Chapter 3

Research Design and Methodology

This chapter discusses the research design as well as the methodology that was used to capture and analyse the data. The measurement tools are discussed in some depth. This includes a description of the questionnaire and the structuring of the questions; and the decision on the selection of items for introducing variation to the key variables used in the empirical research. The selection of an appropriate sample is explained, as are the methods used in collecting, capturing, and analysing the data. Finally the use of case studies for verifying the findings of the survey is introduced.

An overview is given below on the measurement tools and the selection of the key variables.

3.1 Measurement and key variables

"Data sometimes lie buried deep within the minds or the attitudes, feelings, or reactions of men and women" (Leedy, 1997:191). Leedy comments that the best way of accession this type of data is by means of a questionnaire. In selecting the design of the questionnaire, the following comments from Leedy influenced the final choice of questionnaire type being quantitative: "quantitative researchers tend to use experimental or correlational designs to reduce error, bias, and extraneous variables. Underlying these research designs is the belief that there is a relatively stable reality "out there" that can be measured through well-designed questionnaires or instruments. Generalizations are enhanced if the instruments are shown to be valid and reliable". It was therefore decided to design a questionnaire for capturing quantitative data. This data would pertain to the competencies and capabilities (CCs) that the SME believed it had, and whether with an increasing number of CCs the perception by the SME of a successful partnership, increased. In addition data would be captured to determine whether the safeguards that the SME were put in place in the relationship moderated the relationship between CCs and a perceived successful partnership.

Having designed the questionnaire, it would be forwarded to a non-probable sample of SMEs. A non-probable sample is where the researcher cannot forecast, estimate or guarantee that each element in the population will be represented with the same probability in the sample. A convenience or accidental sample is a subcategory of a non-probable sample (Leedy, 1997:106). A non-probable convenience sample was decided upon as there are no comprehensive databases on technology innovative companies in South Africa and hence existing databases listing companies that fell into the desired categories that were accessible, would be used. However, it could not be claimed that companies captured by these databases were necessarily representative of South African technology innovative companies. Because the sample would be one of convenience, it was highly likely that the data would be skewed and hence did not necessarily represent the entire population. As the objective of the research is to identify trends rather than arrive at conclusive statements regarding a whole statistical population, it was decided that a convenience sample would, in this instance, be appropriate.

The questionnaire was examined by three experts to check, inter alia, for bias, research expectancy effect and clarity. Thereafter it was pilot tested on 3 SMEs and in each case where greater clarity was required in terms of the questions being asked, refinements were made in order to arrive at the final questionnaire. Three examples of such refinements follow:

- In testing the SME's perception of the success of the partnership, the following question was posed:
  "Did your company perceive the partnership/acquisition to be a success?" Only two possible answers were given – "yes" or "no". However, the company being interviewed felt uncomfortable with either of these answers as it believed that the partnership had been "partially successful". Hence, in the final questionnaire, the possible answers to this question were changed to be: "successful", "not successful", or "partially successful".
- In enquiring the criteria that SME's used to determine the worth of their company, "projected growth of profits" was added to the existing list.
- In enquiring what was the main motivation for the SME to partner with the LCO, it was agreed that the two independent possible answers: "gaining access to new markets", and "increasing your company's market share" could be collapsed into a single question: "gaining access to new markets or larger share of current market", as both questions related to a single concept, namely gaining access to a larger market.

These companies were again interviewed later using the final questionnaire.

Section 2.6.2 has described the hypotheses and associated subhypotheses to be empirically explored. To recap, two key relationships would be tested, namely:

- whether the more competencies and capabilities the SME has, the more (or less) successful the partnership with the LCO is perceived to be (in the eyes of the SME)
- whether safeguards moderate the relationship between competencies and capabilities and perceived successful partnership (in the eyes of the SME). In other words, the more safeguards that are put in place in the relationship between SMEs and LCOs, and specifically whether the more *informal* safeguards or the more *formal* safeguards that are put in place, the more successful the partnership with the LCO is perceived to be (in the eyes of the SME).

A questionnaire was constructed to capture the perspectives of SME's on the above relationships. Questions were designed to capture a response pertaining to either competencies, capabilities or safeguards (see Table 5 below). The responses were measured in each case using a 2-point scale: 1 = yes; 2 = no. The independent variables were categorized as competencies and capabilities, and the moderating independent variables were described in terms of formal and informal safeguards.

The first group of independent variables related to capabilities that the SME believed it had, and were grouped as ability capabilities or awareness capabilities. The ability capabilities related to the IP developed by the company; the main reasons for the LCO to partner with it (the SME); the LCO's preference for disruptive versus incremental technology; the type of innovative environment in which the SME operated; and an ability to segment the market for a technology product. The awareness capability variables included: complementarity of SME's technological offering with the LCO's core business; main reasons for the LCO to partner with the SME; the type of organization from which the LCO sourced innovative technologies; an awareness of the internal politics of the LCO partner; an understanding of the SWOT of the LCO and whether the SME had a complementary offering; and the preferred sourcing strategy for a technology of the LCO.

The second group of independent variables related to the competencies that the SME believed it possessed. In this case the SME was asked to indicate whether it believed that the main reason for the LCO to partner with it was to access a source of innovation; to acquire the product; or to access its (SME's) network and relationships.

The third group of independent variables were those that moderated the relationship between competencies, capabilities and perceived successful partnership, and were

safeguards that were put in place in the relationship between the SME and the LCO. These were grouped as either formal safeguards or informal safeguards. The formal safeguards included: the existence of a formal partnership; quantitative measures for determining whether the partnership was successful; the existence of a technology strategy for the LCO; the main reasons for the LCO to partner with the SME; the manner in which the LCO gained information on the SME; the existence in the SME of a documented process for monitoring quality and reliability of products; and that a substantial equity stake of the SME was held by another organization. The informal safeguards included: a high level of trust by the SME in the LCO prior to the partnership; a high level of trust by the SME in the LCO after the partnership; classification of the LCO as being opportunistic; cultural fit, namely: the LCO being a South African company, and the main core values to which the LCO ascribed; the SME being the project champion; the criteria used to determine the worth of the SME; the main motivation for the SME to partner with the LCO; the approximate cost for the LCO to switch to/acquire the SME's technology; the process used in managing the partnership; and the position of the SME in its industrial cluster.

Table 5: Questions used to capture the variables to be analysed

Ability capability
1. Has your company developed proprietary information during the period 1995 – 2003? 2. If yes, has this IP been patented?
3. What do you believe were the main reasons for the LCO to partner with you: *to acquire the expertise?*
4. What do you believe were the main reasons for the LCO to partner with you: *to acquire the technology?*
5. What do you believe were the main reasons for the LCO to partner with you: *not to miss a trend,* which could result in falling behind other competitors?
6. When sourcing innovative technologies, your LCO partner sources 6.1 disruptive technology 6.2 incremental technology? 7. Is the sectoral environment in which your company operates one of: 7.1 incremental innovation 7.2 spasmodic innovation 7.3 repetitive innovation 7.4incessant innovation? 8. Do you segment your potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards?
Awareness capability
9. Did you have an adequate understanding of the strengths and weaknesses of your LCO partner? 10. Was your offering complementary to the LCOs SWOT?
11. Was your technological offering complementary to the LCO's core business?
12. Were you aware of the internal politics of your LCO partner?

13. What do you believe were the main reasons for the LCO to partner with you: to take advantage of financial synergies
14. What do you believe were the main reasons for the LCO to partner with you were to satisfy managerial motives such as: 14.1 increasing profitability 14.2 technical economies of scale 14.3 recognition of management expertise for proposing cooperation?
15. Does your LCO partner source innovative technologies from: 15.1 SMEs specifically 15.2 LCOs specifically 15.3 research institutions specifically 15.4 combination of the above?
16. When sourcing a technology, the preferred strategy of your LCO partner is: 16.1 to wholly acquire the technology 16.2 to enter into one of the following partnership arrangements with an SME: 16.2.1 a joint venture 16.2.2 a license 16.2.3 becoming a "reseller of the technology" 16.3 To enter into one of the following partnership arrangements with a LCO: 16.3.1 a joint venture 16.3.2 license 16.3.3 becoming a "reseller of the technology"
Competencies
17. What do you believe were the main reasons for the LCO to partner with you: to access a source of innovation?
18. What do you believe were the main reasons for the LCO to partner with you: to acquire the product?
19. What do you believe were the main reasons for the LCO to partner with you: to access your network and relationships?
Formal safeguards
1. Have you during the period 1990-2003 cooperated and/or partnered with a large company (LCO)?
2. Did you use quantitative measures to determine whether the partnership was successful/unsuccessful/partially successful? 2.1 financial success 2.2 mutual benefits 2.3 no 2.4other
3. Did the LCO have a technology strategy?
4. What do you believe were the main reasons for the LCO to partner with you? 4.1 To access new market segments 4.2 To increase sales 4.3 To pursue market dominance 4.4 To develop a "quick win" that has a high probability of success and will probably produce an immediate pay-off
5. Do you think that the LCO gathered information on your company by: 5.1 Scanning relevant technological magazines? 5.2 Formal business appointment(s) with the owner(s) and/or staff of your company? 5.3 Informal meetings/lunches with the owner(s) and/or staff of your company? 5.4 Word of mouth? 5.5 Relationship building at networking event(s)?
6. Do you have a documented process for monitoring: 6.1 quality control of your products 6.2 reliable delivery 6.3 reliable product support?

7. During negotiations with the LCO, was a substantial equity stake in your company held by: 7.1 a venture capital company 7.2 another company viz: 7.2.1 another SME 7.2.2 an LCO 7.3 an angel investor 7.4 an incubator 7.5 a bank?
Informal safeguards
8. What was your level of trust in the LCO prior to the partnership – high? 9. What was your level of trust in the LCO with whom you partnered after the partnership – high? 10. Would you describe the LCO as being an opportunistic company, viz: seeking self-interest with guile?
11. Was your LCO partner a South African company? 12. List the main core values to which your LCO partner ascribes: 12.1 integrity 12.2 maintaining good relationships 12.3 quality driven 12.4 innovation driven 12.5 building expertise
13. Was a representative from the SME the project champion?
14. Is the worth of your company (SME) based on: 14.1 your sales turnover 14.2 your number of customers 14.3 an analysis of your financial statements 14.4 a high customer sales ratio 14.5 the longevity of your average customer account 14.6 your reputation in the market place 14.7 projected growth of profits\
15.What was the main motivation for your company to partner with the LCO: 15.1 gaining access to new markets or larger share of current market 15.2 improving/adding to your management skills 15.3 easing pressure from investors 15.4 obtaining financial support 15.5 optimizing entrepreneurship value (“cashing in”) 15.6 “piggy backing” on the LCO’s technical infrastructure and expertise 15.7 your company had moved into a mature phase and no longer provided challenges for management.
16. Can you quantify the approximate cost for the LCO to switch to/acquire your technology
17. As part of the negotiation process, did you, with your partnering LCO: 17.1 establish a long-term strategic intent 17.2 develop a short-term joint intent 17.3 identify and create project teams 17.4 widely communicate the joint intent 17.5 obtain stakeholder support 17.6 establish an implementation plan 17.7 develop an exit strategy for the SME
18. Are you recognized as an important player in your industrial cluster?

In order to test whether the SME perceived the partnership to be successful or not, the following question was asked “did your company perceive the partnership/acquisition to be a success?” This was selected as the dependent variable. Three response options were offered: “successful”, “not successful”, and “partially successful”. The “partially

successful" option was included to ensure a response, rather than have companies decide not to answer this question as they were uncomfortable with a choice of only two possibilities at either end of the scale, namely "successful" or "not successful". In analysing this data, "partially successful" was grouped with "not successful" as it was clear that "partially successful" certainly did not equate with "successful", but could imply "not successful".

The questions were dichotomous and did not allow for much variation. Hence, in order to improve the variation of the variables, the variables listed in Table 5 were treated as items and in consultation with field experts, were compounded into new variables. The new variables were described as *ability capabilities; awareness capabilities; competencies; formal safeguards;* and *informal safeguards.*

Having discussed the measurements used, including the variables and the compounding of the items into new variables, the research design will be described next.

3.2 Sample design

3.2.1 Original research design

The original plan was to interview companies (small and large) by means of a "mirror" questionnaire. The questionnaire would be similar and would ask the same questions, rephrasing them when appropriate, and designed to capture the perspectives of senior management of both the large companies, and the SMEs respectively. The two sets of data would then be compared and analysed for similar, as well as differing views. Where differences were apparent, it was envisaged to explore these by means of structured interviews with a smaller sample of the original sample population. However, this strategy had to be changed due to the extremely poor response rate of the large companies. What follow is therefore first a description of the execution of the original research plan, followed by a description of the new research plan that was developed and its execution.

Having developed the questionnaires for the large companies, and in an attempt to secure a good response rate, a small "response rate test survey" was conducted during July 2003. The process for identifying participants in the "test" survey is described below. Data from the South African Innovation Survey 2001 for Manufacturing and Services was screened for those companies responding positively to the following question: "5a: Did your firm have technological innovations in the period 1998 – 2000?" Six of these respondents were

randomly selected and telephoned to test whether they would be willing to complete a questionnaire. All six responded in the affirmative, but a couple of the respondents requested that the conversation be confirmed per telefax. Rather than duplicate effort in terms of both a telephone conversation and a telefax follow-up, a second approach (telefax only) was adopted, using a different dataset. This second dataset comprised the awardees of 2003 SPII (Support Programme for Industrial Innovation) grants. Awardees were telefaxed a preliminary questionnaire (see Appendix 1) providing background on the research topic and enquiring whether they would be willing to fill in a questionnaire. Of the 27 targeted companies, only two responded (both being SMEs).

It was therefore felt that rather than expend effort on preliminary questionnaires probing the expected response rate, companies should be targeted using the final questionnaire. The large companies were the first to be approached. A database of 113 companies (duplicates having been removed) was compiled comprising the following:

- 2003 SPII awardees (21 companies)
- Companies participating in the South African Innovation Survey 2001 for Manufacturing and Services, indicating a positive response to the question: Did your firm have technological innovations in the period 1998 – 2000?, as well as having indicated that they were classified as a large company (27 companies)
- 2002 Technology Top 100 finalists (62 companies)
- Selected well known South African large technology companies (3 companies)

In an attempt to secure a good response rate, companies were telephoned to identify the appropriate respondent. The incentivization for participation in the survey would be a summary of the main research findings. The telephonist identifying the appropriate respondent, was incentivized as follows: R500 to phone all the companies; an additional R300 if more than 80% agreed to fill in the questionnaire; and an additional R200 if 70% of those that agreed actually completed and returned the questionnaires.

