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Impact of discounted professional fees on the risk exposure of civil and structural engineering services consultants in South Africa

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The abolition of mandatory fee scales and the prevalence of lowest-cost bidding for the procurement of consulting services in South Africa have seen engineering services consultants compete based on price for engineering contracts. Discounts benchmarked against ECSA (Engineering Council of South Africa) professional fees guidelines demanded by clients have resulted in declines in professional fees over the years. The capacity to deliver professional services that are of such high quality that it meets the client's expectation, professional and ethical standards when working at low fees is one of the biggest challenges facing consulting professionals today. This research studied the risks encountered by civil and structural engineering services consultants and the impact of discounted professional fees on their risk exposure. The study included a review of literature, discussions with practising engineers and a questionnaire survey of 23 practising consulting engineers representing small, medium and large consulting engineering firms. A key finding of this study is that discounted fees accentuate several project level risks and create organisational level risks for the consulting engineering professional. The implications of these are discussed, and recommendations for improving the industry put forward.

BACKGROUND

It is widely known that consulting engineers are liable for the professional advice they give to their clients. However, within the South African environment, the ability of consulting engineers to continually provide sound professional advice in the face of declining professional fees in the industry has been a cause for concern amongst stakeholders and academics alike. Weidemann (2014) pointed out that engineers in South Africa are struggling "in an industry racked by discounting, tendering, lack of knowledge and skills."

The decline in professional fees in the country over the years can be partly attributed to competitive tendering and the practice of discounting professional fees benchmarked against the professional fee guidelines published by the Engineering Council of South Africa (ECSA) (CESA 2007). Given that quality and cost-based selection (QCBS) methods of tender evaluation are used for public procurement by the government (the largest client for these professional services in South Africa), cost plays a crucial role in contract allocation

(CESA 2013). The implication of this is that contracts are awarded to the firm that quotes the lowest price to provide the service (CESA 2014).

Professional bodies such as Consulting Engineers South Africa (CESA) have, however, maintained that consulting engineering services is not a commodity, and as such the use of competitive tendering procurement methods based on price is inappropriate (Thela 2014). This argument is based on the fact that, while it is possible to draft specifications against which the quality of commodities (physical goods) will be evaluated, such specifications cannot be drawn up easily for consulting services (Davies 2006).

Lu *et al* (2013) provide a detailed review of previous research carried out in the field of construction professional services (CPS), and segmented the focus areas into the following subject categories: competitiveness of CPS firms, characteristics of CPS firms, impact of information technology on CPS firms, management practices of CPS firms and procurement methods of the CPS industry.

This submission by Lu *et al* (2013) and a perusal of literature reveal that the subject of risk, as it relates to the CPS industry, has received very little attention.

Also, while the inherent risks for clients who engage professional services providers at low fees have been well researched and identified to include low quality of service resulting in increased life cycle cost of the project, and project delays resulting from reworks and poor contract documentation (Hoxley 2000; Ling 2004; Love & Edwards 2004), perusal of the literature revealed that the implication of low fees on the risk exposure of the consulting engineering professional is highly under-researched. This study attempts to fill this research gap by pursuing the following objectives:

- To obtain information on project and organisational risks particular to the civil and structural engineering services consultants.
- To obtain information on the extent of discounting practices amongst consulting engineering firms in South Africa.
- To determine the impact of discounted fees on project and organisational risk factors by ranking them according to how they are impacted by discounted fees.
- To identify measures adopted by consulting engineers to manage and mitigate the influence of low professional fees on their risk exposure.

LITERATURE REVIEW

Procurement and remuneration for consulting engineering services

In South Africa, public sector clients account for the greater percentage of professional fees earned by consulting engineering firms. In 2013, for example, 54% of all fees earned in the first half of the year were from public sector clients (CESA 2013). The procurement of consulting engineering services in South Africa by this category of clients is governed by several procurement legislations, such as the Preferential Procurement Policy Framework Act (PPPFA), Public Finance Management Act (PFMA), Municipal Finance Management Act (MFMA), Broad-Based Black Economic Empowerment (BBBEE), various Treasury (government department) and Construction Industry Development Board (CIDB) procurement guidelines (CESA 2014). These legislations

stipulate the use of quality and cost-based selection (QCBS) methods for the evaluation of tenders. Under the QCBS approach, as envisaged under these laws, firms are awarded points for price, quality and preference criteria, and the firm that scores the highest points gets awarded the job. However, more emphasis is placed on price, while quality and functionality are de-emphasised, as the threshold for quality is limited to the minimum acceptable level (CESA 2014).

