

CHAPTER 9 - PRIMARY DATA COLLECTION: INITIAL SURVEYS

9.1 Introduction

The research methodology described in Chapter 7 acknowledged the fact that the problem statement is complex, with many important variables being undefined and with the reaction of the industry to the survey furthermore being unknown.

The exploratory study technique [29] was therefore selected in order to iteratively:

- develop concepts more clearly,
- establish priorities,
- develop survey methodologies and
- improve the final research design.

This technique made it possible to cope with previously unidentified and undefined problems as they arose during the study process. The scope and detail of data collection was therefore modified iteratively as the study proceeded in order to optimise the study design.

The first step in an exploratory study such as this is a search of secondary literature [109] to collect secondary data [29]. A literature survey was conducted and certain of the information contained in the previous chapters originated from such secondary data sources as indicated in the text and the List of References appended to this document. It was decided to conduct a limited scale pilot survey to assist in defining the secondary data processing

needs and as an instrument to plan future industry surveys, as primary data forms the backbone of this study. This chapter describes the first phase of primary data collection consisting of the pilot survey and the first full-scale industry survey.

9.1.1 Target population

The target population for all the surveys was the South African professional consulting engineering industry. The available census data on the entire consulting engineering industry [198, 199] showed the total number of consulting engineering offices to be 695 and 758 in 1987 and 1993 respectively. The corresponding data for SAACE member firms was not available, but official SAACE membership statistics for 2001, which originate from the compulsory annual declarations made by member firms, showed a total of 892 offices of which 50 are situated outside South Africa [171, 175]. The resultant 842 offices within South Africa suggest that offices of SAACE member firms probably represent more than 90% of consulting engineering offices in South Africa.

The available census data on the entire consulting engineering industry [198, 199] showed the total number of people employed to be 10 014 and 11 558 in 1987 and 1993 respectively. The corresponding data for SAACE member firms was not available, but the 11 938 people employed by SAACE firms in June 1996 (Table 12.3) again seem to support the claim that SAACE member firms represent at least 90% of the total consulting engineering profession in South Africa [54].

The statistical representivity of the SAACE members as representing the target population (all South African consulting engineers) was further investigated in

terms of total industry turnover during the primary data collection process and this was reported on in the next chapter.

The remaining estimated less than 10% of consulting engineers in South Africa do not belong to a voluntary organisation, such as the SAACE, and are therefore not easily traceable or contactable. The primary sample of the target population [29] surveyed was therefore the approximately 380 member firms of the SAACE and this was considered sufficiently representative of the South African professional consulting engineering industry.

9.2 Pilot survey

The pilot survey was used to test the quality and statistical representivity of returns and to provide guidance for the finalisation and iterative refinement of future survey instruments. The pilot survey was designed to be brief and to test participants' reaction to both quantitative and qualitative questions and to establish trust with respondents in terms of the confidentiality of individual firm information.

9.2.1 Pilot survey process

The pilot survey covered the period 1 July 1995 to 30 June 1996. Pilot survey questionnaires were sent both electronically and by mail to the mandated principals of all (388 at the time of the survey) SAACE member firms, that is the principals authorised by the individual firms to represent their respective practices in all SAACE matters. Firms were asked to return the completed questionnaires by e-mail or fax to the SAACE directorate.

A covering letter by this author was sent with the survey questionnaire to every member firm to explain the procedure by which individual firm data was to be captured and processed by an independent economist to ensure the confidentiality of such data. The letter furthermore explained the intention of developing an industry-wide SMIS for the South African consulting engineering industry, described the proposed methodology for developing the SMIS, and pointed out the benefits that such an SMIS could have for the industry and for individual firms.

The survey questionnaire identified firms only by their unique firm identification code, which was only identifiable by the mandated principal of each firm and by the member services manager of the SAACE. The economist who captured the survey data and did the initial data processing did not have firm names, but was only provided with the firm identification codes with corresponding firm size categories (by number of staff). The firm size categories used are shown in Table 9.1.