113 large companies indicated that they would fill in the questionnaire and in August 2003, e-mails were forwarded to the targeted companies - they were given three weeks to respond. Only 1 response was received by the due date (and a couple of companies indicated that as this research was not relevant to them they would not be participating). Reminders were forwarded to the non-respondents, and a time extension of a further two weeks was given. This led to responses being received from an additional 4 large companies.

Because of the low response rate, it was decided that a review of the current approach was required. An assumption was then made that this research would be of greater relevance to SMEs than to large companies, and that SMEs would therefore most probably be more inclined to respond to the questionnaire as it was in their interests to contribute to a survey that would produce meaningful results from which they would benefit. A second assumption made was that most large companies would act opportunistically given circumstances permitting such behaviour, and that there was therefore little point in trying to get them to admit to their predisposition to engage in such opportunistic behaviour, and hence trying to extract their "real motives" for a partnership would be very challenging. For these reasons it was decided that technology innovative SMEs only, would be surveyed.

3.2.2 Revised research design

As intensive one-on-one interviews were planned, a decision was made to use databases where the companies had already been pre-screened to ensure they complied with the stipulated requirements, namely being an SME, being technology innovative and having partnered with a large company.

The sources for SMEs that were finally selected had already been screened by the respective application processes (2002 Technology Top 100 finalists; 2003 THRIP SME grant-holders; tenants of business incubators) or by the "referral network", in terms of ensuring that they complied with the selection criteria of being both an SME, and being technology innovative. SMEs were defined in accordance with the South African National Small Business Act of 1996 for the manufacturing sector for an SMME (see Table 6 below):

Table 6: Definition of an SME as per the South African National Small Business Act of 1996 for the manufacturing sector

Size	Full-time employees	Annual Turnover	Total gross asset value (fixed property excluded)
Medium	200	R40 million	R15 million
Small	40	R10 million	R3,75 million
Very small	20	R4 million	R1,5 million
Micro	5	R0,15 million	R0,10 million

A small or medium sized company in South Africa for the purposes of this research was therefore defined as having equal to or less than 200 full-time employees, an annual turnover of equal to or less than R40 million, and a total gross asset value (fixed property excluded) of equal to or less than R15 million.

To ensure that the SMEs in the sample were indeed SMEs, were technology innovative, and had experience of a partnership with an LCO, compliance with the following criteria being posed as questions in the questionnaire (and indicated by a positive answer), was essential for participation in the data analysis:

- Classification as an SME (compliance with at least two of these criteria essential):
  - Approximate number of full time employees in your firm on 31 March 2003 (less than or equal to 200)
  - Annual turnover of your firm on 31 March 2003 (less than or equal to R40 million)
  - Total gross asset value (excluding fixed property) (less than or equal to R15 million)
- Has your company developed proprietary information during the period 1995-2003?
- Have you during the period 1990 – 2003 cooperated and/or partnered with a large company?

Using largely the same databases as those for the large companies, but this time selecting SMEs rather than LCOs from the databases, a non-probable, convenience sample of technology innovative SMEs that had some recent experience of partnering with a large company, was targeted. As mentioned above, in addition to the original databases used, SME grant-holders from the 2003 Technology and Human Resources for Industry Programme (THRIP); word of mouth referrals; and SMEs participating in two business incubation programmes were targeted. The final list comprised 180 companies once the duplicates had been removed, and the number of companies from each source is listed in Table 7 below:

Table 7: Sources of SMEs surveyed

Source	Number of SMEs targeted
2003 SPII awardees	5
Companies participating in the South African Innovation Survey 2001 for Manufacturing and Services, indicating a positive response to the question: Did your firm have technological innovations in the period 1998 – 2000?, as well as having indicated that they were classified as a large company	1
2002 Technology Top 100 finalists	33
2003 SME grant-holders from Technology and Human Resource for Industry Programme (THRIP)	57
SMEs referred by word of mouth	15
SMEs participating in a Gauteng based business incubator	5
SMEs participating in a Cape Town based business incubator	64

Only one SME that had already been verified as indeed a technology innovative SME, was used from the list of SMEs that had participated in the South African Innovation Survey 2001 for Manufacturing and Services. The rest of this list was not used for the following reasons:

- The focus of the planned research was not necessarily only on manufacturing and services companies, but on any SME that had demonstrated technology innovation
- The integrity of the data on "size of company" was questionable as a closer examination of the companies that had indicated they were "small or medium-sized", had revealed that they did not necessary fall into this category but were, in fact, large companies as per the definition of our research.

The survey would rely on the SME's perception of the behaviour of its partnering large company, i.e. the SMEs interpretation and perception of the situation. Using a perception to present a reality is supported in the literature by Pfeffer et al (1976:229), citing the work of Festinger (1954), in stating that "in the absence of objective, agreed-upon standards, social comparison is used to stabilize opinions and decide on actions". Pfeffer et al also cite earlier work of Festinger (1950:273) "it also follows that the less "physical reality" there is to validate the opinion or belief, the greater will be the importance of the social referent, the group, and the greater will be the forces to communicate." "When you don't know what to do because there are not clear standards to guide your behaviour, you look around and observe what others like yourself are doing, and you then employ this social standard to reduce your uncertainty (Pfeffer et al, 1976:230 citing Festinger (1950 and 1954)).

As mentioned above, the decision to use a non-probable, convenience sample is because the SME technology innovative community in South Africa is not well organized structurally, i.e. not easily accessible as there are no national, integrated databases for this category of firms. Probability sampling, whereby each segment of the population is represented in the sample, is therefore extremely difficult, if not impossible in the absence of good databases. For this reason, a convenience sample was selected from existing databases of SMEs that were participating in national programmes for technology innovation, as well as from personal and "word-of-mouth" networks (as listed in Table 7 above).

3.3 Data Collection

Because of the bad experience in very poor response rates from the original research design that surveyed LCOs, and in an attempt to secure an acceptable response rate, one-on-one interviews by means of a structured questionnaire were conducted during the period October – December 2003. (The pilot survey on the 3 SMEs was conducted by the researcher herself, during September 2003.) Because of the one-on-one interviews and the logistic constraints associated with conducting the interviews, for convenience purposes companies

that were based in Pretoria and Johannesburg were approached. In addition, a few of the companies that were referred by "word-of-mouth" and were based in Durban and Stellenbosch were also approached as they had already been sensitized regarding the research. The Durban and Stellenbosch companies were approached telephonically and requested to complete the questionnaire electronically – i.e. no one-on-one interviews were held. Furthermore 64 start-up companies that were resident in a business incubator in Cape Town were also targeted. In this case the Manager of the incubator was approached with a request to sensitize her tenants to the research and encourage them to fill in the questionnaire. One-on-one interviews would be conducted with those start-ups that were willing to participate in the survey.

Seven second and third year students from the School of Management and Economic Sciences of the University of Pretoria, who were studying Entrepreneurship, were recruited and trained in terms of the research objectives of the study; how to identify the appropriate person and set up an interview; how to interview the candidate; and how to clarify questions when necessary. The students were financially incentivised to hand in fully completed questionnaires (they were remunerated per completed questionnaire). In addition, the researcher herself interviewed over 11% of the total sample (that translated to almost 50% of the respondents).

3.4 Data capturing and data editing

Appointments were made with the CEO/Director of the SME and the candidate was interviewed by means of a structured questionnaire. The students conducting the interviews had been trained regarding how to pose and clarify if necessary the questions, as well as how to capture the information. Each question was coded such that each quantitative question was treated as a separate, dummy variable (item). Answers to the qualitative questions were quantified by grouping into common categories and each category was then treated as a dummy variable. The groupings of qualitative common categories and compilation of these dummy variables were ratified by consensus by two field experts.

As already mentioned in section 3.1, because the quantitative questions were mostly dichotomous, they were treated as dummy variables. In order to improve the variation of the variables, the dummy variables were "grouped" into compounded variables, namely competences, capabilities (comprising ability capabilities and awareness capabilities), or

safeguards (formal or informal). The selection of dummy variables comprising each compounded variable was controlled by consensus first having been reached by two field experts.

Data from the completed questionnaires was captured using the statistical software package, SPSS. Once the data had been captured, the entries were cross-checked for correctness against the original questionnaires by the researcher and an assistant. A field expert (and also an expert in SPSS) also checked the entries for possible inconsistencies. Once there was agreement that the data had been correctly captured, the analysis began.

3.5 Data analysis

The frequencies of responses to the various questions "dummy variables" were first examined. This would give an indication of perceived importance of the issue from the viewpoint of the SME. Thereafter, backward conditional logistic regression would be performed on the data to explore empirically the hypotheses. Finally, in order to understand which dummy variables specifically affected the relationship between competencies, capabilities and successful partnership, a Phi test was done on all the dummy variables

In explaining the reason for selection of logistic regression, what follows is a description by Field (2000:163-204) of the reasoning behind logistic regression. He begins by listing several assumptions that must be valid in order to use multiple regression analysis. The assumptions that were prevalent in this research were:

- Variable types must be measured at the interval level and there should be no constraints on the variability of the outcome
- The predictors should have some variation in value
- There should be no perfect linear relationship between two or more of the predictors, i.e. the predictor variables should not correlate highly
- The residuals in the model are random, normally distributed, variables with a mean of zero.
- All the values of the outcome variable are independent
- The relationship being modeled is linear.

The dummy variables were compounded into the variables competencies, capabilities (ability capabilities and awareness capabilities) and safeguards (informal safeguards and formal safeguards). Having examined the frequencies of the variables, logistic regression using the backward conditional regression method was decided upon as the statistical method to be used in order to establish the relationship of competencies and capabilities, and safeguards, with the perceived success of the partnership. Logistic regression rather than ordinary regression was selected for the following reasons:

- The dependent variable was nominal (dichotomous)
- Some of the variables of the independent variable were bimodal and hence did not have a normal distribution. Furthermore some of the variables although not bimodal, did not have a normal distribution.

Because the assumptions for ordinary or normal regression analysis are violated, logistic regression analysis was selected as it allows for a nominal dependent variable and not normally distributed independent variables – logistic regression is a distribution-independent statistical technique.

Backward conditional regression analysis was used for analysing the data in order to determine which model best fitted the data. Field (2002:169) comments that backward conditional regression is appropriate when no previous research exists on which to base the hypotheses for testing and one is merely trying to find a model to fit the data – as was the case with this research. Furthermore, because we wished to examine the effect of a predictor when another variable was held constant, this method was deemed to be appropriate (Field, 2000:169). This will be elaborated on below.

Multiple regression, in which there are several predictors, can be described by the following formula (Field, 2000:164):

$$Y = b_0 + b_1 x_1 + b_2 x_2 + \ldots.. b_n x_n + e_1$$

where:

Y is predicted from a combination of each predictor variable multiplied by its respective regression coefficient;
b_n is the regression coefficient of the corresponding variable x_n ;

and e_1 is the residual value (where the higher the residual value, the worse the result). However, because this research attempts to find a model that fits the data rather than trying to predict what happens when certain conditions prevail, residual values are not that important a consideration in this case.

In logistic regression, the probability of Y occurring given known values of x_n, is predicted. Where there are several predictors, the multiple logistic regression formula is:

$$P(Y) = \frac{1}{1 + e^{-z}}$$

where $z = b_0 + b_1 x_1 + b_2 x_2 + \ldots.. b_n x_n + e_1$

Linear regression can only be used where the relationship between the variables is linear. When the outcome variable is dichotomous, however, this assumption is usually violated. By transforming the data using the logarithmic transformation, the form of the relationship is made linear whilst leaving the relationship itself as non-linear. Hence logistic regression expresses the multiple linear regression equation in logarithmic terms and overcomes the problem of violating the assumption of linearity.

The resulting value from the above equation is a probability value that varies between 0 and 1. If the value is *close to zero* it means that Y is very *unlikely* to have occurred, whereas if it is *close to 1* it means that Y is *very likely* to have occurred. As in linear regression, each predictor variable in the logistic regression equation has its own coefficient. In running the analysis the value of these coefficients must be estimated in order to solve the equation. "These parameters are estimated by fitting models, based on the available predictors, to the observed data. The chosen model will be the one that, when values of the predictor variables are placed in it, results in values of Y closest to the observed values. Specifically, the values of the parameters are estimated using the maximum-likelihood method, which selects coefficients that make the observed values most likely to have occurred. So, as with multiple regression, we try to fit a model to our data that allows us to estimate values of the outcome variable from known values of the predictor variable or variables" (Field, 2000:166).

Introducing the moderator effect, the components of a moderator model are:

$$Y = b + d_1 x_1 + d_2 x_2$$

where d_1 is the "pure" effect on y, given the effect of d_2 on the other variables (Field, 2000)

To test for the moderator effect, the *backward conditional regression method* was used for analyzing the data. In this case testing begins with all predictors (independent variables) included. "The computer then tests whether any of these predictors can be removed from the model without having a substantial effect on how well the model fits the observed data. The first predictor to be removed will be the one that has the least impact on how the model fits the data" (Field, 2000:169). Field (2002:169), citing Menard (1995), further comments that stepwise methods (as in the backward conditional regression method) are appropriate "when used in situations in which no previous research exists on which to base hypotheses for testing, … and you merely wish to find a model to fit your data". Furthermore, the backward method takes into account suppressor effects that occur "when a predictor has a significant effect but only when another variable is held constant" (Field, 2000:169).

In analyzing the filled in questionnaires, only those questions that were coded as dummy variables were analysed. The dummy variables were initially analysed in terms of frequency of response – which would indicate those issues that the SME perceived to be important. Thereafter logistic regression was performed on the data to test the hypotheses. This included not only the effect of the numbers of core competencies and capabilities on perceived partnership success, but also the interaction or moderator effect of formal and informal safeguards (individually and combined) on perceived partnership success. Lastly, cross tabulations with *perceived partnership success* as the y (dependent) variable, and certain dummy variables falling into the category *capabilities* as the x (independent) variable, were performed to clarify some of the logistic regression findings.

3.6 Verification of the survey findings by means of case studies

As the sample number of the survey was relatively small for the purposes of conducting multivariate analyses, and as limited qualitative data could be captured by means of a questionnaire, case studies were conducted on a sample of four SMEs that had participated in the survey. This approach was adopted in order to verify the findings from the survey. (An expanded explanation for the use of case studies, as well as the methodology used is discussed in Chapter 5: Case studies.)

Having described the methodology that was used, the next chapter will focus on the results obtained.