In response to cost-based selection methods adopted by clients, consulting engineering firms have adopted a 'market driven' strategy of price-based competition and no longer compete based on quality of services offered (Davies 2006; Love & Edwards 2004). The rationalisation for this lowest cost-based selection for consulting engineering services includes "... clients wanting to pay fees that conform to existing market practice, the availability of qualified firms willing to do work at lower fees, and the need for cost saving." (Ling 2004).

While some countries, such as the United States of America (USA) and the United Kingdom (UK), have since abolished professional fee scales, and some, such as the USA and Japan, only use quality-based selection (QBS), in South Africa guidelines for determining professional fees are obtainable, and price-based competition is not prohibited. This is because the Competition Commission has outlawed mandatory fee scale guidelines by professional bodies such as ECSA, as it is interpreted as price fixing and therefore in contravention of the Competition Act. In this regard ECSA has modified the fees scale guidelines over the years by doing away with the scale of fees and replacing it with a system of tables and charts to enable the estimation of fees based on a known project type and scope of work.

South African civil and structural engineering professionals have, however, argued that compensation for their services as provided for under the ECSA guideline is inadequate, especially on building projects, mainly due to the increased frequency of redesigns and coordination inputs required on building projects. Increased construction monitoring and supervision responsibilities are also implied by the nature of their service, which has not been adequately reflected under 'normal service'.

The consulting engineer's risks

Risk to the consulting engineer for the purpose of this research is defined as:

An event, condition or circumstance before, during or after the execution of a project that puts the consulting engineer in an unfavourable position with regard to meeting clients' expectation, meeting professional and ethical standards and the possibility of incurring financial liability or reputational damage.

Low professional fees have been observed to influence conditions and/or attitudes that create risk for consulting engineers. This is evident in the findings of a questionnaire survey of members of the Association of Consulting Engineers in the UK (Hoxley 2000). The survey revealed that, for projects with low fees, consulting engineers:

- give less consideration to design alternatives and to checking and reviewing of drawings;
- consider the risks of design error occurring as being higher;
- produce simpler designs to minimise the commitment of resources to a design task;
- judge the number of claims for additional fees to be higher on projects with low fees;
- think that low fees engender mistrust between client and consulting engineer; and
- bid low with the intention of doing less than in the enquiry, and making up fees with claims and variation.

The implication of these is a decrease in the quality of professional services, which creates risk for the consulting engineer's practice. Quality issues often result in "unsafe structures, delays, cost overruns and disputes in construction contracts" (FIDIC 2004). On the one hand, client dissatisfaction resulting from poor project performance is not desirable if a consulting practice is to be successful. On the other hand, however, quality service on the project and a satisfied client will, to a great extent, ensure a repeat appointment from the same client and also referrals (Jaafar *et al* 2008).

The risks exposure of engineering services consultants is hence two-pronged – one aspect of their risk exposure is liability for the professional services they offer to their clients, while the other aspect concerns threats to running a financially viable business. These risks are categorised into project risks and organisational business risks, and are discussed below.