TABLE 9.1
Firm size categories by number of staff employed

Category	Number of staff employed
A	More than 500
B	100 to 500
C	50 to 99
D	10 to 49
E	Less than 10

Aspects covered by the quantitative questions in the questionnaire were:

- **Geographical distribution of income.** Firms were asked to provide their gross fee income for the survey period as well as the proportion of such income originating from each province and also from outside South Africa.
- **Construction value of projects.** Firms were asked to provide a similar geographical distribution of the estimated construction value of projects for the survey period. This was done to establish average fees per project as a percentage of the construction value of the project.
- **Public and private sector contribution to income.** Firms were asked to provide details of the relative proportions of their total income that originate from the public and private sectors in each province as well as outside South Africa.
- **Value of order book.** Firms were asked for details of their confirmed appointments or commissions for the next 12 months, i.e. the 12 month period immediately following the survey period.
- **Salary cost.** Respondents had to provide information on the total cost of technical staff salaries for the survey period.
- **Bursaries.** Firms had to furnish details on the value and number of study bursaries awarded, as well as on the percentage of such bursaries awarded to previously disadvantaged students.

The only qualitative question included in the questionnaire asked respondents to rate their perception of business conditions at the end of the survey period. This question required respondents to answer with a simple four-point perception grading (very good, good, poor and very poor). A copy of the survey questionnaire is enclosed as Annexure 2.1.

9.2.2 Statistical representivity of pilot survey data

A total of 104 questionnaires were received out of a membership of 388 firms. The size of the responding firms had to be taken into account in determining the statistical representivity of this response. Using SAACE data from compulsory annual declarations submitted by firms, it was found that the representivity of the response was 42,98% when measured by the number of staff employed (i.e. total employment by respondents : total number of staff employed by SAACE member firms). The statistical representivity of provincial responses is shown in Table 9.2.



TABLE 9.2

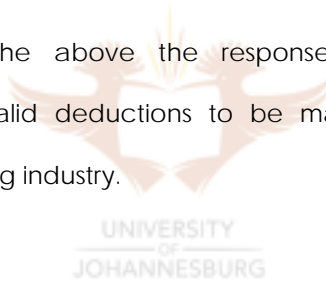
Statistical representivity (by total employment) per province

Province	% of total number employed by SAACE member firms
Western Cape	40,13
Eastern Cape	23,53
Northern Cape	20,51
Free State	97,01
North West	40,68
Northern Province	60,00
Gauteng	41,00
Mpumalanga	64,65
Kwazulu-Natal	41,23
Average	42,98

Respondents furthermore reported their total fee income as R768,7 million against the total industry fee income for the years 1995 and 1996 in the historic national time series for fee income (Table 10.3) of R1 541,41 million and R1 705,68 million respectively, which represent statistical representivity levels of 45% to 49%.

When statistical representivity was measured by size of (SAACE member) company, it was observed that 47,2% of the companies in the highest quartile (i.e. the 25% largest companies) responded, 19,1% of those in the second quartile, 18,9% in the third quartile and 44% of the 25% smallest companies.

Based on all of the above the response was considered sufficiently representative for valid deductions to be made about the South African consulting engineering industry.



9.2.3 Pilot survey responses

Responses to questions will be discussed in general terms. Data will be discussed, analysed and presented in more detail in Chapter 12.

