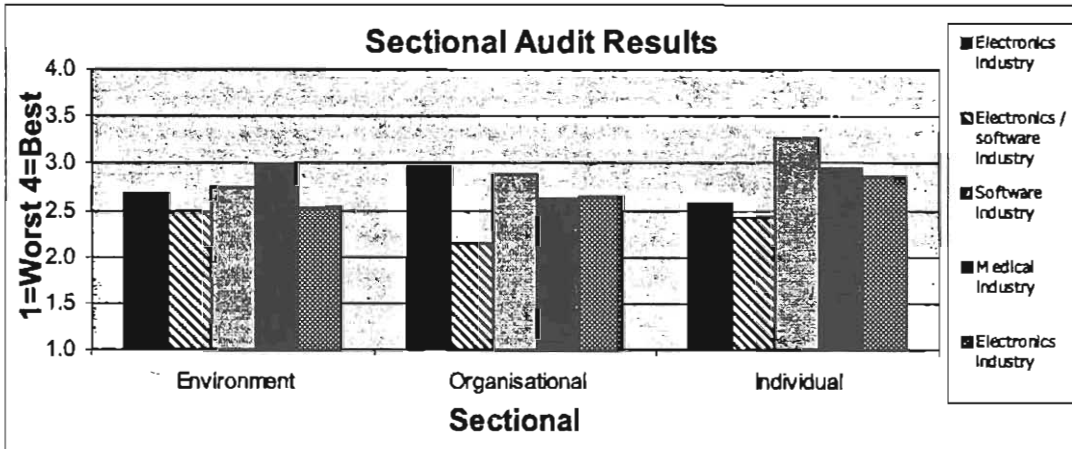

Figure 6.2: Organisational Analysis

Figure 6.2 illustrates the sections of the innovation audit questionnaire for the five organisations that were audited. The three sections, environment, organisational and individual form the foundation of the audit questionnaire and comparing these sections with each other may highlight respective strengths and weaknesses. The graph enables organisations to compare the different sections with other organisations who also completed the audit questionnaire.

In Figure 6.2 it is interesting to note that the organisation in the software industry, is stronger in the individual section than any of the others, while the organisation in the medical industry is strongest in the environment section. This may be attributable to the focus of the different organisations. The software organisation clearly relies heavily on individual competencies and creativity, while the medical development organisation relies more on professionalism, and the correct research and development of a new substance.

It is apparent that the electronics/software integration organisation, second bar from left in each of the three sections in Figure 6.2, was found to be less competent at innovation. This may, however, be an anomaly. Since the innovation audit is based on perceptions, it is possible to find an organisation with a strong or weak perception of its own innovative ability, irrespective of its 'real' ability in comparison with others.
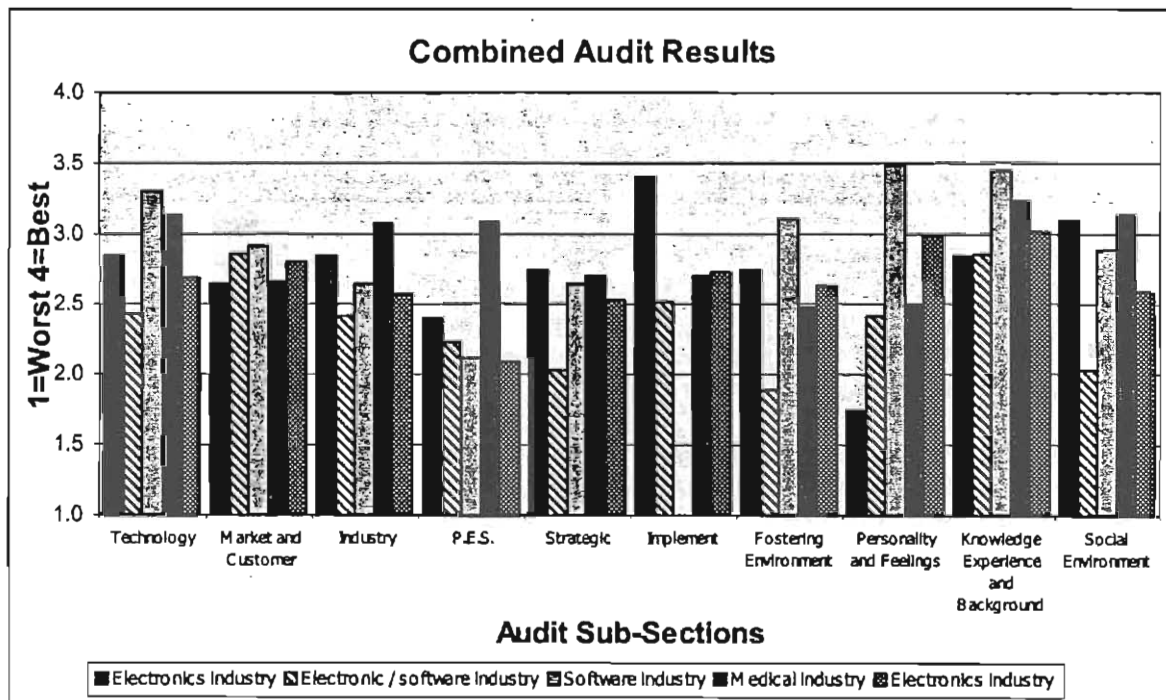