Table 1 Summary of consulting engineers' risk as identified by various authors

Project-specific risk groups	Risk factors	Reference
Client risk	Type of client and structure of client organisation.	IEA 2005 Tang <i>et al</i> 2007 Kometa <i>et al</i> 1996 Jerling 2009 Maritz & Robertson 2012
	Size of client organisation relative to consulting firm. A client organisation that is significantly larger than the consulting organisation can cause harm to the consulting firm from a legal perspective.	
	Depending on a single client for a substantial portion of the firm's annual fee income.	
	Non-payment or late payment by client.	
	Client insolvency; inability of client to meet financial obligation.	
	Unrealistic project duration target set by clients.	
	Poor communication and decision-making structure within client organisation.	
	Client's legal history; clients having a reputation of being litigious.	
	Past experience with client.	
	Client performance on previous projects; client having a history of unsuccessful projects.	
Vulnerability of client to prevailing political and economic situation.		
Brief, scope and contractual risk	Unclear brief that does not properly state the role and responsibility expected of each party.	IEA 2005 Victor <i>et al</i> 2014
	Client's expectations being higher than those communicated to and understood by the engineer.	
	Scope creep – broadening scope of services.	
	Unclear procedure for variation and expansion of project scope.	
	Providing professional advice without a written professional services agreement in place.	
	Professional services agreement that does not clearly define terms and conditions of appointment.	
	Unbalanced risk allocation and limits of contractual liabilities.	
Terms of contract that are ambiguous and unspecific in terms of: <ul style="list-style-type: none"> ■ Scope of normal services ■ Scope of additional services ■ Quantum and timing of compensation ■ Site staff for the project ■ Channels of communication ■ Client obligations and responsibilities. 		
Design and documentation-related risk	"Time boxing" (allocating set time) of design task.	Bubshait <i>et al</i> 1998 Lopez <i>et al</i> 2010 Love <i>et al</i> 2008
	Inability to perform value engineering.	
	Low professional fee.	
	Designs not being reviewed by experienced colleagues.	
	Time pressure resulting from unrealistic project schedule.	
	Weak or absence of quality control systems in the design process.	
	Insufficient knowledge, skill and experience within the design organisation.	
	Over-dependence and ineffective utilisation of computer-aided design programs.	
Poor coordination and communication between members of the project team.		
Rework of design and drawings	Method of project procurement (fast-tracked project procurement methods that compress the schedule between the design and construction phases of the project or allow both phases to go on concurrently).	Burati <i>et al</i> 1992 Lopez <i>et al</i> 2010 Love <i>et al</i> 2000 Love 2002 Love & Edwards 2004 Love & Li 2000
	Understaffing of project / staff strength and work load of firm.	
	Quality of staff assigned to the project.	
	Schedule pressure.	
	Inability of client to make project decisions timely and correctly.	
	Quality and timeliness of information from other project consultants (architect, electrical and mechanical engineers).	
Quality control on site risk	Professional services agreement that limits inspection responsibility or totally redirects such responsibilities to the client.	Kagan <i>et al</i> 1986 Tang <i>et al</i> 2003 Kerkes 2006
	Inexperienced site staff engaged for construction inspection services.	
	Professional negligence with regard to construction inspection.	

Project-specific risk groups	Risk factors	Reference
Unethical practices	Conflict of interest; consultants using their positions for financial gain.	Bowen <i>et al</i> 2007 Vee & Skitmore 2003 Kerkes 2006 Ayat 2013
	Revealing tender information.	
	Concealing construction faults, poor workmanship and material quality during inspection.	
	Altering of construction documents.	
	Main consultant cutting the fees of other consultants.	
	Consultant withholding information from the client which results in variations.	
	False promises of project advancement.	
	Misleading clients on project management.	
Financial risk	Performing work 'at risk'.	Jerling 2009 IEA 2005
	Below-cost tendering.	
	Client's treasury and financial control system (applicable to public clients in South Africa) not suitable for project's financial requirement.	
	Unreasonable levels of contractual penalties and liabilities.	
	Contract payment tied to project milestones.	
Professional indemnity risk	Difficulty affording professional indemnity insurance premiums.	Watermeyer & Smith 2014 Padayachee 2011 IEA 2005
	Premium loadings being applied to jobs evaluated by insurers to be high risk, e.g. low-fee jobs.	
	Most cost-cutting measures adopted by consulting firms border on dishonesty and unethical conduct, which are grounds for denial of claims by insurers.	

Project risks

Project risks are those that threaten the attainment of project objectives in terms of cost, time, quality, environmental sustainability and safety. The occurrence of such risks could have serious consequences for project stakeholders, including clients paying more as a result of overruns on the project budget; reputational damage, indemnity claims and loss of future appointments for the consulting engineer; and loss of revenue for the contractor due to penalties (Visser & Joubert 2008). From the perspective of the consulting engineer's practice, the possible impact of low fees on these risks is presented under nine risk groups. Table 1 summarises project risk factors identified by a variety of authors.

Organisational business risks

The failure of construction projects concurrently managed by a consulting engineering firm at the same time may not only be as a result of failure of the firm to manage risk at the project level, but also at the organisational level (Liu *et al* 2013). Organisational risks can be considered as threats to the business and operational activities of the organisation, and impact on the competitiveness of the organisation. These risks, if not controlled, could result in economic losses for the firm.

The construction business environment in South Africa is full of risks, with

companies operating within the industry having weak risk management cultures, frameworks and practices, but also having high risk management awareness at the project level (Visser & Joubert 2008). The emphasis of these companies appear to be on project level risks and less concern for the risk at the organisational level. Visser and Joubert (2008) cited the work of Von Widden and Black (2007) who categorised risks to construction business using the Marsh 'Risk Universe'. Table 2 presents organisational business risks and their potential impact as it affects

consulting engineering firms based on the risk framework developed by Visser and Joubert (2008).