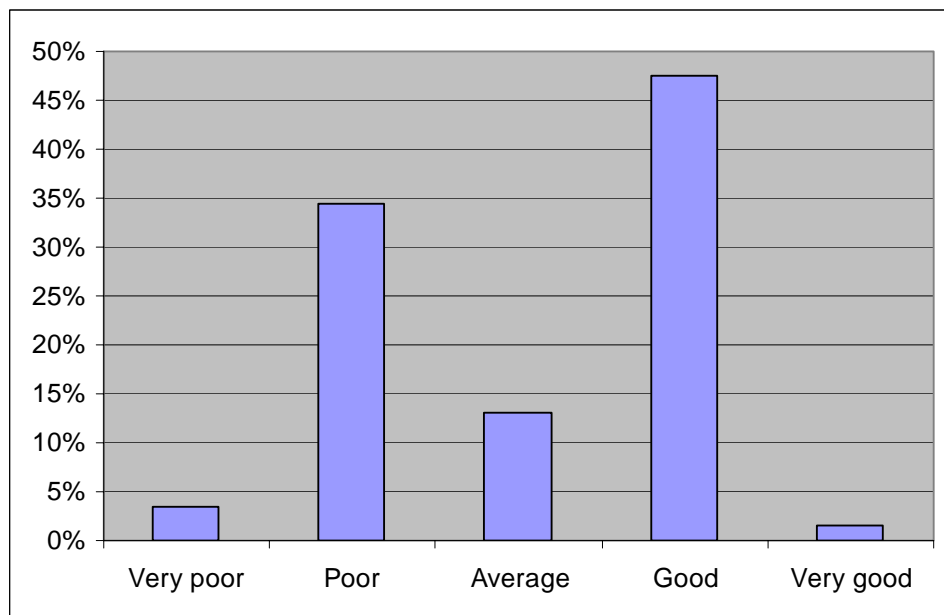
9.2.3.1 Confidence levels in the profession

This qualitative question was included in the questionnaire to test respondents' reaction to such a question. Responses were weighted according to firm size. Weighted responses in each perception-grading category were then expressed as a percentage of the total response as illustrated in Figure 9.1. The percentage shown for the

average confidence level in the figure represents those respondents who indicated their perception to be both good and poor on the four-point perception grading scale.

FIGURE 9.1

Confidence levels in the profession as at 30 June 1996 (national)

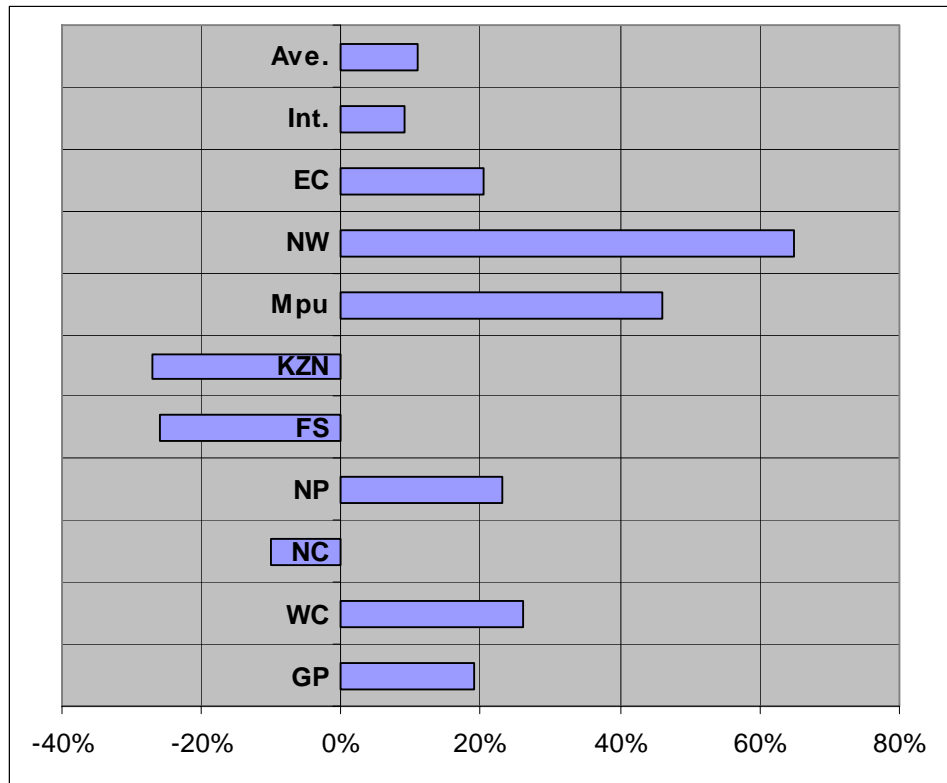


The provincial confidence levels could be meaningfully presented by using one of the following methods:

- **Expressing confidence level as a net balance:** The aggregated good and very good responses were subtracted from the aggregated poor and very poor responses. In the case of this questionnaire only 11,1% (net) of the respondents perceived the business conditions at the time to be good or very good as shown in Figure 9.2. The abbreviations used in the figure are explained in the List of Abbreviations appended to this document.