Chapter 4

Results of the survey

This chapter discusses the analyses of the empirical findings of the survey. It begins with a description of the sample in terms of the source databases; the sample's geographic distribution, and the size of the companies in the sample. The response rate of SME's that perceived the partnership to be (un)successful is given. Thereafter, the frequencies of the individual items and the distributions of the compounded variables "number of capabilities", "number of competencies" and "number of safeguards" in the relationships are discussed. The results of the logistic regression tests on the relationship between number of competencies and capabilities and perceived partnership success; as well as the effect of safeguards, formal, informal, and a combination of the two, on the relationship between the number of competencies and capabilities and partnership success are presented. Lastly, in an attempt to arrive at more in depth insights pertaining to the relationships that are discovered, the association of individual items with the dependent variable are explored by means of Phi tests on those significant variables are presented, with an associated interpretation in each case.

A description of the sample of respondents follows.

4.1 Description of the responding population

Of the 180 companies that were approached with questionnaires, 43 responses were received, giving a response rate of 23.9%. This is a fair response rate, considering that companies were contacted and interviewed by appointment. The following table indicates from where the respondents were sourced:

Table 8: Source of respondents

Data source	Number of respondents
2003 SPII awardees	1 (5)
Companies participating in the South African Innovation Survey 2001 for Manufacturing and Services, indicating a positive response to the question: Did your firm have technological innovations in the period 1998 – 2000?, as well as having indicated that they were classified as a large company	0 (1)
2002 Technology Top 100 finalists	10 (33)
2003 SME grant-holders from Technology and Human Resource for Industry Programme (THRIP)	11 (57)
SMEs referred by word of mouth	14 (15)
SMEs participating in a Gauteng based business incubator	5 (5)
SMEs participating in a Cape Town based business incubator	2 (64)

Numbers in brackets = original number of companies approached (taken from Table 8)

From the table above it is clear that there was a very high representation of companies who were referred by word of mouth or who were participants in the Gauteng based business incubator. Where there was no relationship and companies were merely cold-canvassed, the response rate was far lower (e.g. SPII, TT100, THRIP grant-holders, and SMEs in the Cape Town based business incubator).

The geographic distribution of the respondents is given in Table 9. By far the majority of the companies was based in Gauteng (91%), with most of these companies (59%) based in Pretoria. The external validity of the research findings (i.e. the generalizability of the findings to the population at large) would therefore be low. A more representative sample of the entire geographically distributed population would be required to ensure a high external validity.

Table 9: Geographic distribution of respondents

Geographic area	Number of companies
Pretoria	23
Johannesburg	16
Cape Town/Stellenbosch	3
Durban	1

In reporting on the size of company in the survey sample, 32.6% of the companies that responded had five or fewer full time employees, and the majority, 86%, had 40 or fewer full time employees (see Table 10). Most of the companies interviewed, therefore were small rather than medium sized.

Table 10: Number of full-time employees during 2003

		Frequency	Percent	Cumulative Percent
Valid	<=5	14	32.6	32.6
	<=20	13	30.2	62.8
	<=40	10	23.3	86.0
	<=200	6	14.0	100.0
	Total	43	100.0	

From Table 11 it is evident that the largest percentage (41.9%) had an annual turnover during 2003 of between R0.15 million and R4 million, and only 7% had a turnover of more than R40 million.

Table 11: Annual turnover of firm as at 31 March 2003

		Frequency	Percent	Cumulative Percent
Valid	<= 0.15 mln	3	7.0	7.0
	<=4 mln	18	41.9	48.8
	<=10 mln	6	14.0	62.8
	<=40 mln	13	30.2	93.0
	>40 mln	3	7.0	100.0
	Total	43	100.0	

The largest percentage of companies interviewed (60.5%) had a gross asset value of R1.5 million or less (see Table 12).

Table 12: Gross asset value of firm

		Frequency	Percent	Cumulative Percent
Valid	<=R0,1mil	9	20.9	20.9
	<=R1,5mil	17	39.5	60.5
	<=R3,75mil	8	18.6	79.1
	<=R15mil	8	18.6	97.7
	>R15mil	1	2.3	100.0
	Total	43	100.0	

From the tables above it is clear that the majority of the respondents could be classified as small, rather than medium sized companies. This size of company would be very vulnerable to opportunistic behaviour of LCOs and hence the sample selected was indeed relevant in terms of the size of company being studied.

The next section will discuss the frequencies of the responses, starting with those companies that had indicated that they perceived the partnership to be (un)successful (the dependent variable). Thereafter the frequencies and distributions of the following independent variables and their composition will be reported on: the ability capability variable; the awareness capability variable; the competency variable; the formal safeguard variable; and the informal safeguard variable.

4.2 Perception of successful partnership (dependent variable)

The frequency of the dependent variable: successful partnership - as perceived by the SME is given in Table 13. 60,5% of the SMEs considered the partnership to be a success and 39,5% considered it to be partially or not successful. This result is somewhat surprising as a lower result for successful partnership was expected. As LCOs can act opportunistically in accessing the knowledge and expertise of an SME when partnering, and the anecdotal evidence (see case 1) suggests that they do, a lower response rate in terms of perceived successful partnership by the SME was anticipated. If LCOs do abuse their power in a partnership with an SME, one could have expected more SMEs to indicate that they believed the partnership to be NOT successful.

Table 13: SMEs indicating that they perceived the partnership to be successful

		Frequency	Valid Percent
Valid	No	17	39,5
	Yes	26	60,5
	Total	43	100,0

4.3 Capabilities, competencies and safeguards (independent variables)

Next to be considered do the frequencies of the variables comprise competencies, capabilities and safeguards, being the independent variables. Thereafter their respective distributions are discussed.

4.3.1 Ability capability variable (X1 first independent variable)

4.3.1.1 Frequency of ability capability

The ability capability variable refers to a number of abilities of the SMEs to produce, utilize and protect inherent technological knowledge and information. This variable includes the following abilities: developing and patenting intellectual property; expertise and technology ability; ability to establish a new trend; ability to understand different types of innovative technology, as well as the innovative environment; and an ability to segment the market for innovative technologies. The variables comprising the ability capability variable and their frequencies are listed in Table 14 below.

Table 14: Frequency of responses: ability capability variables

Ability capability variables	Frequency (%)
1. The company developed proprietary information during the period 1995 – 2003	86
2. This IP was patented	35
3. SME had expertise	79
4. SME had technology	54
5. Ability of SME to establish a new trend	67
6. When sourcing innovative technologies, SME's LCO partner sources	
6.1 disruptive technology	26
6.2 incremental technology	81
7. The sectoral environment in which SME operates is one of:	
7.1 incremental innovation	47
7.2 spasmodic innovation	28
7.3 repetitive innovation	44
7.4 incessant innovation	35
8. SME segments its potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards	54

In examining the variables comprising ability capabilities as listed in Table 14, the following observations can be made:

Most of the companies interviewed (86%) had developed *proprietary knowledge* (IP), although only 35% had patented this IP. Kwak (2002) believed that possessing at least one patent – which would give an indication of an ability capability, increases a start-up's probability for collaboration. The high percentage of companies that indicated having developed IP confirmed that most of the companies interviewed were in fact developing technology innovations and hence had an ability to apply knowledge and expertise. The high percentage of SMEs developing IP appears to follow the trend described by Arundel (2001:611) where because of a shift from competition based on price towards competition based on technical innovation, economic importance is attached to IP that encourages its development. A second reason given by Arundel (2001:611) for the increase in the development of IP is that IP is associated with the rise of new technologies, e.g. biotechnology and information technology – and many of the SMEs interviewed were in the information technology sector.

The relatively small percentage that had patented their IP could be as a result of the industry that they were in (in South Africa patenting of software is not permissible), or because the costs of defending a patent are very high for a small company and hence patenting is not an attractive option for an SME. It could also be as they did not wish to fully disclose their inventions as this could "release valuable information to competitors on potentially profitable research areas or how to invent around the patent" (Arundel, 2001:612), or because of the high costs associated with patenting, or the fact that most of the innovations were of an incremental nature and therefore not patentable (Arundel, 2001:213).

Most of the SMEs (79%) believed that it was their *expertise* that had attracted the LCO to partner with them. This finding is in support of findings reached by Kimzey and Kurokawa (2002) who stated that one of the reasons for LCO's to outsource was because they wished to be the technology leader rather than the technology driver. To be seen as a technology outsource partner, would be dependent on the level of expertise residing in the SME, i.e. an expertise ability that would ultimately support technology development. This specialist knowledge that the SME had could be viewed by the LCO as an ability, which they (the LCO) sought. 67% of SMEs believed that they had an ability to *establish a trend,* whereas only 54% believed that it was their *technology* that attracted the LCO.

Hence expertise appeared to be the most important ability capability that motivated an LCO to partner with an SME.

81% of SMEs believed that their LCO partner sourced incremental technology, and only 26% believed their LCO partner sourced disruptive technology. Christensen (2002) commented that leaps in growth were accompanied by radical innovation. Hence it is fair to assume that the opportunities for SMEs were largely in providing incremental, rather than radical technology solutions. Furthermore, 47% of SMEs were of the opinion that the sectoral environment in which their company operated was one of incremental innovation, (44% believed it was one of repetitive innovation, 35% believed it was one of incessant innovation, and 28% believed it was one of spasmodic innovation). These results indicate an ability by the SME to understand the innovative environment in which it operated. Furthermore, the results are consistent with Burgelman et al's findings (1995) that technology evolves through long periods of incremental innovation, punctuated occasionally by disruptive innovations. It would seem that not only is the environment largely one of incremental innovation, but that LCOs expect to source incremental, rather than radical innovation. Hence the fact that the findings of this research appear to support the findings in the literature (Burgelman et al, 1995) would confirm that the SMEs did appear to have an ability to understand the types of technology that the LCOs source, as well as the innovative environment in which they operate.

More than half (54%) of SMEs segmented their potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards. This supports the findings of Moore (1999) confirming the importance of companies wishing to access markets with new products, to identify and understand the paradigms and needs of the market players and thereafter to align their marketing strategies with the paradigms of the players. Hence an apparent ability to segment the market to introduce new innovations was prevalent in the majority of the SMEs.

In concluding this section, it appears that nearly all the SMEs had developed IP and had sought after expertise; the SMEs had an ability to understand that the environment in which they operated was one of incremental innovation, and that the LCOs were by and large sourcing incremental innovation from this environment; and that more than half of the SMEs had an ability to understand the market segmentation required for introducing a new innovation to the market.

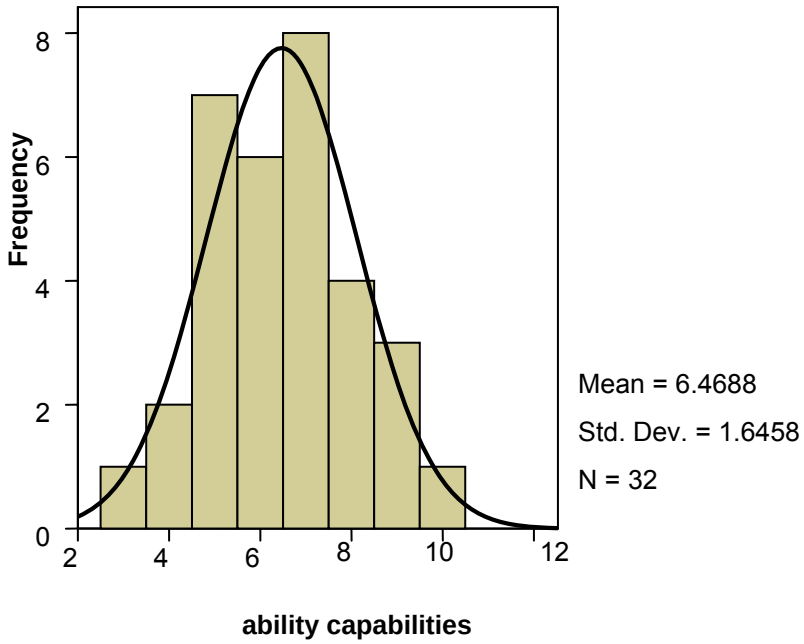
4.3.1.2 Distribution of ability capability

As discussed in Chapter 3, in order to improve the variation of the variables, compounded variables were constructed by grouping the individual ability capability variables together to create a single ability capability variable. Hence items 1 – 8 of Table 14 were compounded into a single variable: the ability capability variable. In considering the distribution of the ability capability variable, it is apparent from Table 15 and Figure 9 that on average SMEs have 6.5 ability capabilities. The compounded ability capability variable has a normal distribution in which 7 abilities is the most frequent score. Only a few (2%) SMEs score on all abilities. The standard deviation is relatively low and a considerable number of the SMEs have 5 – 8 abilities.

Table 15: Distribution of ability capability variable

Number of ability capabilities		Frequency	Percent
Valid	3,00	1	2,3
	4,00	2	4,7
	5,00	7	16,3
	6,00	6	14,0
	7,00	8	18,6
	8,00	4	9,3
	9,00	3	7,0
	10,00	1	2,3
	Total	32	74,4
Missing	System	11	25,6
Total		43	100,0

Figure 9: Distribution of ability capability variable



4.3.2 Awareness capability variable (X2, second independent variable)

4.3.2.1 Frequency of awareness capability

The awareness capability variable refers to the level of awareness that the SME has relating to the environment in which it operates, and the needs of the LCO. This variable includes the following awareness capabilities; understanding of LCO's SWOT, and complementarity of technological offering with the LCO's SWOT and core business; awareness of the LCOs internal politics; awareness of opportunities SME presents to the LCO in terms of providing opportunities for financial synergy, increasing profitability, technical economies of scale, recognition of management expertise for proposing the cooperation; awareness of organizational type from whom LCO sources technologies; and awareness of the technology sourcing strategy of LCO.

Table 16 lists the frequencies of the items comprising the awareness capability variable.

