

CHAPTER 8 - SECONDARY DATA COLLECTION

8.1 Introduction

Chapters 1 to 6 included discussions on:

- the history and nature of consulting engineering in South Africa,
- the nature of changes in the external business environment and the impact thereof on South African consulting engineering firms,
- the use of management information systems in consulting engineering, and
- the need for a strategic management information system (SMIS) to improve the South African consulting engineering industry's understanding of their external business environment.

Chapter 7 described the research methodology used to develop such a SMIS and this chapter discusses the first stage of the research, that is the collection of secondary data. For the purposes of this study *secondary data* was regarded as data collected by others for their own purposes [29] and recorded in secondary literature.

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. The secondary data collection discussed in this chapter refers specifically to the

collection of data that was considered as potentially useful in the development of a SMIS for the South African consulting engineering industry.

8.2 The need for secondary data

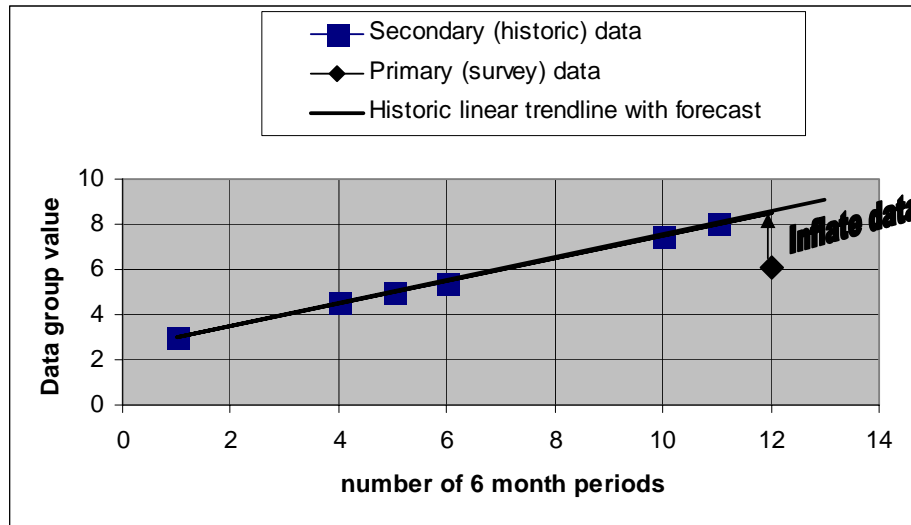
The collection of primary data by way of costly and time-consuming industry-wide surveys posed two problems that were addressed by making use of secondary data as follows:

- **Ensuring that survey samples are statistically representative of the target population:** It could reasonably be foreseen that initial survey response levels may be low. The unavailability of recent industry census data was furthermore a given. It would therefore have been difficult to determine the levels to which survey data had to be adjusted or weighted to accurately represent data for the entire target population or statistical universe. Secondary data should therefore provide reasonably accurate estimates, for the target population (i.e. the South African consulting engineering industry), of the statistically representative values of each of the key primary data groups. Such secondary data could then be used to determine the extent to which the primary data obtained from surveys have to be adjusted to represent data for the entire target population as illustrated in Figure 8.1.

FIGURE 8.1

Determining the levels to which primary (survey) data have to be adjusted to represent data for the target population

e.g. Inflate primary data from survey value of 6 to representative value of 8.6



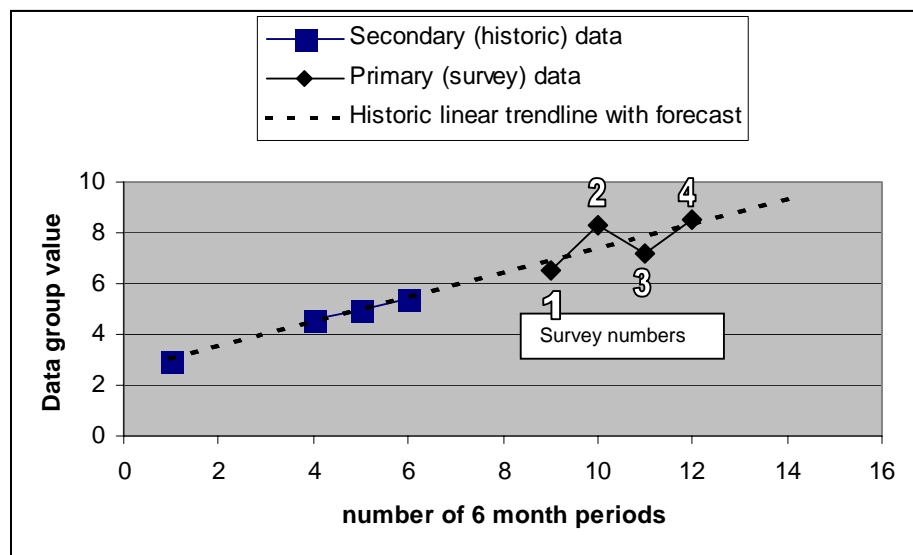
- Rendering primary data useful within the shortest possible time