FIGURE 9.2

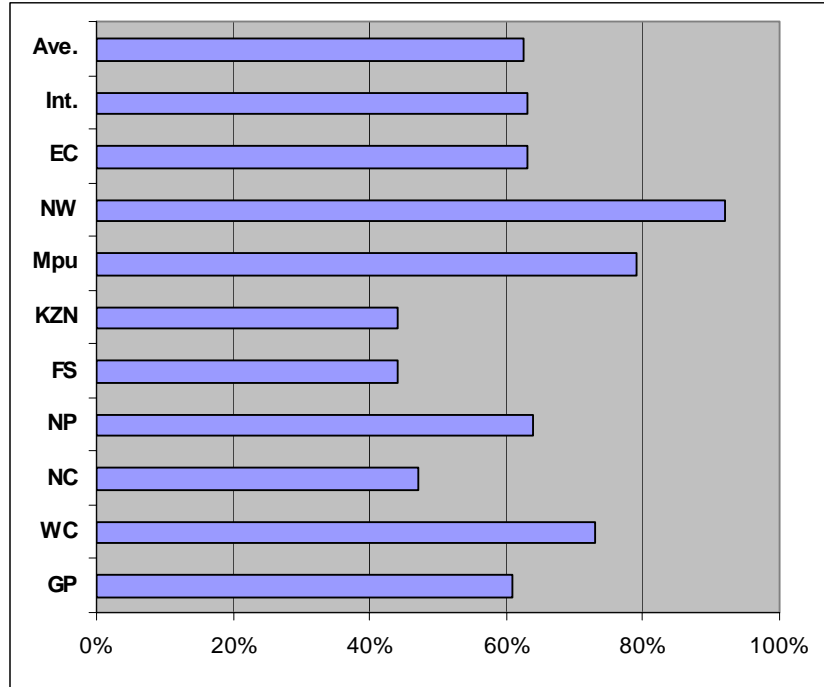
Provincial confidence levels as at 30 June 1996: net balances method
(net percentage of respondents perceiving present conditions to be
good or very good)



- **Percentage of respondents satisfied with business conditions:** The average, good and very good responses were aggregated and the result expressed as the percentage of respondents satisfied with business conditions. In the case of this pilot survey 62,5% of respondents declared themselves satisfied with business conditions at the time as illustrated in Figure 9.3.

FIGURE 9.3

Provincial confidence levels as at 30 June 1996: percentage of respondents satisfied with their present business conditions



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9.2.3.2 Fee income by province and by client

A geographical fee income distribution is shown in Figure 9.4. The figure represents the total fee income per geographical area as a percentage of the total fee income of the South African consulting engineering industry for the survey period. It can be seen that the Gauteng, Kwazulu-Natal and the Western Cape provinces jointly represented nearly 70% of the consulting engineering market.