Table 16: Frequency of responses: awareness capability variables

Awareness capability variables	Frequency (%)
9. SME had adequate understanding of the strengths and weaknesses of their LCO partner	72
10. Complementarity of SME's offering with LCO's SWOT?	88
11. Complementarity of technological offering with LCO's core business	86
12. Awareness of the internal politics of LCO partner	58
13. Opportunities SME presents: take advantage of financial synergies	35
14. Opportunities SME presents in terms of satisfying managerial motives such as:	
14.1 increasing profitability	67
14.2 technical economies of scale	49
14.3 recognition of management expertise for proposing cooperation	47
15. Organizational type from whom LCO partner sources innovative technologies:	
15.1 SMEs specifically	14
15.2 LCOs specifically	19
15.3 research institutions specifically	12
15.4 combination of the above?	74
16. Technology sourcing strategy of LCO is:	
16.1 To wholly acquire the technology	30
16.2 To enter into one of the following partnership arrangements with an SME:	
16.2.1 a joint venture	42
16.2.2 a license	40
16.2.3 becoming a "reseller of the technology"	54
16.3 To enter into one of the following partnership arrangements with a LCO:	
16.3.1 a joint venture	37
16.3.2 a license	28
16.3.3 becoming a "reseller of the technology"	44

In examining the items comprising *awareness capabilities* as listed in Table16, the following observations can be made:

72% of the SMEs indicated that they had an adequate understanding of the strengths and weaknesses of their LCO partner, and 88% believed that their offering was complementary to the LCO's SWOT. This need for an alignment of offerings is supported in the literature by Klein Woolthuis and Groen, 2000; Hitt et al, 1998, Gadiesh et al, 2001, Klofsten and Schaerberg (2000); Bakker et al (1994); Hart and Saunders, 1997; Hlavacec (1977); Teece, 1986; and Niosi (2003). Being aware of the LCO's SWOT would hence indicate an awareness capability. Furthermore, the large majority of SMEs (86%) believed that their technological offering was complementary to the LCO's core business. These findings are in accordance with the literature (Klein Woolthuis and Groen, 2000), where technological complementarity was found to be a strong motive for partner choice.

More than half (58%) of SMEs indicated that they were aware of the internal politics of their LCO partner. The expectation would be that the greater the awareness of the internal politics, the more successful the relationship would be and an awareness would enable the SME to align itself correctly, politically.

Only 35% of SMEs believed that the LCO could take advantage of financial synergies such as the high growth potential the SME offered, although hampered by being cash strapped. However, 67% believed that they presented the LCO with an opportunity of increasing profitability (supported by the literature: Laurie, 2001; Barber et al, 1995); 49% believed the opportunity was technical economies of scale, and 47% believed it was to satisfy the managerial motive of recognition of management expertise for proposing cooperation. An understanding of the opportunities the SME offers to improve the LCO's profitability indicates the presences of an awareness capability by the SME.

74% of SMEs believed that LCOs sourced innovative technologies from a combination of SMEs, LCOs and research institutions, whereas only 19% believed it was sourced from LCOs specifically, 14% believed it was sourced from SMEs specifically and 12% believed it was sourced from research institutions specifically. This finding of few partnerships with a single organization is in support of the findings of Oerlemans et al (2003:73) where most South African firms (82%) had innovated on their own, and the percentage of innovating firms actively partnering with other South African firms was low - and considerably lower than those firms in the European Union (18% versus 26%). In addition they found that the larger the firm, the higher the percentage of innovative partners the firm had (approximately 36% of firms of 500 and more employees collaborated with domestic partners versus only 15% of firms of less than 50 employees).

Evidence from the literature is that companies tend to collaborate with single, rather than a combination of institutions, for example, Whitley (2002) comments that firms relying on new generic knowledge will either develop this in-house, or develop close alliances with research teams in the public science system. Furthermore, the findings of this research that LCOs seem to source innovative technologies from a combination of different sizes and types of organizations could appear to be contrary to the findings of Klein Woolthuis and Groen (2000) who found that LCOs preferred to collaborate specifically with other LCOs, as did SMEs with other SMEs. Their research was based on surveying European companies, where there is more selection and hence companies have the choice in terms of with which companies they wish to collaborate – large or small. South Africa is a small market with a relatively small number of technology companies, hence the selection in

terms of with whom to partner is not so great. The reality may therefore be that in South Africa LCOs need to source innovative technologies from a variety of players, inter alia, SMEs, LCOs and research institutions, rather than any single organizational type. In conclusion, therefore, having such an awareness capability would enable the SME to develop the necessary linkages with other organizations to ensure it was "on the radar screen" of the LCO sourcing technologies.

Entering into a partnership with the SME and becoming a reseller of the SME's technology appeared to be the most preferred strategy of the LCO partner when sourcing a technology as reflected by the majority (54%) of the SMEs. This finding would support the earlier finding (see Table 14) that one of the motivations for LCOs to enter partnerships with SMEs is to access their technologies (54% of LCOs partnered with the SME because of their (SME's) technology). 44% believed that *becoming a reseller of the LCO's technology* was the most preferred strategy of the LCO. This finding, rather than the previous finding, is supported in the literature where, for example, Klein Woolthuis and Groen (2000) found that LCOs preferred to collaborate with other LCOs, and SMEs with other SMEs. 42% believed that *entering into a joint venture with an SME*; 40% believed that *entering into a license agreement with an SME* (supported in the literature by Lang, 1996) who found that subcontracting was a good way for an SME to do business with an LCO)*;* 37% believed *entering into a joint venture with an LCO*; and 28% believed *entering into a license agreement with an LCO* was the most preferred strategy of the LCO partner. From these results it is clear that the SMEs were of the opinion that LCOs preferred to partner with SMEs rather than LCOs.

To conclude this section the following awareness capabilities are most prominent: most of the SMEs understood the SWOT of the LCOs and had aligned their technological offerings in a complementary fashion with the LCOs core business. Furthermore, more than half of the SMEs understood the internal politics of their LCO partner. The greater majority of the SMEs (67%) were aware that they presented an opportunity for increasing the profitability of the LCO. Most of the SMEs (74%) believed that LCOs sourced innovative technologies from a combination of sources, namely, SMEs, LCO, and research institutions. The majority of SMEs believed that the preferred technology sourcing strategy for an LCO was to become a reseller of an SME's technology.

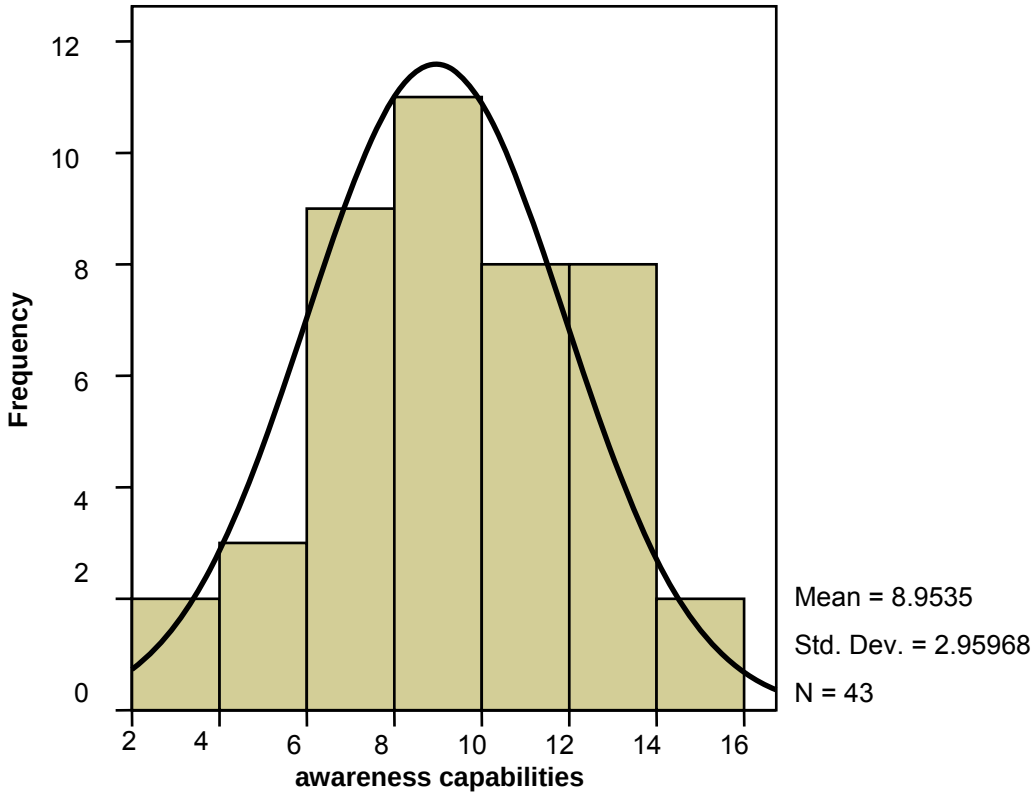
4.3.2.2 Distribution of awareness capability

The distribution of the awareness capability items is as follows. From Table 17 and Figure 10, it is evident that the level is on average 8.9 and the variable has a normal distribution in which the score 7 is the most frequent score. Only a few SMEs (4.7%) score on all awareness capability items. Furthermore only a few SMEs (4.7%) have a very low level of awareness. Most SMEs are located close to the average.

Table 17: Distribution of awareness capability variable

Number of awareness capabilities		Frequency	Percent
Valid	2,00	2	4,7
	5,00	3	7,0
	6,00	1	2,3
	7,00	8	18,6
	8,00	6	14,0
	9,00	5	11,6
	10,00	5	11,6
	11,00	3	7,0
	12,00	6	14,0
	13,00	2	4,7
	15,00	2	4,7
	Total	43	100,0

Figure 10: Distribution of awareness capability variable



4.4 Competencies variable (X3, third independent variable)

Competencies comprise capabilities plus processes. The competencies variable refers to a bundle of skills, technologies and processes for innovation, product, and networks and relationships. The frequencies of these items are listed in Table 18 below.

Table 18: Frequency of responses: competency variables

Competency variables	Frequency (%)
17. What do you believe were the main reasons for the LCO to partner with you: to access a source of innovation?	74
18. What do you believe were the main reasons for the LCO to partner with you: to acquire the product?	42
19. What do you believe were the main reasons for the LCO to partner with you: to access your network and relationships?	35

From Table 18 it can be seen that from the variables comprising competencies, the SMEs believed that the main reason for the LCO to partner with them was because they were seen to be *a source of innovation* (this variable had a frequency of 74%). Only 42% believed that the reason for the LCO to partner with them was to *acquire their product* and 35% believed that the LCO sought their *network and relationships*. The highest ranked competence therefore was *innovation* – more specifically, being seen as a source of innovation.

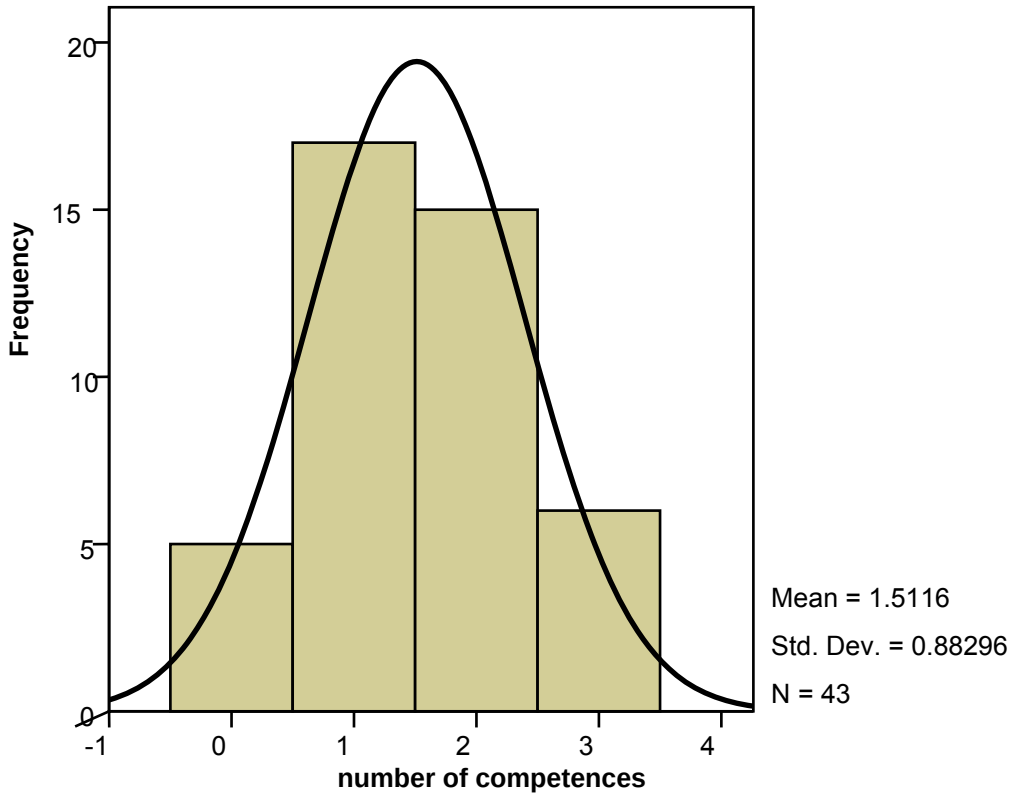
From Table 19 below, this variable can range from 0 to 3 and most SMEs have one or two of the competences included in the variable. Very few SMEs have either no competencies, or all three competencies.

From Figure 11 it is evident that the distribution seems normal.

Table 19: Distribution of competencies variable

		Frequency	Percent
Valid	,00	5	11,6
	1,00	17	39,5
	2,00	15	34,9
	3,00	6	14,0
	Total	43	100,0

Figure 11: Distribution of competencies variable



4.5 Moderator variables -– Number of safeguards in the LCO-SME relationship

Tables 20 and 22 below lists the frequencies of responses to the questions pertaining to safeguards (both formal and informal), i.e. the variables that comprise formal and informal safeguards. In the theoretical model, the safeguards that are put in place in the LCO-SME relationship are classified as the moderator variables.

4.5.1 Number of formal safeguards in the LCO-SME relationship (Z1, first moderator variable)

4.5.1.1 Frequency of formal safeguards

This variable refers to the number of formal safeguards that are put in place to manage and control the relationship with between the SME and the LCO. The variables comprising this

variable are: a formalized partnership; use of quantitative measures to determine partnership success; LCO had a technology strategy; expansionist opportunities SME presents for LCO; means by which LCO gathered information on SME; documented process for monitoring quality control, delivery and support of products. The frequencies of these items are listed in Table 20 below.