Figure 6.3: Organisation Sub-section Analysis

Even more detail is illustrated in the sub-sectional analysis of the different organisations, as illustrated in Figure 6.3. Each organisation is still represented in the same patterns and shades as in Figure 6.1. The bars represent the average of all the questionnaires for each sub section completed by each of the audited organisations. By comparing the sub-sectional results, in-depth knowledge on the strengths and weaknesses of organisations in relation to others, may be identified.

In the Figure 6.3, one may find the specific reasons why some organisations scored better than others in the preceding Figures 6.2 and 6.3. As illustrated in Figure 6.2 the organisation active within the software industry scored top marks. Thus Figure 6.3 can illustrate which of the three sub-sections in the individual section is the reason for the high scores. It is apparent that 'Personality and Feelings' and 'Knowledge, Experience and Background', are both top scores. While the 'Social Environment' is more in line with the other organisations' scores.

The previously mentioned low scoring organisation in the electronics/software industry, may likewise be analysed. Figure 6.2 illustrates this organisation's poor performance in the 'Organisational' section and the more detailed explanation in Figure 6.3 illustrates the reasons. One may conclude from Figure 6.3 that this organisation perceives its 'Strategic', 'Implementation' and 'Fostering Environment' as having poor competencies for innovation.

After identifying the specific areas where underperformance or overperformance were achieved, the organisations may investigate the reasons why, and then plan

strategies to remedy the situation. It would be highly advantageous to both above mentioned organisations (software and electronics/software), if they could identify the reasons why the perceptions were so positive or negative, and then change or improve them in order to bring them in line with the other competencies of the organisation.

The comparative analysis enables the organisations who took part in the innovation audit to benchmark their competencies against each other, without giving away any proprietary information. This is ideal for many organisations with sensitive data and projects. Although the audit may not identify specific actions to be taken, it does identify the holistic areas where strengths and weaknesses lie. To advise in any other way, the audit would have to do in-depth analysis of organisational procedures and processes. The audit does therefore not try to prescribe, but serve as a method for self reflection and identification of an organisation's own characteristics. By pointing out areas of strength or weakness, the audit reaches its goal and enables the organisation itself to identify the specifics in improving their own processes and procedures.

It should be remembered that the audit is based on perceptions and this may lead to organisations with a high opinion of their own abilities, scoring generally higher than others. The results as illustrated in Figures 6.1 to 6.3 are therefore not absolutes, and may not be compared in this manner.

As more and more innovation audits are completed certain profiles for different industries may emerge. This would occur if some sub-sections were found to be more important than others for successful innovation in a specific industry. I.e. the medical organisation with a high score in 'Technology', but a lower score in 'Market and Customer' as may be observed in Figure 6.3, may be indicative of the industry specific requirements. Others may include a high score in the 'individual' section where extensive creativity and individualism is required. By applying these profiles to certain industries, better comparisons may be drawn than those illustrated in Figures 6.1 to 6.3. This may then lead to accurate assessment of industry structures, as well as reasons why some industries are more innovative than others.

6.5.2 Organisational Analysis

The results from the innovation audit may not only be used for comparative analysis, but also for identifying strengths and weaknesses inside individual organisations. Every organisation has to a greater or lesser extent innovation competencies in each of the sections identified by the organisational audit. However to be as successful as possible, the sections need to be balanced, as indicated by Tidd *et al.*[9] Successful innovation requires a balanced score-card for all its many diverse sections and subsections. Even though many perceptions of innovation focus on the brilliance required in the invention stage, without equally brilliant realisation and implementation, few if any, innovations will occur.