FIGURE 9.4

Geographic fee income distribution

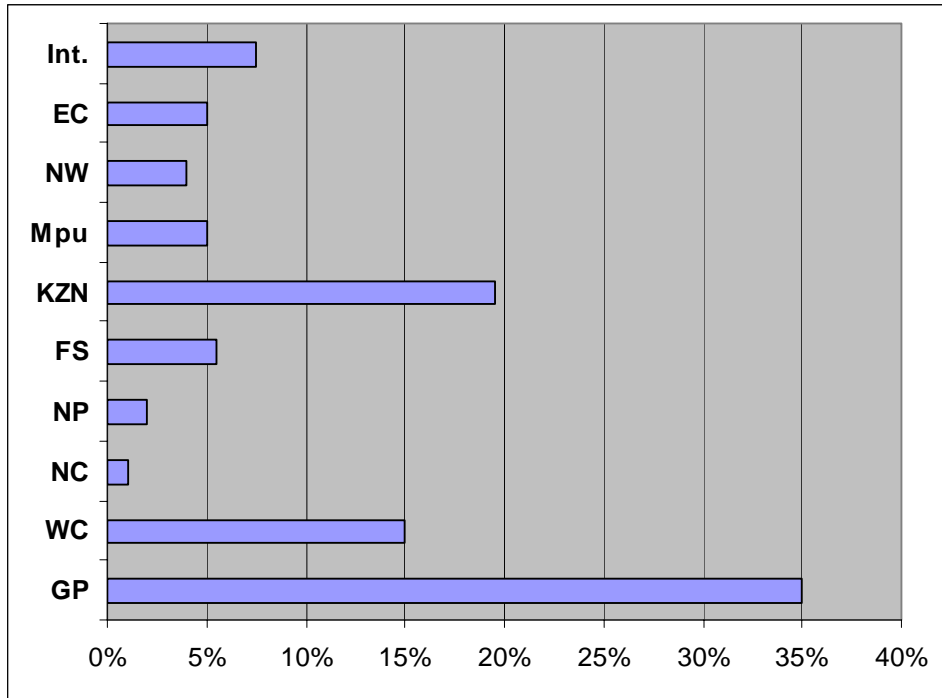
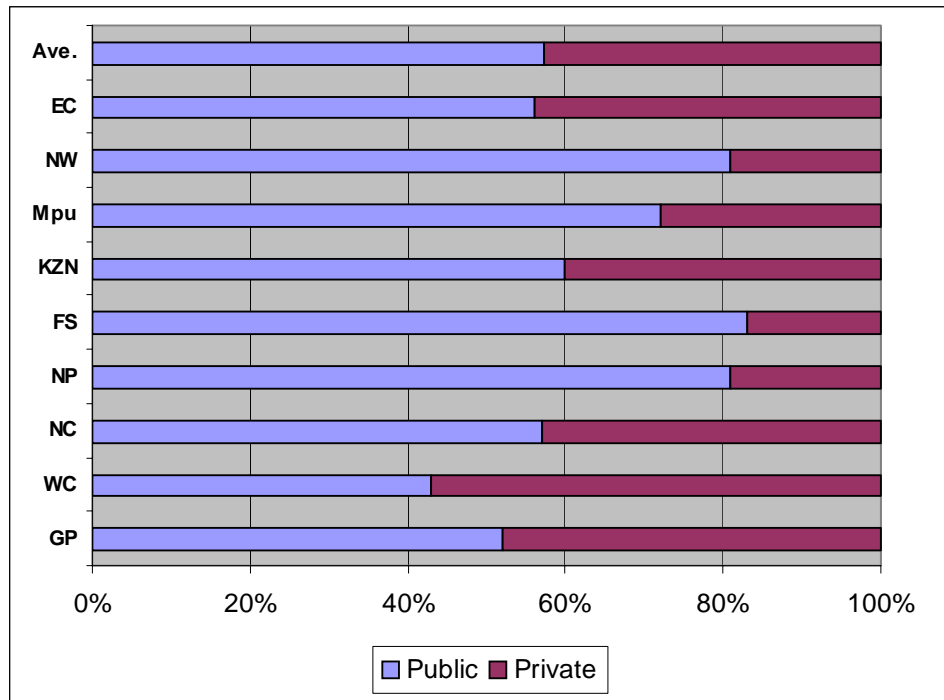


Figure 9.5 represents the distribution of the consulting engineering client base between the public and private sectors in each South African province. The figure represents the percentage contribution by sector to the total consulting engineering fee income in each province. The 42,8 % private sector contribution to the total national fee income was at the time considered to be surprisingly high and was seen as signifying a definite trend from the public to the private sector, when compared to the traditional 30% private sector contribution [54]. It is furthermore interesting to note the high public sector contribution in some provinces compared to others, e.g. Free State, Northern Province and Northwest Province as against Western Cape and Gauteng provinces.