Table 20: Frequency of responses: formal safeguard variables

Formal safeguard variables	Frequency (%)
1. Existence of a collaboration/partnership with an LCO.	93
1. Quantitative measures used to determine whether the partnership was successful?	
1.1 financial success	51
1.2 mutual benefits	12
1.3 no	42
1.4 other	7
3. LCO had a technology strategy	60
4. Expansionistic opportunities SME presents for LCO:	
4.5 to access new market segments	47
4.6 to increase sales	72
4.7 to pursue market dominance	70
4.8 to develop a "quick win" that has a high probability of success and will probably produce an immediate pay-off	51
5. Means by which LCO gathered information on SME:	
5.5 scanning relevant technological magazines?	16
5.6 formal business appointment(s) with the owner(s) and/or staff of your company?	77
5.7 informal meetings/lunches with the owner(s) and/or staff of your company?	65
5.8 word of mouth?	67
5.9 relationship building at networking event(s)?	58
6. Documented process for monitoring:	
6.1 quality control of your products	81
6.2 reliable delivery	82
6.3 reliable product support	77
7. Substantial equity stake in SME held by:	
7.1 a venture capital company	9
7.2 another company viz:	
7.2.1 another SME	5
7.2.2 an LCO	14
7.3 an angel investor	14
7.4 an incubator	2
7.5 a bank?	7

The following observations can be made, referring to Table 20 above, concerning the frequencies of the variables comprising formal safeguards:

93% of the companies indicated that they had cooperated or partnered with a large company during the period 1990-2003. Although 7% had not filled in this variable, they had filled in the sub variables, which indicated the basis for the partnership, hence, confirming that they had indeed cooperated or partnered with a large company. Hence all

SMEs surveyed had cooperated or partnered with an LCO. This would imply that all SMEs surveyed had indeed been subject to the monitoring of performance against certain milestones and hence had been subject to this formal safeguard.

The majority of companies (51%) indicated that they had used the quantitative measure: *financial success* to determine whether the partnership was successful or not successful. Only 12% indicated that they used *mutual benefits* as a quantitative measure. 42% had indicated that they did NOT use quantitative measures to determine whether the partnership was successful/not successful. However, the majority of SMEs had applied quantitative measures as a way to control the relationship, which qualifies as a formal safeguard.

60% of the companies indicated that their LCO partner had a technology strategy. A technology strategy would imply monitoring outcomes against a pre-determined plan and hence served as a formal safeguard.

72% of the companies believed that the main expansionistic opportunity that they presented for the LCO was to *increase sales* and almost as many (70%) believed it was to *pursue market dominance*. 51% believed that it was to *develop a "quick win" that has a high probability of success and will probably produce an immediate pay-off*; and 47% believed it was to *access new market segments.* Hence the focus of LCOs (from the SMEs' perspective) appears to be on growing an existing market rather than on breaking into a new market segment. Working to pre-set targets would therefore serve as a formal safeguard.

Rech (2002) stresses the importance of conducting due diligence on a future partner. Regarding the way the information was gathered, 77% of the SMEs believed that the LCO gathered information on their company by *formal business appointment(s) with the owner(s) and/or staff of their company*; 67% by *word of mouth*; 65% by *informal meetings/lunches with the owner(s) and/or staff of their company*; and 58% by *relationship building at networking events*. Only 16% felt that the LCO gathered information on their company by *scanning relevant technological magazines*. Hence it appears that contact with the SME's people is an important means that the LCO uses to gain information on the SME. Furthermore, it is assumed that this accumulated information was against a pre-determined plan, and hence served as a formal safeguard.

82% of companies indicated that they had a documented process for monitoring *reliable delivery* of their products; 81% for *quality control* of their products; and 77% for *reliable product support*. Hence a documented process for monitoring quality control, delivery and support of products seemed to be a popular form of formal safeguard.

Very few of the companies interviewed indicated that a substantial equity stake in their company was held by another entity, during negotiations with the LCO, namely: 14% indicated that a stake was held by *an LCO*; 14% by *an angel investor*; 9% by *a venture capital company*; and 7% by *a bank*. This finding is contrary to the literature that indicates that equity is an effective mechanism for managing appropriation concerns that are associated with partnering (Pisano, Russo and Teece, 1988: Parkhe, 1993; Moon and Khanna, 1995). In spite of the literature, however, it appears that equity is not a common formal safeguard mechanism for inter-organizational relationships in South Africa.

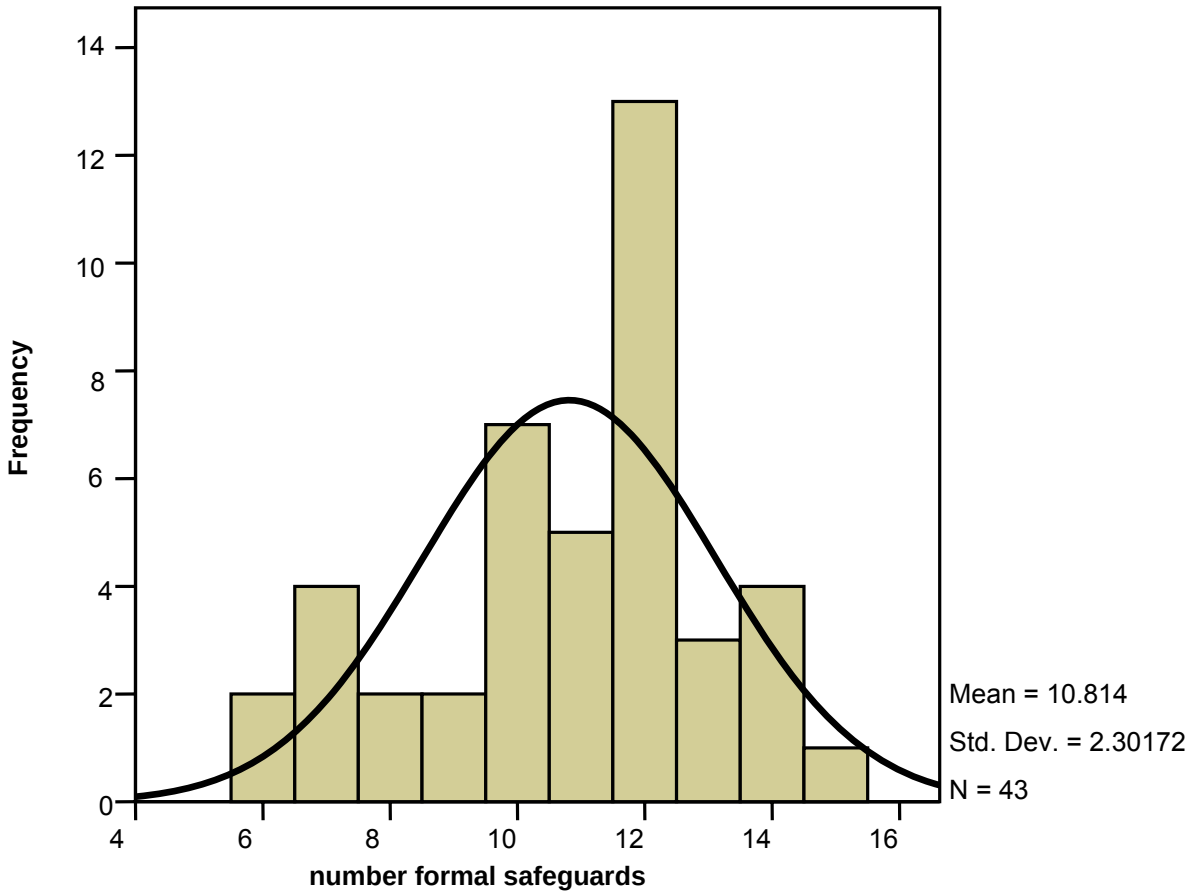
4.5.1.2 Distribution of formal safeguards

In considering the distribution of the formal safeguards, from Table 21 and Figure12, about 30% of the SME-LCO partnerships used 12 formal safeguards. On average the partnerships used about 11 formal safeguards. The variable does not appear to have a normal distribution and is somewhat skewed to the right.

Table 21: Number of formal safeguards in the LCO-SME relationship

		Frequency	Percent
Valid	6,00	2	4,7
	7,00	4	9,3
	8,00	2	4,7
	9,00	2	4,7
	10,00	7	16,3
	11,00	5	11,6
	12,00	13	30,2
	13,00	3	7,0
	14,00	4	9,3
	15,00	1	2,3
	Total	43	100,0

Figure 12: Distribution of formal safeguards



4.5.2 Number of informal safeguards in the LCO-SME relationship (Z2, second moderator variable)

4.5.2.1 Frequencies of informal safeguards

This variable refers to the number of informal safeguards that are put in place to manage and control the relationship between the SME and the LCO. The items comprising this variable are: trust in the LCO; cultural fit; SME as project champion; reputation; specific motivations for SME to partner with LCO; LCO's switching costs; management of the partnership; and being an important player in the industrial cluster.

Table 22: Frequency of responses: informal safeguard variables

Informal safeguard variables	Frequency (%)
8. Level of trust in the LCO *prior* to the partnership – high	63
9. Level of trust in the LCO with whom SME partnered *after* the partnership – high	56
10. The LCO was an opportunistic company	63
11. LCO partner was a South African company	79
12. The main core values to which SME's LCO partner ascribes:	
12.1 integrity	23
12.2 maintaining good relationships	21
12.3 quality driven	23
12.4 innovation driven	16
12.5 building expertise	16
13. Representative from the SME was the project champion	73
14. The worth (reputation) of the SME was based on:	
14.1 their sales turnover	63
14.2 their number of customers	44
14.3 an analysis of their financial statements	54
14.4 a high customer to sales ratio	26
14.5 the longevity of their average customer account	63
14.6 their reputation in the market place	91
14.7 projected growth of profits	67
15. Specific motivations for the SME to partner with the LCO was to:	
15.1 gain access to new markets or larger share of current market	81
15.2 improve/adde to their management skills	26
15.3 ease pressure from investors	16
15.4 obtain financial support	49
15.5 optimize entrepreneurship value ("cashing in")	40
15.6 "piggy back" on the LCO's technical infrastructure and expertise	47
15.7 SME had moved into a mature phase and no longer provided challenges for management.	9
16. Can quantify the approximate cost for the LCO to switch to/acquire your technology	63
17. As part of the negotiation process, SME, with partnering LCO:	
17.1 established a long-term strategic intent	81
17.2 developed a short-term joint intent	61
17.3 identified and created project teams	49
17.4 widely communicated the joint intent	61
17.5 obtained stakeholder support	49
17.6 establish an implementation plan	72
17.7 developed an exit strategy for the SME	37
18. SME recognized as an important player in industrial cluster?	77

The following observations can be made, referring to Table 22 above, concerning the frequencies of the items comprising informal safeguards:

63% of the SMEs indicated that their level of trust in the LCO *prior* to the partnership was high, and slightly fewer (56%) indicated that their level of trust in the LCO *after* the partnership was high. Interestingly enough, 63% indicated that they would describe the LCO as being an opportunistic company. This would indicate that although the SMEs

were aware of the opportunistic possibilities, they still generally trusted the LCO. Furthermore it can be derived that the "before" and "after" experience was not radically different. This is supported by a "cross check" variable that had posed the question: "would you consider partnering with this large company again?" and that gave an 81% "yes" response rate.

79% of the companies indicated that their LCO partner was a South African company. This would be an informal safeguard as there would be some cultural fit. In listing the main core values to which their LCO partner ascribes, 23% listed *integrity*; 23% listed *quality driven*; 21% listed *maintaining good relationships*; 16% indicated *innovation driven*; and 16% *building expertise*. An alignment of the SME with the core values of the LCO would indicate a cultural fit, which would serve as an informal safeguard.

These results are somewhat surprising as although 79% of SMEs had indicated that they believed that the reason for the LCO to partner with them was to acquire their expertise (see Table 14), their perception was that only 16% of LCO's indicated "building expertise" as a core value to which they ascribed. There appears to be a mismatch as although the SMEs have expertise "on offer", they are of the opinion that this is not the reason for the LCO's to partner with them! What these results could indicate, however, is that the core values listed, in the eyes of the SME, are not very high on the LCOs' priority list. The low percentages allocated to the respective core values implies that either these values are not necessary that prevalent, or that the SME does not have a good understanding of the LCOs core values and hence cannot comment with confidence on their (the LCO's) core values.

73% indicated that a representative from the SME was the project champion. This might account for the higher than expected perception of successful partnership, and would support the theory (Klein Woolthuis and Groen, 2002) of high partner satisfaction being linked to the SME being the project champion. Being the project champion would enable the SME to exert some social control and hence serve as an informal safeguard.

Almost all the companies (91%) believed that the worth of their company was based on *their reputation in the market place*. 67% believed that this was based on *projected growth of profits*; 63% on *their sales turnover*; 63% on the *longevity of their average customer account*; 54% on *an analysis of their financial statements*; 44% on *their number of customers;* and only 26% on *a high customer to sales ratio.* The reputation of the SME is a positive social control mechanism and hence an informal safeguard.

By far the majority (81%) stated that the main motivation for their company to partner with the LCO was *to gain access to new markets or larger share of current market*. 49% stated that the main motivation was *to obtain financial support*; 47% *to "piggy back" on the LCO's technical infrastructure and expertise*; 40% *to optimize entrepreneurship value (cash in)*; 26% *to improve/add to their management skills*; 16% *to ease pressure from investors*; and only 9% because *their company had moved into a mature phase and no longer provided challenges for management*. Growing their market therefore was clearly the main motivator for the SME and if the LCO delivered on this expectation it would reinforce a capability trust. This therefore served as an informal safeguard in the SME-LCO relationship.

63% of SMEs could quantify the approximate cost for the LCO to switch to/acquire their technology, hence building capability trust with the LCO, which served as an informal safeguard.

81% had, as part of the negotiation process with their partnership LCO, *established a long-term strategic intent*; 72% had *established an implementation plan*; 61% had *developed a short-term joint intent*; 61% *had widely communicated the joint intent*; 49% had *identified and created project teams*; 49% had *obtained stakeholder support*; and only 37% had *developed an exit strategy for the SME*. (Büchel (2001) had listed these activities as being important when establishing the joint value for entering the partnership.) This formed part of the joint decision making process building trust between the partners, and hence served as a social control mechanism or an informal safeguard. It also appears from the results that although the "big picture" was in place, the more detailed management that was required, the fewer SMEs had achieved this.

77% indicated that they were recognized as an important player in their industrial cluster. Bell and Albu (1999) comment that the flow of materials and goods constitute key linkages in a cluster. Hence being positioned as a linkage in the cluster would imply a good reputation, i.e. being a reliable supplier of materials and goods. Having a good reputation in the market place would build competence trust with the LCO and hence serve as an informal safeguard.