Analysing the separate sections of the audit results, with a subsequent refocus on sub-sections, enable organisations to identify their strengths and weaknesses in relation to their other competencies in innovation. The following two figures will illustrate the sections and sub-sections better. They represent a single organisation.
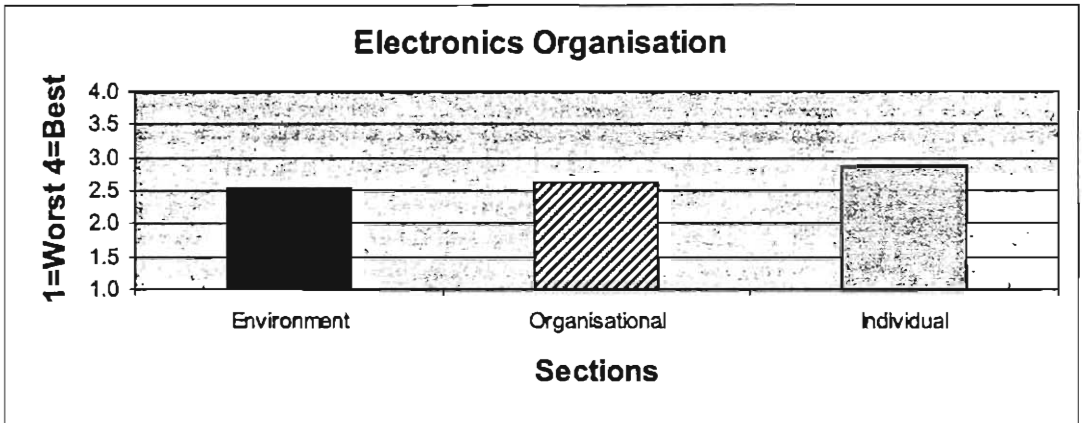
Figure 6.4: Organisation Innovation Section Analysis

Figure 6.4 illustrates the three sub sections as reported by the innovation audit questionnaire. The same calculations were made as for the comparative analysis in paragraph 6.7.1. All the relevant data is also incorporated into the Addendum in Appendix E, as well as a more detailed explanation of the calculations.

Figure 6.4 illustrates the 'Environment', 'Organisational' and 'Individual' sections for a single organisation. The 'Environment' bar, left in Figure 6.4, appears to have the lowest score, while the 'Individual' bar highest. All three sections scored between 2,5 and 3 making them average to near above average.

It is interesting to note the relation between the 'Individual' and 'Environment' scores. Although the reasons why these differ, may not be found in these results, the figure with the sub-section results will prove to be more informative. However the organisation would be prudent in researching why their environmental competencies contribute less to the innovation process, than the others.
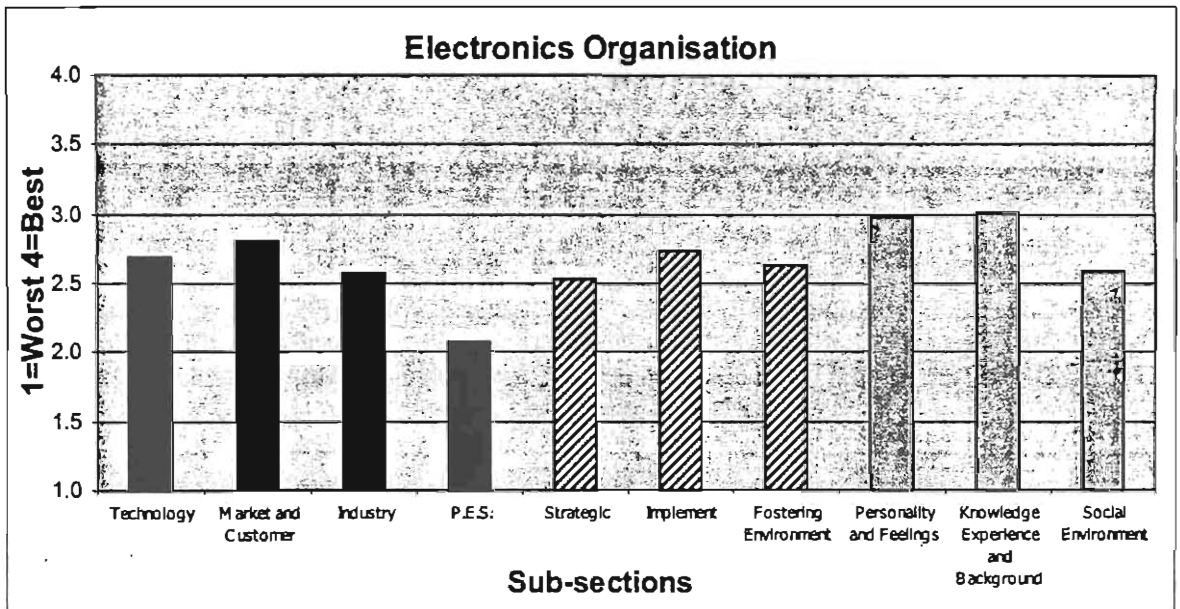

Figure 6.5: Organisational Innovation Sub-section Analysis

The results displayed in Figure 6.5 indicate the specific areas where the innovation process in the organisation lacks the necessary competencies. The 'P.E.S.' (Political, Economical, Social) attracts immediate attention on the low side, while the 'Personality and Feelings' and 'Knowledge Experience and Background' sub-sections, attract attention on the high scoring side.