FIGURE 9.5

Provincial client base: sectoral distribution



9.2.3.3 Bursaries


Respondents reported that 324 bursaries were granted to students at the time of the survey, of which 181 (56% of the total) have been awarded to students from previously disadvantaged backgrounds. The average bursary value was reported as approximately R7 500, which amounted to a total bursary expenditure by respondents of R2,423 million or less than 1% of their current salaries at the time. The respondents supported on average 3,1 students per firm, of which 1,7 were from the previously disadvantaged group.

9.2.4 Pilot survey conclusions

- **Qualitative questions** (the confidence level question in this case) should possibly be separated from the quantitative questions. Attempts should be made to have the qualitative questions answered by managing directors / company leaders to get a future-orientated outlook, as compared to the quantitative questions who could be answered by any person in a company who has access to the relevant company information. Respondents expected a fifth (neutral) choice when answering the qualitative question and the author therefore decided to make provision for a fifth choice to provide for neutral or average responses when interpreting responses.
- The biggest uncertainty experienced by respondents revolved around the question on **confirmed orders for the next 12 months** where 21% of the respondents did not know whether to provide fee income values or construction values. In most cases interpreting the responses in the light of the information reported for the previous twelve months could rectify this. The relevant definitions and the wording of questions should however be clarified in future surveys.
- 6% of the respondents were unsure whether or not director's fees should be included in the total amount for **salaries**. This should be clarified in future survey questions to avoid possible confusion.
- Very valuable information was gathered and in particular the data on fee income by province and by client as well as the bursary

information were unavailable prior to this pilot survey. These could in time be developed into valuable time series.


- It was clear that data should be benchmarked against secondary data to ensure statistical representivity, but also to establish additional data points to enable survey data to be used at the earliest possible time to make meaningful deductions about quantum and trends.
- It was at the time considered preferable to split the next survey form into sections that could be specifically targeted at different respondents in firms, i.e.

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- an opinion or perceptions survey with qualitative questions on specific controversial, policy or futuristic issues that will be targeted at managing directors or practice leaders;
 - a statistical survey with quantitative questions on aspects such as fee income, geographical splits, discipline split, salaries, etc. that will be targeted at financial or operational management and
 - a quantitative survey of human resources issues such as employment numbers, shortages, ages, composition, bursaries, training etc. that will be targeted at human resource managers.

9.3 First full-scale survey

The questionnaire for the first full-scale survey was sent to 380 mandated principals of active SAACE member firms, accompanied by a covering letter. The letter reported on progress with the development of the SMIS, motivated respondents by repeating the potential future benefits of a SMIS for the industry and the individual firm, and explained the different sections of the survey form.

The proposal of splitting the survey into separate parts and targeting the parts at specific respondents (section 9.2.4) was discarded after a snap telephone survey of a number of firms who indicated:

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- that in the majority of the practices, a single person will in any case be completing all the survey forms and
 - that a multitude of survey forms will confuse participants and may lead to so-called survey fatigue, the implication of which will be poor percentage survey returns and the resultant poor statistical representivity of data.

The survey covered the period 1 July 1996 to 30 June 1997 and was conducted prior to the development of the historic time series that is described in Chapter 10. The historic time series were only developed during February and March 1998. Respondents were asked to return their completed questionnaires to the SAACE offices by fax.

The following paragraphs discuss the different sections of the questionnaire as the format of this questionnaire set the general format for all the survey forms used in later surveys. A copy of the survey questionnaire is enclosed as Annexure 2.2. Detailed survey data will not be presented or discussed in this chapter as data will be presented, analysed and discussed in Chapter 12.

9.3.1 General questions

This section of the survey questionnaire included seven quantitative questions, which covered the following topics:

- **Total number of employees:** This required respondents to provide details on the number of people employed in each of four main categories, i.e. partners/ directors, other engineers, other technical staff and all other staff. The question was intended to provide data with which total employment, management and staff ratios, productivity trends etc. could be tracked.
- **Gross total salaries paid over the past twelve months.**
- **Type of work:** Respondents were asked to provide a percentage split of their total income into a number of disciplines or categories of competency. The categories were chosen to coincide with the competency areas in the annual declaration forms that all SAACE member firms have to complete. Respondents were therefore familiar with the

various category definitions. Table 9.3 shows the disciplines used.