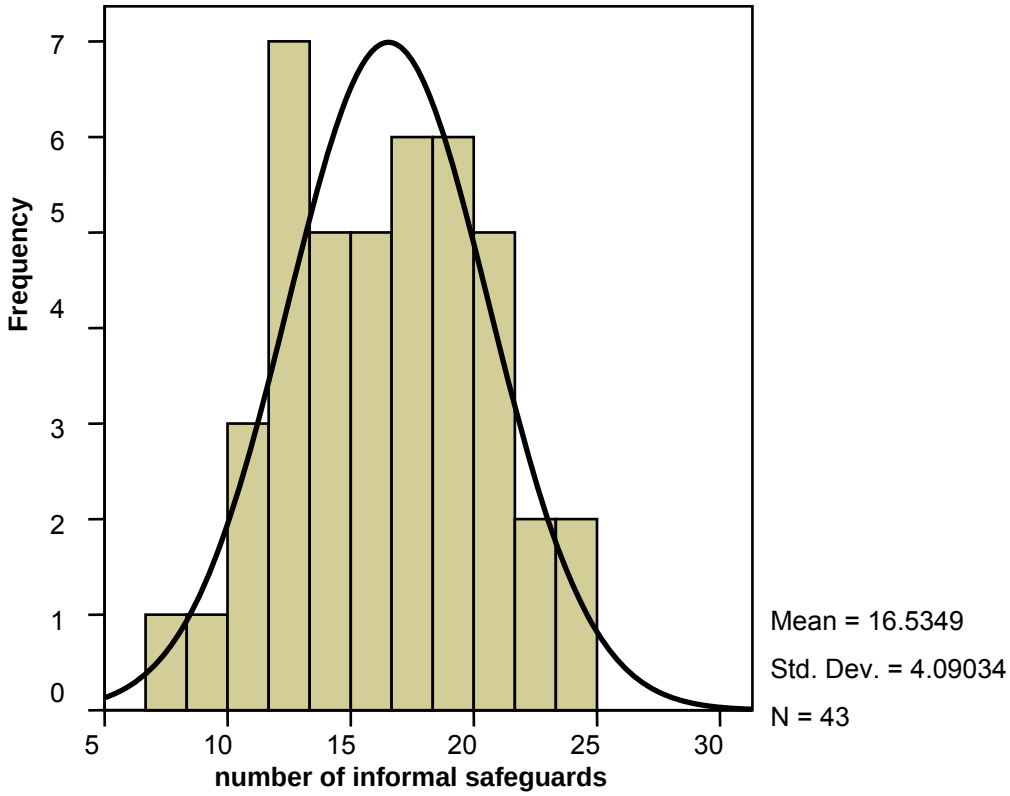
4.5.2.2 Distribution of informal safeguards

In considering the distribution of informal safeguards, Table 23 and Figure 13 shows that, on average, SMEs use about 17 informal safeguards to manage their relationship with the LCO. Furthermore, this appears to be a normal distribution.

Table 23: Number of informal safeguards

		Frequency	Percent
Valid	8,00	1	2,3
	9,00	1	2,3
	11,00	3	7,0
	12,00	1	2,3
	13,00	6	14,0
	14,00	3	7,0
	15,00	2	4,7
	16,00	5	11,6
	17,00	5	11,6
	18,00	1	2,3
	19,00	3	7,0
	20,00	3	7,0
	21,00	5	11,6
	22,00	2	4,7
	25,00	2	4,7
	Total	43	100,0

Figure 13: Distribution of informal safeguards



4.5.3 Total number of safeguards in the LCO-SME relationship (Z3, third moderator variable)

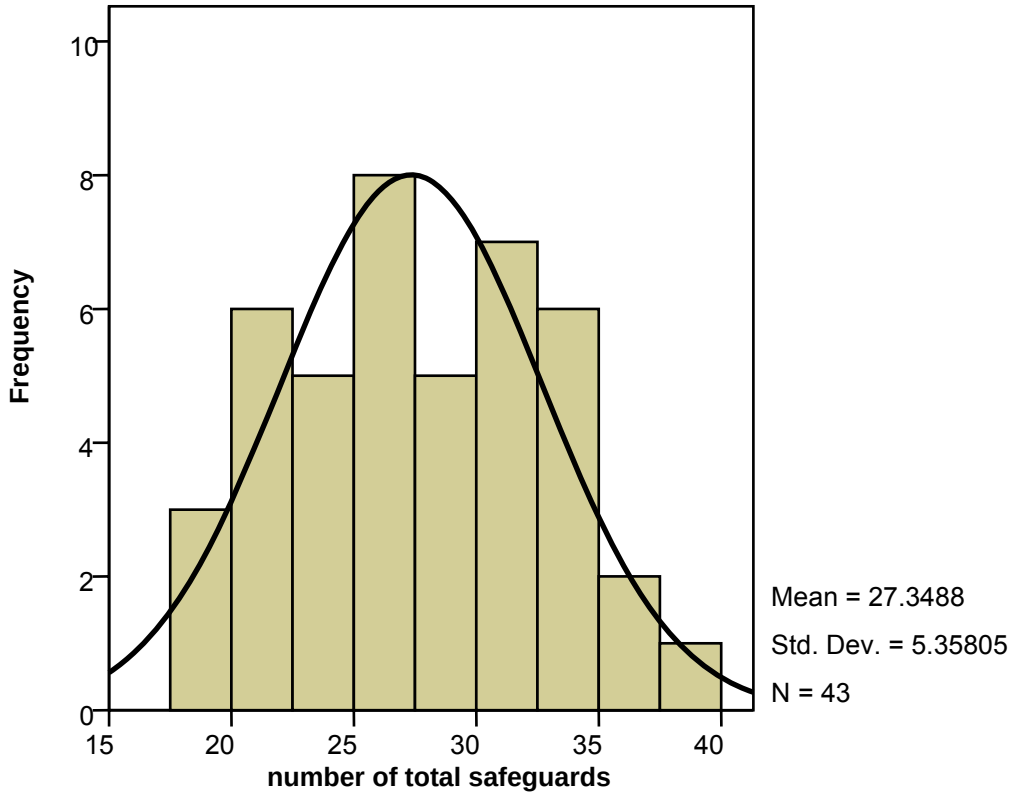
This variable refers to the total number of safeguards that were put in place in the SME-LCO partnership to manage and control the relationship.

From Table 24 and Figure 14 it is appears that the variable appears to have a bimodal distribution rather than a normal distribution. About 9% of SMEs use 27 safeguards, 12% use 31 safeguards, and 9% use 33 safeguards. Furthermore the distribution is slightly skewed to the right. On average SMEs used 27 safeguards.

Table 24: Total number of safeguards (formal and informal)

		Frequency	Percent
Valid	18,00	2	4,7
	19,00	1	2,3
	20,00	4	9,3
	21,00	1	2,3
	22,00	1	2,3
	23,00	2	4,7
	24,00	3	7,0
	25,00	1	2,3
	26,00	3	7,0
	27,00	4	9,3
	28,00	2	4,7
	29,00	3	7,0
	30,00	2	4,7
	31,00	5	11,6
	33,00	4	9,3
	34,00	2	4,7
	35,00	1	2,3
	37,00	1	2,3
	39,00	1	2,3
	Total	43	100,0

Figure 14: Distribution of total safeguards



Having examined the frequencies of SMEs that perceived the partnership to be successful (dependent variable), capabilities and competencies (independent variables) and safeguards (moderator variables) we shall next consider the results of the conceptual models, using logistic regression, in order to verify the proposed hypotheses.

4.6 Exploring the hypotheses: Logistic regression models

This section discusses the findings once the respective models had been fitted to the data. Table 25 lists the results from backward conditional logistic regression when applied to each model respectively. A discussion on the findings of each respective model follows after the table.

Table 25: Backward conditional logistic regression analyses with partnership success as the dependent variable and the factors influencing partnership success as the independent variables (significance in parenthesis)

Independent variables	Model 1	Model 2	Model 3	Model 4
Nagelkerke R Square	0.143	0.24	0.189	0.322
% Correct overall	68.8	68.8	65.6	71.9
% Correct unsuccessful	42.9	57.1	64.3	57.1
% Correct successful	88.9	77.8	66.7	83.3
Omnibus test	3.604 (0.058)	6.319 (0.097)	4.859 (0.182)	8.788 (0.032)
Exp B coefficient				
Ability capability	0.639 (0.077)	0.055 (n.s.)	0.001 (n.s.)	0.506 (n.s.)
Awareness capability	0.069 (n.s.)	0.509 (0.066)	0.640 (n.s)	0.406 (0.025)
Competencies	0.122 (n.s.)	0.316 (n.s.)	0.162 (n.s.)	0.618 (n.s.)
Interaction of total safeguards and ability capabilities (TI1)		0.981 (0.062)		
Interaction of total safeguards and awareness capabilities (TI2)		1.025 (0.042)		
Interaction effect of total safeguards and competencies (TI3)		0.357 (n.s.)		
Interaction of ability capabilities and informal safeguards (IA1)			0.972 (0.066)	0.001 (n.s.)
Interaction of awareness capabilities and informal safeguards (IA2)			1.028 (0.085)	0.008 (n.s.)
Interaction of competencies and informal safeguards (IA3)			0.114 (n.s.)	0.515 (n.s.)
Interaction of ability capabilities and formal safeguards (FA1)				0.947 (0.047)
Interaction of awareness capabilities and formal safeguards (FA2)				1.089 (0.014)
Interaction of competencies and formal safeguards (FA3)				0.763 (n.s.)

4.6.1 Determining the relationship between levels of competencies and capabilities and partnership success (model 1)

Model 1 examines empirically the relationship between the number of competencies and capabilities and perceived partnership success. The outcome is uncertain and one of the following is expected:

- either that the more competencies and capabilities an SME has, the higher will be the perceived partnership success as the SME presents the LCO with a broader and more varied offering;
- or that the lower will be the perceived partnership success as the LCO cannibalizes the SME's many competences and capabilities.

This is captured in hypotheses $1_{a,b \text{ and } c}$ representing a positive relationship, and $2_{a, b \text{ and } c}$ representing a negative relationship:

Positive relationship:

H_{1a} Higher numbers of ability capabilities are associated with *higher* levels of perceived partnership success

H_{1b} Higher numbers of awareness capabilities are associated with *higher* levels of perceived partnership success

H_{1c} Higher numbers of competencies are associated with *higher* levels of perceived partnership success

Negative relationship:

H_{1d} Higher numbers of ability capabilities are associated with *lower* levels of perceived partnership success

H_{1e} Higher numbers of awareness capabilities are associated with *lower* levels of perceived partnership success

H_{1f} Higher numbers of competencies are associated with *lower* levels of perceived partnership success

In order to interpret the Naglelkerke's R Square value, we refer to the following definition provided by Field, (2000:181): "The R-statistic is the partial correlation between the outcome variable and each of the predictor variables and it can vary between -1 and 1. A positive value indicates that as the predictor variable increases so does the likelihood of the event occurring. A negative value implies that as the predictor variable increases the likelihood of the outcome occurring decreases. If a variable has a small value of R then it

contributes only a small amount to the model." In defining R^2, Field expands on the above definition by stating "R^2 is a measure of how much the badness-of-fit improves as a result of the inclusion of the predictor variables. It can vary between 0 (indicating that the predictors are useless at predicting outcome variable) and 1 (indicating that the model predicts the outcome variable perfectly)".

Hence, from Table 25 above, the Nagelkerke's R^2 for Model 1 is 0.143 indicating that Model 1 predicts 14.3% of the variation. For micro or firm-level models, 10% is perceived as being reasonably predictive. This is because of the complexities of doing research in a non-laboratory environment where it is assumed that the other 90% is caused by variations outside the control of the researcher.

As seen from Table 25, the Model 1 classifies 68.8% of the cases correctly which is not a very good result. (This indicates how close the observed are to the predicted values.) The quality of the prediction for successful partnerships is better than that for not successful partnerships (89% versus 43%).

"The Omnibus test is the ratio of the observed points to the predicted number of points. If the omnibus test = 1, the observed and the expected are the same" (Thiart et al, 2004). In Omnibus tests, ideally the significance should be $\leq$ 0.05 – this would indicate a good overall fit of the model. Therefore, a significance of 0.058 (see Table 16), being very close to 0.05, indicates that Model 1 has a good overall fit.

As can be seen from Table 26 below, the variables not included in the equation were the awareness capabilities (cap_aw) and competencies (comp) as they were not significant (0,79 and 0,73 respectively are not less than 0.1).

Table 26: Variables not in the equation (Model 1)

		Score	Sig.
Variables	cap_aw	,069	,793
	comp	,122	,727

The expB "is an indicator of the change in odds resulting from a one unit change in the predictor … if the value is greater than 1 then it indicates that as the predictor increases, the odds of the outcome occurring increase. Conversely, a value less than 1 indicates

that as the predictor increases, the odds of the outcome occurring decrease" (Field, 2000:184).

As captured in Table 25, the ability capability is statistically significant in Model 1 (the level of significance being 0.077 which is smaller than P<0.1). The expected B (coefficient) is less than 1 (0.639), which signals a negative relationship between ability capability and perceived success. This means that the more abilities capabilities SMEs have, the lower the perceived partnership success.

This finding would seem to indicate that the more ability capabilities the SME has, the greater opportunity it presents for opportunism by the LCO. The LCO can more easily cannibalize the offerings of the SME which will lead to an unsuccessful partnership (as perceived by the SME).

From the results of Model 1, hypothesis 1_a is rejected, namely:

H_{1a} *Higher numbers of ability capabilities are associated with higher levels of perceived partnership success*

However, hypothesis 1_d is accepted, namely:

H_{1d} *Higher numbers of ability capabilities are associated with lower levels of perceived partnership success*

As awareness capabilities and competencies were not included in the equation as they were not significant, subhypotheses H_{1b}, H_{1c}, H_{2b}, and H_{2c} could not be verified, namely there is no conclusion for the following subhypotheses:

H_{1b} Higher numbers of awareness capabilities are associated with higher levels of perceived partnership success

H_{1c} Higher numbers of competencies are associated with higher levels of perceived partnership success

H_{1e} Higher numbers of awareness capabilities are associated with lower levels of perceived partnership success

H_{1f} Higher numbers of competencies are associated with lower levels of perceived partnership success

This finding is illustrated in the figure below:

Figure 15: Model 1: The relationship between the number of ability capabilities and perceived successful partnership – a fair fit

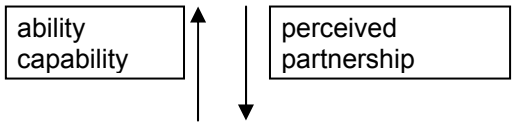


Figure 15 illustrates that as the number of ability capability increases, so the level of perceived partnership success decreases.

4.6.2 Determining the relationship between the numbers of competencies and capabilities and partnership success when total safeguards moderate the relationship (Model 2)

Model 2 tests whether safeguards in the relationship between LCO and SME (formal and informal) moderate the relationship between the number of core competencies and capabilities on the one hand, and perceived partnership success on the other. Safeguards are designed to manage and control risk in a relationship, hence the expectation is that the more safeguards that are in place in the relationship, the stronger (or the less negative) will be the relationship between competencies and capabilities and perceived partnership success. This is reflected in hypotheses 3_{a-f} below:

H_{2a} The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.