Several data points would have been required for each of the primary data groups before the data could be presented and used with confidence to make meaningful deductions. This implied that a number of surveys would have to be conducted before the primary data could become useful as illustrated in Figure 8.2. For example, with reference to the figure, it would have been impossible to meaningfully construct a trend line for short term forecasting purposes with only the data point from the first survey or even the data points from the first and second surveys available, i.e. without the aid of the historic data series or historic data trend line. The historic (secondary) data trend line does however make the primary data useful after the very first survey. Without the aid of the historic

time series one would probably only start having reasonable confidence in forecasting a trend once the first four surveys in the figure have been conducted. The nature and scale of the proposed industry-wide surveys therefore dictated that results could only be interpreted and trends forecasted with reasonable confidence once surveys have been conducted over a period of at least two years.

FIGURE 8.2

Making primary (survey) data useful by linking it to secondary (historic) data



An extended period between the time of conducting a survey and the time of illustrating the value of participation to respondents could impact negatively on survey response rates. Low response rates could in turn jeopardise the statistical representivity of primary data. A perceived lack of progress towards the production of useful interim reports, and

eventually a SMIS, could furthermore put a damper on the industry's enthusiastic support for the project and thereby endanger the SAACE's commitment to provide financial and logistic support for the study.

Secondary data was therefore used to establish historic benchmarks and, using the historic benchmarks, a number of data series, which were linked to primary data in order to minimise the time lag between the first survey and the publication of the first useful industry status reports

8.3 Available statistical information on the South African consulting engineering industry

The only recent official statistical data on the South African consulting engineering industry was found in the reports on the two Censuses for Consulting Engineering, which were conducted during 1987 and 1993. The South African central statistical service (previously CSS, now STATSSA) published reports on these censuses [198, 199]. Consulting engineering data from before 1987 may have been captured in earlier censuses as part of the business services category, but was not available in a meaningful form for the purposes of this study. The data from the 1987 and 1993 industry censuses therefore served as the main source of secondary data for this study.

Statistical data that was published by the South African central statistical service (now STATSSA) on actual and expected capital expenditure by the public sector served as the supplementary source of secondary data for this study [200]. This information was considered relevant due to the substantial contribution of the public sector to the total fee income of the South African consulting engineering

industry during the period between 1980 and 1997. Private sector work contributed less than 30% to the total turnover of SAACE member firms up to 1996 [99]. This public sector capital expenditure data was captured by province for the period 1980 to 1997 and this provided regular regional breakdowns of public sector capital expenditure, which could be used as an indication of geographic distribution trends for consulting engineering fee income. These trends were therefore used to construct historic time series for key indicators of activity in the South African consulting engineering industry from the secondary data points provided by the two (1987 and 1993) industry censuses.

8.4 Existing comparable industry-wide management information systems

A number of industry-wide management information systems were reviewed to determine:

- The relevance or otherwise of these systems to the South African consulting engineering industry and
- whether these systems may provide a useful model for the development of an industry-specific MIS for the South African consulting engineering industry.

The following sections discuss the information systems developed and used by the organisations shown.

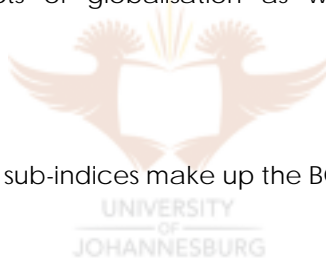
8.4.1 The South African Chamber of Business

The South African Chamber of Business (SACOB) has developed the concept of a Business Confidence Index (BCI). The SACOB Business Confidence Index is a market-related index that reflects not what businesses are saying, but what they

are doing and experiencing. It is therefore not a perception-based index. It is likely that in any one month the business mood will be influenced both positively and negatively by developments in various sectors of the economy. The BCI seeks to reflect the net result of these positive and negative influences [202].

The BCI is a composite weighted index of thirteen sub-indices. Eighteen economic indicators are used to compile the thirteen sub-indices. The economic indicators that are monitored have been judged by business to have the greatest bearing on the business mood.

The BCI was first published in 1985. The composition of the index was last revised in January 1998 to take account of the structural changes in the domestic economy, the effects of globalisation as well as the changing business environment [202].