TABLE 9.3

Work categories used in answering the question: "What type of work have you been engaged in over the past 12 months?"

TYPE	% OF INCOME
Acoustics	
Agricultural	
Building Services	
Chemical	
Civil	
Development	
Electrical	
Electronic	
Environmental	
Geotechnical	
Industrial	
Mechanical	
Marine	
Mining	
Process Engineering	
Structural	
Transportation	
Architecture	
Land Surveying	
Project Management	
Quantity Surveying	
Town Planning	
Multidisciplinary/Professional	
Dispute Resolution	
Total:	100%

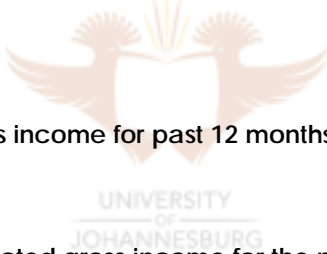
- Percentage income per province:** In addition to the 9 South African provinces used in the pilot survey a tenth category was added to the survey form in order to measure the contribution of international work (i.e. work outside the RSA) to the total fee income of the South African consulting engineering industry.

- **Percentage income per client type:** The client type categories that were introduced in this survey form are shown in Table 9.4.

TABLE 9.4

Percentage income per client type

CLIENT	% OF INCOME
Central Government	
Provincial Government	
Local Government	
Parastatals	
Private Sector	
Total:	100%

- 
- **Gross income for past 12 months.**
 - **Projected gross income for the next six months.**

9.3.2 Economic cycle indicators

Six qualitative questions were included in this section of the survey form. The questions were aimed at establishing short-term trends in terms of level of economic activity, competition and profitability in the South African consulting engineering industry. The questions were aimed at gauging the perceptions of respondents regarding the tempo of business activity, level of competition and profit margins both during the survey period (the past twelve months) and over the next twelve months, i.e. a perception of the future.

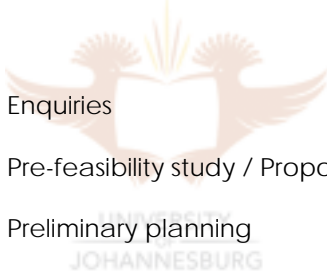
9.3.3 Product cycle indicators

This section of the questionnaire was aimed at establishing trends in terms of the various stages of the product cycle of delivering traditional project-focused consulting engineering services. The qualitative question asked was:

"Over the past 12 months, were your business indicators receding, static or improving?"

Respondents were asked to indicate whether they perceived six indicators, which represent six typical project stages, to be receding, static or improving.

The six indicators chosen were:

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- Enquiries
 - Pre-feasibility study / Proposal preparation
 - Preliminary planning
 - Detailed planning and design
 - Tender adjudication and appoint contractor
 - Construction or execution

9.3.4 Human resources

This section of the questionnaire included both qualitative and quantitative questions. The qualitative questions were aimed at establishing trends with regard to staffing, staff availability and recruitment in different staff categories. The categories chosen were engineers, other technical staff, support staff and technical staff from a previously disadvantaged background.

The quantitative questions were aimed at establishing:

- The number and value of bursaries awarded,
- the proportion of those bursaries allocated to students from a previously disadvantaged background, and
- the level of expenditure on in-house training of professional and other technical staff.

9.3.5 Capacity utilisation

The two qualitative questions included in this section were aimed at assessing the level of technical staff utilisation over the survey period.

9.3.6 Business conditions in general



The two qualitative questions in this section were aimed at gauging perceptions regarding current and future business conditions in the consulting engineering industry.

The questions were:

- “What is your overall assessment of the conditions experienced by your company, taking into account your current situation and expected future (one year) workload?”
and
- “How did your business situation change compared to 12 months ago?”

Respondents were asked to rate their perceptions by choosing from a number of alternatives.

9.3.7 Leverage ratios

In this section of the questionnaire two qualitative questions were asked in an attempt to establish ratios that could possibly be useful in developing the future ability of the SMIS to use survey data for short term forecasting purposes.