H_{2b} The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between awareness capabilities, and the perceived success of the partnership.

H_{2c} The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between competencies, and the perceived success of the partnership.

H_{2d} The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between ability capabilities, and the perceived success of the partnership.

H_{2e} The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between awareness capabilities, and the perceived success of the partnership.

H_{2f} The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between competencies, and the perceived success of the partnership.

From Table 25 the following findings are evident:

The Nagelkerke R^2 is 0.24 indicating that Model 2 predicts 24% of the variation of partnership success. A combination of total safeguards and capabilities (awareness and ability) therefore appears to be a better predictor of perceived partnership success than ability capabilities only (which were only 14%).

The total model classifies 68.8% of the cases correctly, and this is not a very good result. Furthermore, the quality of the prediction for successful partnerships is better than that for not successful partnerships (77.8% versus 57.1%).

The Omnibus test indicates a significance of 0.097, which is sufficiently close to $\leq$ 0.05 to indicate that Model 2 is a fair fit, although not as good a fit as model 1.

Table 27: Variables not in the Equation (Model 2)

		Score	Sig.
Variables	cap_ab	,055	,814
	comp	,316	,574
	TI3	,357	,550
Overall Statistics		,379	,945

From Table 27 we can see that variables that were not included in the equation were: ability capabilities; competencies; and the interaction effect of total safeguards and competencies (TI3). Hence the variable that was included in the equation was the interaction effect of total safeguards and awareness capability (TI2).

From Table 25 it can be seen that awareness capability (0.066); the interaction effect of total safeguards and ability capability (TI1 = 0.062); and the interaction effect of total safeguards and awareness capability (TI2 = 0.042) are statistically significant. Because the awareness capability is less than 1, this means that as the awareness capability increases, the perceived successful partnership diminishes.

The value for the interaction effect of total safeguards and ability capability is 0.981 and as this is close to 1 it can be taken as 1. This means that the interaction effect of total safeguards and ability capability has almost no effect on the perceived partnership success. As the ability capability increased from 0.639 in model 1 where total safeguards did not moderate the relationship, to 1 where total safeguards DID moderate the relationship, it can be concluded that the introduction of total safeguards affects the relationship positively. It would appear, therefore, that whereas the more ability capabilities an SME has, the lower the perceived partnership success, that when total safeguards are introduced the perceived partnership success is no longer affected (either positively or negatively) by increasing numbers of ability capabilities. Total safeguards therefore eliminate the negative effect on partnership success when ability capabilities are increased.

The ExpB for the interaction effect of total safeguards and awareness capability is greater than 1 (1,025), hence, as both total safeguards and awareness capability increase, so does the perceived partnership success. This may be explained as follows. Simply being aware of the LCO's needs, internal politics, motivations for partnering, and technology sourcing strategies does not influence the SME-LCO partnership to be more successful – in fact it influences the partnership negatively. However, with increasing numbers of safeguards together with increasing numbers of awareness capability, the level of perceived partnership success increases. This would imply that if safeguards are put in place as a control mechanism, the effect of awareness capability on partnership success is augmented.

As total safeguards and awareness capability increase, so does the perceived partnership success; and furthermore, as total safeguards and ability capability increase, the less

negative the perceived partnership success, the below mentioned hypotheses are accepted:

H_{2b} *The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between increasing numbers of awareness capabilities, and the perceived success of the partnership.*

H_{2d} *The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between increasing numbers of ability capabilities, and the perceived success of the partnership.*

From Table 25 it appears that Model 2 predicts 24% of the variation, which is a fair fit. Model 2 is not however, particularly good as only 68.8% of the cases are classified correctly. The Omnibus tests indicate that Model 2 has a fair fit.

These hypotheses are illustrated in the two figures below.

Figure 16: Model 2: The relationship between the number of awareness capabilities and perceived successful partnership when total safeguards moderate the relationship – a fair fit

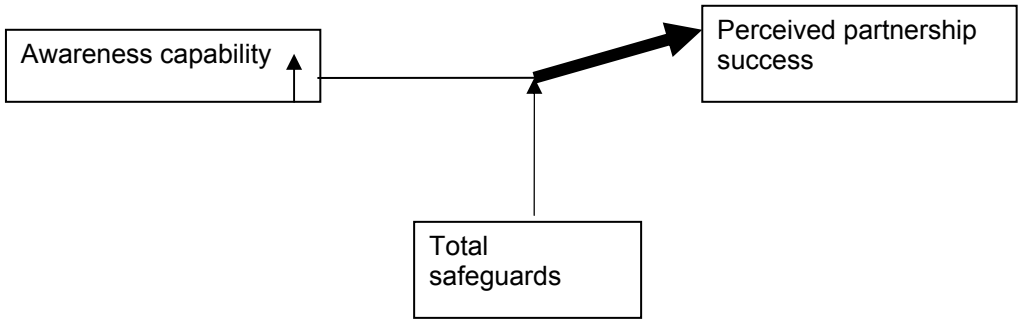


Figure 16 illustrates that as the awareness capability increases together with increased usage of total safeguards, so the perceived partnership success increases.

Figure 17: Model 2: The relationship between the number of ability capability and perceived successful partnership when total safeguards moderate the relationship – a fair fit

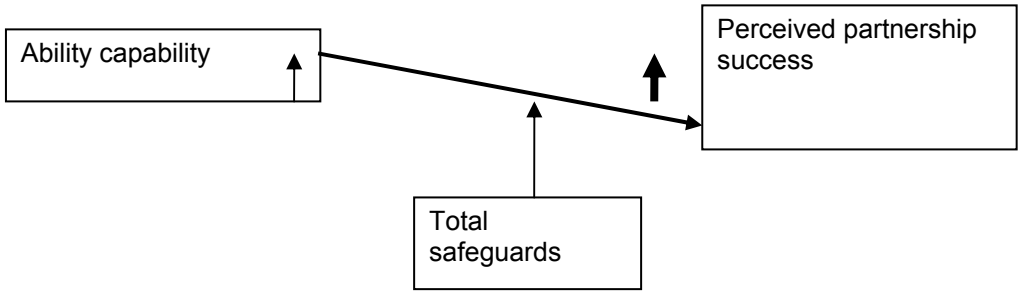


Figure 17 illustrates that as the number of ability capabilities increases, so does the perceived successful partnership decreases. However, as the ability capability and the interaction affect of total safeguards increases, so the relationship between ability capability and perceived partnership success becomes less negative.

The following hypotheses are rejected, namely:

H_{2a} *The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.*

H_{2e} *The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between awareness capabilities, and the perceived success of the partnership.*

As competencies were not included in the equation because they were not significant, no conclusions can be derived for hypotheses 2_c and 2_f below:

H_{2c} *The greater the number of safeguards (formal and informal) that are put in place, the more positive will be the relationship between competencies, and the perceived success of the partnership.*

H_{2f} *The greater the number of safeguards (formal and informal) that are put in place, the less negative will be the relationship between competencies, and the perceived success of the partnership.*

Next to be considered is the impact of informal safeguards on the perceived partnership success.

4.6.3 Determining the relationship between the number of competencies and capabilities and partnership success when informal safeguards moderate the relationship (Model 3)

Model 3 examines the effect of informal safeguards on the relationship between competences and capabilities, and perceived successful partnership. The expectation is that the more informal safeguards there are in place, the more positive will be the relationship between competencies and capabilities and perceived partnership success.

H_{3a} The greater the number of informal safeguards that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.

H_{3b} The greater the number of informal safeguards that are put in place, the more positive will be the relationship between awareness capabilities and the perceived success of the partnership.

H_{3c} The greater the number of informal safeguards that are put in place, the more positive will be the relationship between competencies and the perceived success of the partnership.

H_{3d} The greater the number of informal safeguards that are put in place, the less negative will be the relationship between ability capabilities and the perceived success of the partnership.

H_{3e} The greater the number of informal safeguards that are put in place, the less negative will be the relationship between awareness capabilities and the perceived success of the partnership.

H_{3f} The greater the number of informal safeguards that are put in place, the less negative will be the relationship between competencies and the perceived success of the partnership.

From Table 25, the Nagelkerke R^2 is 0.189 indicating that Model 3 predicts 18.9% of the variation of partnership success.

The total model classifies 65.6% of the cases correctly which is not a very good result. Furthermore, the quality of the prediction for successful partnerships is only slightly better than that for not successful partnerships (66.7% versus 64.3%).

As the Omnibus test has a significance of 0.182, which is far greater than 0.05 and hence is not significant, we conclude that Model 3 does NOT have a good overall fit.

Table 28: Variables not in the equation (Model 3)

		Score	Sig.
Variables	cap_ab	,001	,977
	comp	,162	,687
	IA3	,114	,736
Overall Statistics		,244	,970

As can be seen from Table 28, the variables not included in the equation were ability capability, competencies, and the interaction effect of competencies and informal safeguards (IA3). The variables included in the equation were awareness capability, the interaction of ability capability and informal safeguards (IA1), and the interaction of awareness capability and informal safeguards (IA2).

The ExpB for awareness capability is not significant. However, the ExpB for the interaction of awareness capability and informal safeguards (IA2) is statistically significant (0.085) and is greater than 1 (1.028), which indicates a positive relationship between awareness capability and perceived partnership success when the relationship is moderated by informal safeguards. This means that higher levels of awareness capability, in combination with higher usage of informal safeguards increases the perceived partnership success.

The ExpB for the interaction effect of ability capability and informal safeguards (IA1) is statistically significant (0.066) and is only slightly less than 1 (0.972) which indicates a

slightly negative relationship between ability capability and perceived partnership success. However, as the value is close to 1 the end result would be almost a “no effect” when informal safeguards moderate ability capability. The considerably higher value resulting when informal safeguards were included (0.972 versus 0.639), indicates that the inclusion of informal safeguards makes the initial effect on the relationship between ability capability and perceived success less negative. Informal safeguards therefore do not change the relationship between ability capability and perceived partnership success from negative to positive, but they do influence this relationship such that it is less negative. Where there is a negative relationship between ability capability and perceived partnership success, the introduction of informal safeguards makes this relationship less negative.

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Higher levels of awareness capability, in combination with high usage of formal safeguards increase. To conclude, the hypotheses below are accepted:

H_{3b} *The greater the number of informal safeguards that are put in place, the more positive will be the relationship between awareness capabilities and the perceived success of the partnership.*

H_{3d} *The greater the number of informal safeguards that are put in place, the less negative will be the relationship between ability capabilities and the perceived success of the partnership.*

Model 3 predicts 18.9% of the variation of the perceived successful partnership. This model is not particularly good as only 65.5% of the cases are classified correctly. Furthermore, the Omnibus test indicates that Model 3 does NOT have a good overall fit.

These hypotheses are illustrated in the figures below.

Figure 18: Model 3: The relationship between the level of awareness capability and perceived successful partnership when informal safeguards moderate the relationship – a poor fit

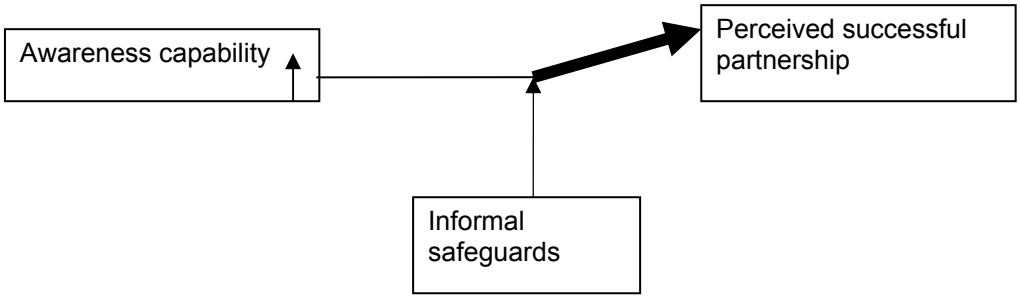


Figure 18 illustrates that higher levels of awareness capabilities, in combination with higher usage of informal safeguards, increases the perceived successful partnership.

Figure 19: Model 3: The relationship between the number of ability capability and perceived successful partnership when informal safeguards moderate the relationship – a poor fit

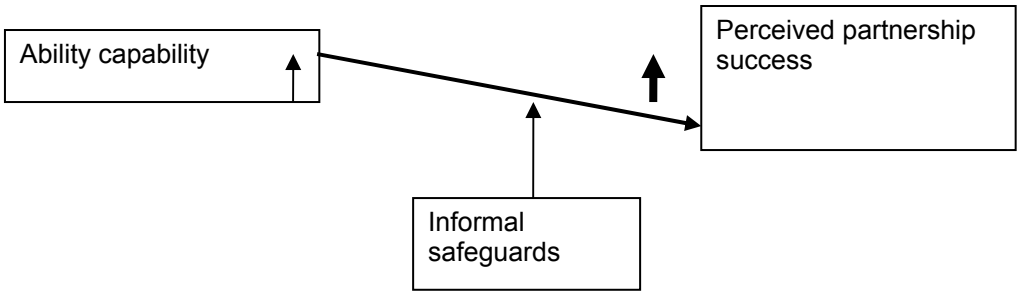


Figure 19 illustrates that as the ability capability increases, so the perceived partnership success decreases. However, with increased use of informal safeguards, the perceived partnership success is less negative.

The below mentioned hypotheses are rejected:

H_{3a} *The greater the number of informal safeguards that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.*

H_{3e} *The greater the number of informal safeguards that are put in place, the less negative will be the relationship between awareness capabilities and the perceived success of the partnership.*

As competencies were not included in the equation as they were not significant, the following hypotheses could not be verified:

H_{3f} *The greater the number of informal safeguards that are put in place, the less negative will be the relationship between competencies and the perceived success of the partnership.*

H_{3c} *The greater the number of informal safeguards that are put in place, the more positive will be the relationship between competencies and the perceived success of the partnership.*

Next to be examined is the effect of formal safeguards on the relationship between competencies and capabilities and perceived successful partnership.

4.6.4 Determining the relationship between the number of competencies and capabilities and partnership success when formal safeguards moderate the relationship (Model 4)

Model 4 examines the effect of formal safeguards on the relationship between competencies and capabilities on the one hand and perceived successful partnership on the other hand. The expectation is that the more formal safeguards that are in place in the relationship between the LCO and the SME, the worse will be the relationship between competencies and capabilities and perceived partnership success. This is because too many formal safeguards can signal distrust and the partners may then focus on looking for loopholes via which they can exploit and appropriate (St John, 1996;

Markus 2000; Gallivan and Depledge, 2003). Such opportunistic behaviour would lead to an unsuccessful partnership. The hypotheses are formulated as:

H_{4a} The greater the number of formal safeguards that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.