The following thirteen sub-indices make up the BCI:

- Average monthly weighted exchange rate of the rand against the US dollar, the euro and the British pound.
- Monthly core inflation rate for metropolitan and urban areas.
- Average monthly real yield on long-term government bonds.
- Monthly volume of retail sales.
- Monthly real credit to the private sector.
- Average monthly weighted US dollar price of gold and platinum.
- Monthly volumes of merchandise imports.
- Monthly volume of merchandise exports.
- Monthly new vehicle sales.
- Monthly liquidations of companies and closed corporations.

- Monthly volume of manufacturing production.
- Monthly real value of building plans passed.
- Average monthly all-share price index of the JSE Securities Exchange.

SACOB uses their BCI in conjunction with surveys of confidence levels in the manufacturing sector to model South African business conditions. SACOB conducts these surveys monthly and, by using electronic (e-mail) communication technology and uncomplicated questionnaires, are able to provide very up-to-date information on the state of the South African manufacturing sector. SACOB believes that “this combination of the quantitative aspects of the Business Confidence Index, and the qualitative aspects of the Survey of Confidence Levels in the Manufacturing Sector, provide the most up-to-date overview of the South African business environment available” [202]. The information is published as comprehensive monthly reports, such as the report for April 2001 [201], which regularly receive wide media coverage.



The survey of the manufacturing sector is of a qualitative nature. It seeks to gauge the expectations of industrialists about the performance of aspects such as sales, production, stock levels, employment and capital expenditure. Respondents must state whether they believe that such factors will be higher or lower in the present month and coming twelve months than in the previous month and twelve months, respectively.

The survey indicates the relative proportion of respondents that expect particular aspects of their firm's activities to show improvement on the previous month's results. A figure below 50% indicates that more than half the respondents expect that aspect to be worse than in the preceding month. A

figure of above 50% indicates that the majority of respondents are expecting an improvement. As a result of the short turnaround time, and the fact that it is based on the perceptions of manufacturers around the country, the survey provides a good barometer of the expected impact of different socio-economic and socio-political events on the manufacturing sector.

The survey also provides useful information on the state of different regional economies. Because the industrial profile of each region varies, the response to different environmental factors or influences also differs from one region to another.

The author is of the opinion that the BCI is complex and contains too many indices that are unrelated to the health of or activity levels in the consulting engineering industry to be of much use. The BCI was however tracked during the study period with a view to possible use as a leading indicator for confidence levels in the South African consulting engineering industry.

The qualitative techniques used in the surveys of the manufacturing sector were found to be useful and were therefore incorporated in certain sections of the surveys conducted as part of this study.

8.4.2 The South African Federation of Civil Engineering Contractors

The South African Federation of Civil Engineering Contractors (SAFCEC) conducts quarterly surveys of its members and produces quarterly reports on the State of the South African Construction Industry. These reports cover aspects such as [193]:

- General economic background
- Industry turnover
- Employment
- Confidence index
- Inflation trends
- Market segmentation

SAFCEC furthermore produces economic reports on specific current issues such as:

- The possible role of the construction industry development board (CIDB) [97]
- Structural shifts taking place in the construction industry [96]
- Impact of the national budget on the construction industry [98]

The SAFCEC surveys only include civil engineering construction contractors. Consulting engineering, although being one of the sectors of the construction industry, is therefore not included in the SAFCEC reports. It was found that many of the survey techniques used, as well as the format of the SAFCEC reports, could be suitable to be adapted for use in the consulting engineering SMIS.

Mr. Henk Langenhoven, the SAFCEC economist at the start of this study, was therefore contracted as independent economist for the first half of the study period [114] to work with the author and the SAACE in developing the first full-scale survey questionnaire under this study and to capture and process survey data. Mr. Langenhoven's in-depth understanding of activity levels and trends in the wider construction industry made his participation in the study particularly valuable. His input ensured that the consulting engineering SMIS could also be

of relevance to other industry participants and the experience that he gained in developing the SAFCEC economic service proved to be invaluable in the initial development stages of the consulting engineering SMIS.