The first question was aimed at establishing whether a pattern or trend existed whereby work inflow (new appointments received) was distributed between the four quarters of the financial year.

The second question was intended to establish workflow ratios between various stages in the project cycle within a consulting engineering practice. The question asked was:



“What is, in your opinion, a typical success rate of enquiries progressing to the various project stages? In other words, taking ‘Enquiries’ at 100%, what percentage of those enquiries reach the proposal preparation stage, etc.? In the example shown, 95% of all the enquiries received reached the proposal preparation stage, while only 10% of all enquiries received developed into completed projects.” The respondent had to answer by completing Table 9.5.

TABLE 9.5

Establishing workflow ratios between project stages

PHASES OF WORK	EXAMPLE	YOUR FIRM
Enquiries	100%	
Pre-feasibility / proposal preparation	95%	
Preliminary planning and design	75%	
Detailed planning and design	70%	
Formal appointment as consultant	50%	
Funding procurement	30%	
Tenders closing	20%	
Project awards / starts	15%	
Projects completed	10%	

9.4 Statistical representivity of returns

The number of responses received and their statistical representivity improved from that of the pilot survey as shown in Table 9.6. The fact that improvements in statistical representivity differed for different measurement criteria can be ascribed to the fact that some respondents did not answer all the questions.

TABLE 9.6

Representivity of response: first full-scale survey and pilot survey

Representivity measured by	Pilot survey [%]	First full scale survey [%]	Improvement [%]
Staff employed	43	57	32,55
Salaries paid	36	49	36,11
Fee income received	39	56	43,59

9.5 Conclusion and recommendations

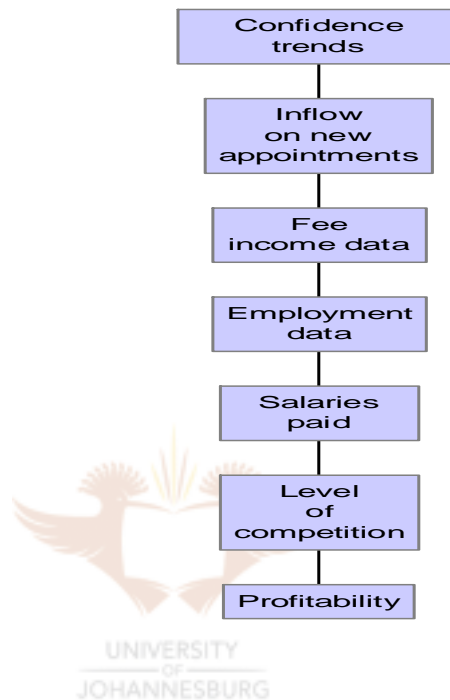
The pilot survey questionnaire was amended and expanded substantially into the questionnaire used for the first full-scale survey. The pilot and first full-scale surveys both produced interesting data that have not been available to the industry before. The available data points were however still too few to deduce trends and to attempt meaningful forecasts. It was therefore decided to proceed with the development of a number of historic time series from secondary data to assist in calibrating primary data and in rendering primary data useful at the earliest possible date. Chapter 10 describes the process of developing the historic time series.

The approach in attempting to forecast future prospects for the industry should be based on the principle that key indicators of industry activity will follow each other in a wave-like pattern. In the next surveys it was therefore attempted to isolate the relevant indicators and to understand the leads and lags between wave patterns. The key indicators follow the sequence shown in Figure 9.6 and the lags and leads between these indicators were investigated in the surveys described in Chapter 11.

FIGURE 9.6

Sequence of important indicators

(Process flows from top to bottom)



The qualitative questions on the confidence regarding typical project stages or work flow (product cycle indicators: section 9.3.3) and economic cycle indicators (section 9.3.2), rendered valuable qualitative indicator information. The absence of corresponding quantitative data limits the usefulness of the indicators in terms of quantitative forecasting. It was attempted to address this shortcoming in the next industry surveys.

The survey period should preferably be shortened for future surveys so that trends could be monitored on a more regular basis and to obtain more data points.