It is interesting to note the low score the organisation attains in sections relating to social interaction and fostering environments. The sections, 'P.E.S.', 'Fostering Environment' and 'Social Environment' generally scored the lowest in its respective sections, with the exception of the 'Fostering Environment'. This is an indication that some work on the culture in the organisation may be overdue, and may make a significant impact on the innovation process, if improved.

The two strong sub-sections illustrated in Figure 6.5, lie in the 'Personality and Feelings' and 'Knowledge Experience and Background'. This may be ascribed to the type of employees employed by the organisation. They are all highly qualified engineers or scientists with strong personal motivation and a will to achieve success. This influences their response to their own capabilities and competencies boosting the two sections.

The organisation illustrated in Figure 6.5 may improve its innovation process dramatically, if they followed the proposals made by the results from the innovation audit, viz.

1. They have a strong human capability / competency capacity illustrated by the 'Personality and Feelings' and 'Knowledge Experience and Background' scores. This means they should be able to teach their employees new skills or improve their competencies through new projects.
2. They may improve by increasing the focus on the social interaction environment, as well as the fostering of new innovations.
3. They may improve through greater interaction between the organisation and the industry, as well as the political, economical and social environment (P.E.S).

These are but a few of the measures the organisation may consider. Analysing the specific questions in the innovation audit in more detail, the reasons for specific strengths or weaknesses may be discovered.

It is only natural for organisations that would like to improve their innovation processes to focus first on the things they 'know how to do', or 'are good at'. This often results in an unbalanced innovation repertoire with poor end results. The strength of the innovation audit lies in identifying the areas where improvement is most necessary, or may have the greatest impact. The audit is able to point out the areas where improvement will contribute much or little, enabling organisations to focus their competency development processes better.

Ultimately the innovation audit aims to create a balanced scorecard of innovation competencies in the organisation by identifying the imbalances between the various sub-sections. It secondly proposes the improvement of the total scorecard to enable the organisation to better compete within its own industry. Organisations may therefore employ the innovation audit, not only to identify strengths and weaknesses in their own operations, but also in its associated industry.

6.6 Conclusion to the Beta Test Process

The beta tests were resoundingly successful in identifying problems and improvements in the innovation questionnaire and implementation methodology. Through discussion with organisations, the proposed innovation model was also validated to a certain extent.

The audit results illustrated the expected nature of the proposed innovation audit well. The proposed innovation audit does not aim to identify specific practises or methods that should be followed in order to be successful at innovation. It neither prescribes actions to be taken to improve or change the innovation process. The audit has one goal in mind and that is to identify strengths and weaknesses in the innovation competencies of the organisation, and then let them determine how to improve these. The results from the audit tests prove the ability of the audit to capture perceived competencies and illustrates them in a sensible manner. It is able to clearly illustrate the strong and weak areas of the organisation's innovation process, enabling the organisation to take action.

The only true way to validate the innovation audit is through application in as many organisations as possible. Then with the findings of the audit implemented, the results in the innovative ability of the organisation, will prove the worth of the audit. If organisations do not improve due to the innovation audit and its identification of strengths and weaknesses, one may regard the audit as a failure. However, in identifying strengths and weaknesses the audit does succeed as clearly illustrated by the graphs in this section.

6.7 Conclusion

This chapter introduced the final part in the development of a competence audit for technological innovation. Many questions from various literary sources, as well as personal opinions as expressed by individuals in the industry, were discussed. These were then incorporated into an audit questionnaire for use in the implementation of an innovation audit, with the aim of identifying strong and weak competencies in organisations.

The chapter included reasons why various questions were included or excluded. The primary reason was often the limited nature of the questionnaire, and since innovation has so many facets, not every question could be included.

The chapter concluded with the beta testing of the questionnaire, as well as the proposed audit methodology and proposed innovation model, as discussed in previous chapters. The results were found to be subjective but largely conforming to expected industry and organisational perspectives. The tests did, however, clearly illustrate the ease with which strengths and weaknesses were identified by the audit, not only when organisations were compared with each other, but when their own competencies were compared as well.

6.8 References

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