8.4.3 The Building Industries Federation of South Africa

The Building Industries Federation of South Africa (BIFSA) employs an economist and produce quarterly economic reports on the South African building industry. Industry data is collected through quarterly surveys of the regional Master Builders' Associations (MBA's), which constitute BIFSA. The following are examples of topics covered in the quarterly economic reports [194]:

- General economic outlook
- Building activity in various sectors of the industry e.g. residential, industrial, shopping centres etc.
- Number and value of projects
- Geographical (provincial) trends in terms of project distribution
- Levels of activity with regard to tendering, contract awards and project postponements
- Confidence levels in various industry sectors
- Client base sectoral split (Public/ private sectors)
- Employment levels
- Building cost inflation statistics
- Cement demand
- Statistics on number and value of building plans passed
- Liquidations of construction companies

The BIFSA surveys only include building construction contractors. Consulting engineering and other building professionals, such as architects and quantity surveyors, are therefore not covered in the BIFSA reports. Certain aspects of BIFSA's economic reporting format were found to be useful and were subsequently incorporated in the consulting engineering SMIS in consultation with the BIFSA economist.

8.4.4 The International Federation of Consulting Engineers (FIDIC)

FIDIC conducts an annual survey of its national associations with a specific focus on business trends in consulting engineering. The survey format was extensively modified in 2000 [61] to reflect the outcome of a pilot study executed during 1998 by Jean Felix of SYNTEC in France [59]. He showed that it was possible to arrive at fairly accurate industry demand and turnover figures by using only key national statistics provided annually by Member Associations of FIDIC together with macroeconomic data. The annual survey of Member Associations furthermore include benchmarking items aimed at benchmarking both the firms and the consulting engineering industry in each country.

The FIDIC annual country survey aims to:

- Establish industry statistics for the consulting engineering industry by country, by region and globally
- Profile FIDIC Member Associations
- Provide a capacity benchmark of FIDIC Member Associations

The survey results are used to provide the following outputs:

- A summary report on the global state of the consulting engineering industry
- Standardised individual country reports
- Country-by-country industry comparisons
- Country Capacity Indices

FIDIC's country survey for 2000 was conducted electronically and in subsequent years only changed data will need to be updated online by the representative organisation from each country. FIDIC's annual country survey form for 2000 [57] was reviewed for its applicability to this study. The report produced [55] was targeted at a global or macro scale, but still proved to be useful for industry benchmarking purposes (comparing the local industry against that in comparable countries) and for identifying opportunities for exporting local professional services. The information in the report was however of little use in the development of the SMIS for the South African consulting engineering industry.

FIDIC furthermore carries out special-purpose surveys and produce reports on specific topical issues, such as the recent 2001 Business Practice Survey report [53]. The international focus of these surveys generally renders them useful for industry benchmarking purposes and for broadly tracking international trends.

8.4.5 The British Association of Consulting Engineers

The British Association of Consulting Engineers (ACE) does not conduct extensive surveys at specific intervals, but it does conduct and participate in specific issue-driven surveys. The following are examples of such surveys and reports:

- **Survey to determine key performance indicators for construction consultants.** The ACE conducted this national survey of construction businesses during 2000 and launched its first report on 20 July 2000 [3]. The report identified four key areas for the development of key performance indicators (KPI's), namely:
 - Profit levels
 - Tender/ bid success
 - Repeat business
 - Expenditure on innovation.
- **Workload survey of British consulting engineers.** The ACE conducts an annual workload survey of all their member firms. The resultant reports include the following topics [4]:
 - Total industry turnover and turnover trend
 - Value and trend of income in terms of the domestic and the international (outside the UK) markets
 - Value and trend in terms of earnings per staff member and per Principal



- Sector analysis to reflect value and trend in terms of earnings from sectors such as transportation, structural/ commercial, PFI projects etc.
- Public/ private sector activity split.
- **Skills shortage survey.** Industry concerns about the lack of qualified engineering staff available to fill key positions has led the ACE to conduct a survey of its member firms during 2000 to investigate skills shortages and what was referred to as the “expertise deficit” [2].
- **Survey on the operation of Constructionline.** The ACE surveyed its members during 2001 to determine the effectiveness of this tender pre-qualification register for the construction industry. [1].

The ACE's industry surveys and reports, with the exception of their annual workload survey, are generally more issue-specific than the surveys required to collect extensive and regular industry data for the establishment of an industry-specific SMIS. Several of the topics covered in all the above-mentioned ACE surveys were however found to be useful and were therefore incorporated in the regular survey questionnaires developed during this study.

8.4.6 Other relevant international studies

Over and above the annual country surveys by FIDIC members, as reported under 8.4.4, the following were found to be relevant to this study:

- BSRIA, a United Kingdom-based centre for building services technologies, information and consultancy, has undertaken a

research project during 1999 aimed at providing information on the size, structure and role of building services consultants within the UK construction industry. The research was part funded by the British Department for Transport, Local Government and the Regions (DETR). The research results reported included inter alia analyses of the UK building services consulting market by area of specialisation as well as by services procurement method [18].