H_{4b} The greater the number of formal safeguards that are put in place, the more positive will be the relationship between awareness capabilities and the perceived success of the partnership.

H_{4c} The greater the number of formal safeguards that are put in place, the more positive will be the relationship between competencies and the perceived success of the partnership.

H_{4d} The greater the number of formal safeguards that are put in place, the less negative will be the relationship between ability capabilities and the perceived success of the partnership.

H_{4e} The greater the number of formal safeguards that are put in place, the less negative will be the relationship between awareness capabilities and the perceived success of the partnership.

H_{4f} The greater the number of formal safeguards that are put in place, the less negative will be the relationship between competencies and the perceived success of the partnership.

The Nagelkerke R^2 is 0.322 indicating that Model 4 predicts 32.2% of the variation on perceived partnership success. This is a very good result and the best of all the models.

The total model classifies 71.9% of the cases correctly – which is a fair result, and the best of all the models. The quality of the prediction for successful partnerships is far better (83.3%) than for not successful partnerships (57.1%).

The Omnibus test is significant (0.032), indicating a good overall fit of the model.

Table 29: Variables not in the equation (Model 4)

		Score	Sig.
Variables	cap_ab	,506	,477
	comp	,618	,432
	FA3	,763	,383
	IA1	,001	,974
	IA2	,008	,929
	IA3	,515	,473
Overall Statistics		1,387	,967

From Table 29 it can be seen that the following variables were not included in the equation: Ability capabilities; competencies; interaction of competencies and formal safeguards (FA3); interaction between ability capability and informal safeguards (IA1); interaction between awareness capability and informal safeguards (IA2); and interaction between competencies and informal safeguards (IA3). By implication, therefore, the following variables were included in the equation: awareness capability, the interaction of ability capabilities and formal safeguards (FA2) and the interaction of awareness capability and formal safeguards (FA2).

The ExpB for awareness capability is significant (0.025) and is less than 1 (0.406), indicating a negative relationship between awareness capability and perceived successful partnership. In Model 1 the ExpB for awareness capability was not significant; hence by including the interaction effect of formal safeguards this variable became significant.

The ExpB for the interaction of ability capability and formal safeguards (FA1) is statistically significant (0.047) and is less than 1 (0.947) which indicates a negative relationship between ability capability and perceived success, when moderated by formal safeguards. As with informal safeguards, the higher value resulting when formal safeguards were included (0.947 versus 0.639) indicates that the inclusion of formal safeguards affects the relationship between ability capability and perceived partnership success such that it is less negative. Furthermore, there is little difference between the ExpB of these two variables (IA1 = 0.972; IA2 = 0.947), indicating that there is little difference in whether formal or informal safeguards serve as the moderator.

The ExpB for the interaction of awareness capability and formal safeguards (FA2) is statistically significant (0.014), and is greater than 1 (1.089) which indicates a positive relationship between awareness capability and perceived successful partnership, if it is moderated by formal safeguards. This means that higher levels of awareness capability,

in combination with high usage of formal safeguards increase the rate of perceived partnership success.

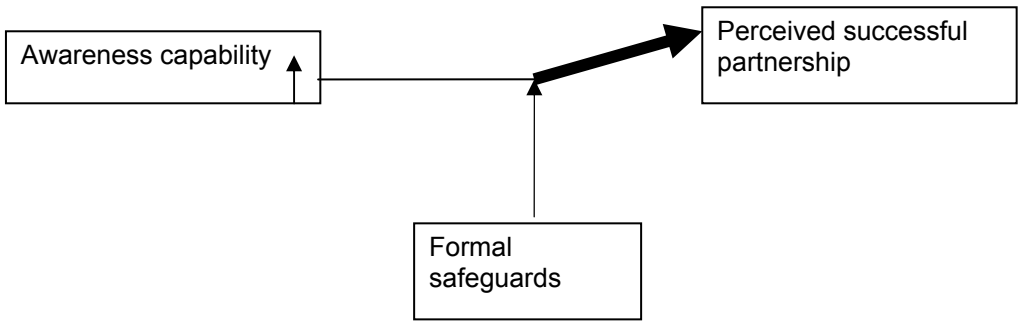
To conclude, therefore, the relationship between awareness capability and perceived success is significant (0.025). It is found that that the higher the awareness capability the lower the perceived success (0.406, being less than 1). However, if the moderator, number of formal safeguards, is combined with awareness capability, a positive relationship results (1.089). This means that if SMEs have awareness capability only, there is a negative effect on perceived success. However, if this is combined with formal safeguards, then the direction of the coefficient changes from negative to positive.

The following hypotheses are accepted:

H_{4b} *The greater the number of formal safeguards that are put in place, the more positive will be the relationship between awareness capabilities and the perceived success of the partnership.*

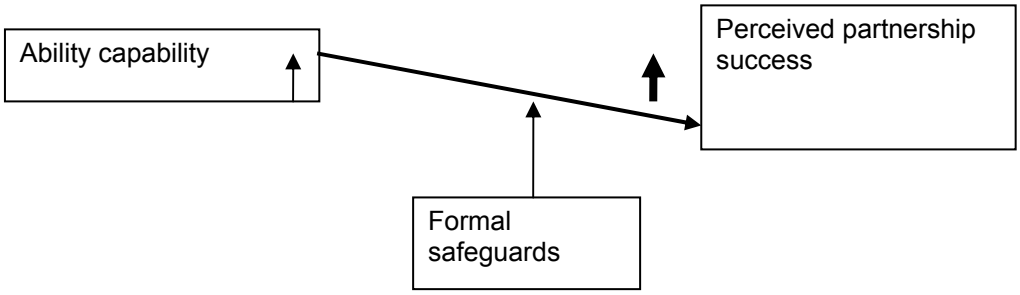
H_{4d} *The greater the number of formal safeguards that are put in place, the less negative will be the relationship between ability capabilities and the perceived success of the partnership.*

Figure 20: Model 4: The relationship between the level of awareness capabilities and perceived successful partnership when formal safeguards moderate the relationship – a good fit



The higher the level of awareness capabilities, if moderated by formal safeguards, results in increased perceived successful partnership.

Figure 21: Model 4: The relationship between the number of ability capabilities and perceived successful partnership when formal safeguards moderate the relationship – a good fit



As can be seen from Figure 21, formal safeguards moderate the relationship between ability capabilities and perceived successful partnership, making it less negative. Higher levels of ability capabilities, in combination with high usage of formal safeguards, results in a less negative perceived successful partnership.

The below-mentioned hypotheses are rejected:

H_{4a} *The greater the number of formal safeguards that are put in place, the more positive will be the relationship between ability capabilities and the perceived success of the partnership.*

H_{4e} *The greater the number of formal safeguards that are put in place, the less negative will be the relationship between awareness capabilities and the perceived success of the partnership.*

As competencies were not included in the equation as they were not significant, the following hypotheses could not be verified:

H_{4c} *The greater the number of formal safeguards that are put in place, the more positive will be the relationship between competencies and the perceived success of the partnership.*

H_{4f} *The greater the number of formal safeguards that are put in place, the less negative will be the relationship between competencies and the perceived success of the partnership.*

4.6.5 Understanding the relationship between capabilities and partnership success by means of cross tabulations

In an attempt to understand the negative relationship between ability capabilities and perceived partnership success, as well as positive relationship between awareness capabilities and perceived partnership success, cross tabulations were run on all the individual items to determine the Phi Square[5]. Only four items turned out to be statistically significant, namely: the company developed proprietary information during the period 1995 – 2003; SME segments its potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards; SME has an adequate understanding of the strengths and weaknesses of their LCO partner; preferred technology sourcing strategy of LCO was to enter into a joint venture with another LCO.

In understanding what affected the negative relationship of *ability* capabilities with perceived partnership success, a Phi test was performed on two items included in the ability capability variable, namely: had the SME developed IP; and did the SME segment their potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards?

In understanding what affected the positive relationship of awareness capabilities with perceived partnership success, only two items were statistically significant, namely: the SME had an adequate understanding of the LCO's SWOT; and the SME believed that the preferred strategy of the LCO partner, when sourcing a technology, was to enter into a joint venture with another LCO.

Table 30 captures the Phi results.

[5] Phi is a measure "of the strength of association between two categorical variables. Phi is used with 2 x 2 contingency tables (tables in which you have two categorical variables and each variable has only two categories)" (Field, 2000:62).

Table 30: Phi values for cross tabulations of items that were significant with perceived partnership success

Item	Phi Value	Approx. Significance
The SME developed proprietary information during the period 1995 – 2003	-0.326	0.033
SME segments its potential market using, inter alia, the following categories of potential clients: early innovators, early adopters, early majority, late majority, and laggards	-0.277	0.069
SME has an adequate understanding of the strengths and weaknesses of their LCO partner	0.345	0.024
Preferred technology sourcing strategy of LCO: to enter into a joint venture with another LCO	-0.263	0.084

From Table 30 it can be seen that where SMEs had developed IP there was a negative relationship with perceived partnership success (-0.326). This can be explained as follows. If SMEs were developing IP, they would be very aware of both the value of their intellectual property (patented and unpatented), as well as possibly the difficulty in defending their patent against an LCO. Hence the SME might be reluctant to share extensively with the LCO, being aware of their (SMEs) vulnerability and hence distrustful of the LCO. This distrust would influence the partnership negatively. Similarly, if the SME were reluctant to share its information freely with the LCO, this may have frustrated/damaged the relationship with the LCO, and hence the end result being an unsuccessful partnership. This is illustrated in Figure 22.

Figure 22: Negative relationship between Ability capability: SME had developed IP, and perceived successful partnership

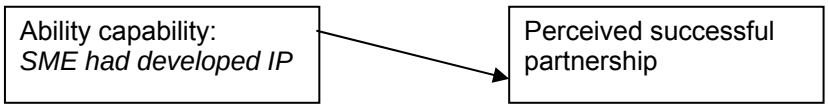


Figure 22 illustrates that one of the influential items resulting in the negative relationship between ability capability and perceived partnership success is *the ability of the SME to develop IP*.

It is seen that where the SME had segmented its potential market using the following categories of potential clients: early innovators, early adopters, early majority, late majority and laggards there was a negative relationship with perceived partnership

success (-0.277). This may be because the SME had expected the LCO to react a certain way, in accordance with the paradigms of these respective market groupings, and possibly the reaction they received was not in accordance with their expectations. There is no confirmation that the SME had correctly identified its target audience according to these groupings, and if this were the case, the SME's marketing pitch may have been inappropriate, which may have created inappropriate expectations, that would ultimately lead to an unsuccessful partnership. Another possible explanation is that although they were of the opinion that they had, most of the SMEs had not yet crossed the chasm. A similar argument prevails here, namely, that if the SME were still marketing to early adopters rather than the early majority (which they believed was their current market), then their marketing pitch and associated expectations would be inappropriate. This would lead to disillusionment and the perception of an unsuccessful partnership. This is illustrated in Figure 23 below.

Figure 23: Negative relationship between Ability capability: SME had segmented its potential market into early innovators, early adopters, early majority, late majority and laggards, and perceived successful partnership

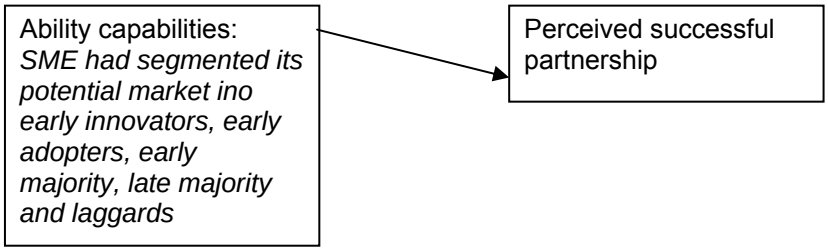


Figure 23 illustrates that the other item resulting in the negative relationship between ability capability and perceived partnership success is *where the SME had segmented its potential market using the following categories of potential clients: early innovators, early adopters, early majority, late majority and laggards*.

Where the SME indicated that it had an adequate understanding of the LCO's SWOT, the Phi Square test indicated that there was indeed a positive relationship between awareness capability and perceived partnership success (0.345). This was expected, as an understanding of the LCO's SWOT should better enable an SME to align itself appropriately. This is illustrated in Figure 24 below.

Figure 24: Positive relationship between awareness capability: understanding of LCO's SWOT and perceived successful partnership

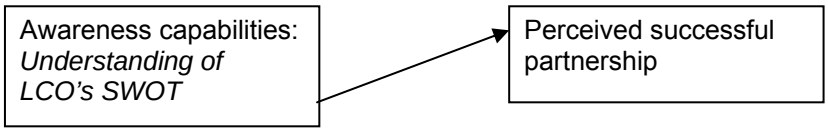
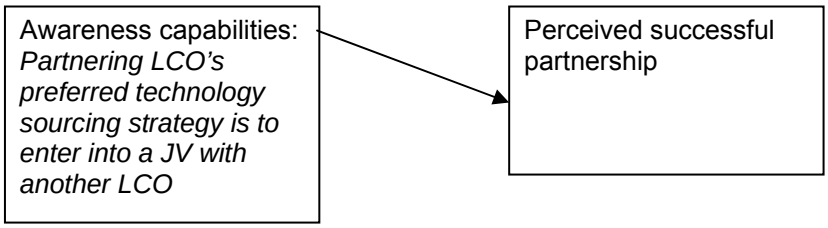


Figure 24 illustrates that the Phi Square test indicated that there was a positive relationship between awareness capabilities and perceived successful partnership when the SME's indicated they had an understanding of the LCO's SWOT.

The Phi value for the SME believing that the preferred strategy of the LCO partner, when sourcing a technology, was to enter into a joint venture with another LCO, and perceived partnership success was negative (-0.263). Such a belief could result in the SME feeling insignificant and that it was not the partner of choice for the LCO. This could result in it engaging less enthusiastically with the LCO in the partnership – resulting in an unsuccessful partnership. This is illustrated in Figure 25 below.

Figure 25: Negative relationship between awareness capability partnering LCO's preferred technology sourcing strategy is to enter into a JV with another LCO, and perceived successful partnership



Having discussed the results of the survey in terms of frequencies of the variables, as well as the "best fit model" for the data and an explanation of the results, the next chapter will discuss the case studies. In order to verify the major findings of the quantitative study and gain a deeper understanding of some of the issues raised, a supplementary case study approach was adopted. A comparative study with a select number of SMEs that had participated in the survey was embarked upon to explore the relevance of the major findings. Chapter 5 discusses the reason for the case studies, the methodology employed, the specific cases and their results.