- CIRIA, a United Kingdom-based research association concerned with improving the performance of all involved in construction and the environment, has (since 1999) conducted a research project on performance measurement of design organisations [25]. The study, which included extensive surveys of UK consulting engineering firms, aimed to present a framework for performance measurement of design organisations, including recommended KPI's. The final report was not studied as part of this study project, but can be obtained from CIRIA (james.milne@ciria.org.uk).

Some of the concepts contained in these British studies were incorporated into the South African consulting engineering SMIS.

8.4.7 Other relevant South African studies

Many apparently relevant South African studies, surveys and reports were reviewed, of which the following proved to be of some use in the development of the SMIS for the South African consulting engineering industry:

- **The Association of South African Quantity Surveyors (ASAQS) salary survey.** The ASAQS conducts an annual salary survey of South African QS practices [11]. The primary aims with these surveys are to assist the ASAQS by providing data for determining annual hourly rates for different categories of staff and to provide individual practices with data on industry salary levels. The surveys are however conducted taking the geographic location of each office into account, in other words it provides data on employment levels and geographic distribution of capacity in professional consulting quantity surveyor practices.

- **The South African Institute of Architects (SAIA) industry survey.** The SAIA has, during 2001, undertaken a survey of both their members (i.e. individual architects) and of South African architectural practices. The survey was conducted through the SAIA website and covered the period 1990 to 2000. The primary aims of the survey were to define an accurate profile of the architectural profession and to determine how South African architectural practices have adjusted to their changing business environment [186]. Survey questions to practices cover aspects such as:
 - Employment statistics and trends (numbers, level, location, nature of employment contracts etc.)
 - Impacts of legislative/ regulatory environment and building industry activity cycles on the practice
 - Client information (sector, type, payment record, fee levels, trends etc.)

- Turnover statistics including trends
- Profitability
- Capacity

The results of the survey have not been published to date, but the SAIA director has presented preliminary results to senior government officials at a Construction Alliance (TCA) industry feedback workshop held during May 2001 [131].

- **The BMI-BRSCU report.** The BMI Building Research Strategy Consulting Unit (Pty) Ltd has, in April 2001, published a report “The strategic forum scenarios for South Africa and the Building Industry: 1999- 2010” [16]. This extensive report provides a detailed analysis of current and future activity in the South African building industry. The report is furthermore well suited to equip individual organisations with competitive industry foresight at a strategic level and to enhance their ability to compete in the future.

The report is however produced for the specific needs of building contractors and building material suppliers and it does not address the information requirements of either consulting engineers or the greater construction industry.

- **De Vos’ thesis.** Dr. Tobie de Vos published a doctoral thesis at the University of the Witwatersrand on “The data requirements of the building and construction industry in South Africa” [35] in 1972. The thesis included an extensive survey of available statistical data, but

many of the assumptions (e.g. in terms of the availability of data) and the recommendations made were found to be no longer applicable due to the structural changes in the public sector and the construction industry.

8.5 Conclusion and recommendations

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. The secondary data collection discussed in this chapter refers specifically to the collection of data that was considered as potentially useful in the development of a SMIS for the South African consulting engineering industry. Available secondary data sources relating to the South African consulting engineering, building and construction industries were evaluated in terms of the relevance, usefulness and limitations of the available information for the purpose of developing the proposed consulting engineering SMIS.

The only recent official statistical data on the South African consulting engineering industry was found in the reports on the two Censuses for Consulting Engineering, which was conducted during 1987 and 1993. The data from these two censuses therefore served as the main source of secondary data for the development of the SMIS. Statistical data that was published by the South African central statistical service (previously CSS, now STATSSA) on actual and expected capital expenditure by the public sector served as the supplementary source of secondary data.

The secondary data was utilised to limit the extent, time and cost of primary data collection by ensuring that survey samples are statistically representative of the target population and by rendering primary data useful within the shortest possible time. These two objectives were achieved by developing a number of historic time series that were used to:

- Provide benchmarks by which to calibrate primary data, i.e. to determine the extent to which primary data had to be adjusted or weighted to be statistically representative of the surveyed target population.
- Make primary data useful within the first year of the study period by utilising the historic time series together with primary data to establish trends

A number of industry-wide management information systems were reviewed to determine the relevance of these systems to the South African consulting engineering industry and whether these systems may be useful in the development of an industry-specific SMIS for the South African consulting engineering industry. It was found that none of the systems reviewed provided a model for the type of SMIS proposed, but that certain aspects of each of the reviewed systems were useful and that several of these could be incorporated in the consulting engineering SMIS.

The next chapter, Chapter 9, describes the first phase of primary data collection, which comprised of a pilot survey and the first full-scale survey of the South African consulting engineering industry.