Failure to adapt to rapid changes in the construction industry is the biggest threat to the business of AEC (architecture, engineering and construction) firms; firms that are unable to adapt to these changes will become marginalised and fail (Gupta 2012). The increased complexity and sophistication of construction projects, rapid technological changes, changes in project delivery methods and globalisation have transformed design processes and the

Table 2 Consulting engineers' organisational business risks (adapted from Visser & Joubert (2008))

No	Organisational business risks	Potential impact
1	Shortage of key skills (human capital)	Poor workmanship
2	Tendering and contract exposures	Legal exposures
3	Identification, reporting and actioning of project non-conformance	Project management and quality control issues
4	Poor business risk management	Guarantee exposure/business sustenance
5	Project management issues	Delays and penalties
6	Poor data management	Operational exposure
7	Financial fluctuations and cost overruns on long-term projects	Financial/cost exposure
8	Government and legislation issues	Curtailed options/legal exposure
9	Client relationships	Repeat job/business sustenance
10	Dearth of innovation	Competitiveness/ reputational issues

way engineers collaborate. Globalisation has removed geographic constraints, and has resulted in AEC firms being able to provide their services across international borders. Technology has transformed the way information is shared and accessed, while the increasing complexity of engineering projects is driving greater specialisation within the various engineering disciplines. The implication of these for AEC firms is increased competition, as well as opportunities.

The sustenance of a consulting engineering practice depends on the firm's ability to develop strategies to improve competitiveness and secure adequate volumes of projects that satisfy cash flow requirements and profitability (Jaafar *et al* 2008).

THE RESEARCH CONDUCTED

Given the exploratory nature of the study, a survey research method was applied. A structured questionnaire was used as the data collection tool for this research. The questionnaire aimed to address the research objectives by investigating the following:

- Project and organisational risks encountered by consulting engineers.
- The extent of the practice of discounting amongst consulting engineers.
- The impact of discounted fees on project and organisational risk factors by frequency of occurrence and magnitude of impact.

The questionnaire contained both open and close-ended questions to allow the researcher to analyse the responses both qualitatively and quantitatively. A web-based tool was used for the design and distribution of the survey questionnaire.

The questionnaire consisted of three sections: personal information (section 1), organisation's discounting practice (section 2) and risk factors (section 3). The objectives of questions in section 1 included categorisation of firms, identification of trends associated with organisations with similar characteristics, identifying respondents from the same organisation, and determining the level of experience and participation of the respondent in the organisation's decision-making. Questions in section 2 aimed to understand the practice of discounting among consulting engineering firms, and factors that influence the practice. In section 3, questions about project and organisation risks peculiar to consulting engineering firms were asked.

The insights gained from the review of literature on the subject of risk particular to consulting engineers formed the basis for questions posed to the industry in this section of the questionnaire. Respondents were asked to rate the significance of discounted fees on identified project and organisational risk in terms of frequency of occurrence and impact. Questions were also asked to identify areas of professional services that are likely to be compromised when professional fees are low, and risk management practices employed to mitigate the impact of low fees.

Survey sample and selection of respondents

The target respondents for this research were ECSA-registered civil and structural professional engineers practising in South Africa. A purposive sampling technique was used in the selection of the survey sample for this research. The purposive sampling technique has been identified to be suitable for quantitative and qualitative research methods (Tongco 2007). Emuze and Smallwood (2013) argue that the purposive sampling technique can be used whenever the characteristics of the population cannot be precisely determined, and in such instances the research sample can be made up of informants who the researcher believes to be a representative of the population under investigation.

Respondents for the survey were selected from two sources. The first was a working group of structural engineering consultants who in 2013 drafted a document to push for a review of the published fee scale for structural engineering services on building projects under the 'ECSA Guideline for Defining the Scope of Service and Determining Professional Fees Scales'. Eight members of that working group were identified as respondents for this research.

The second source was a database of civil and structural engineers who had participated in continuing professional development (CPD) courses at the civil engineering department of Stellenbosch University. Participants at these courses are middle-level and senior-level employees at both construction and consulting engineering firms. This database was consulted to identify suitably experienced practising consulting engineers.

A total of 61 consulting engineers were considered suitable for selection as respondents, based on their years of experience, area of competence and position within the organisation. The questionnaire was then emailed to them. Of this number, 23 responses were received, representing a 38%

Table 3 Likert scale conversion – Method 1

Frequency scale	Conversion/interpretation
Never	Not common
Seldom	Not common
Often	Common
Frequently	Common

Table 4 Likert scale conversion – Method 2

Agreement scale	Conversion/interpretation
Strongly disagree	No
Disagree	No
Neither agree nor disagree	Undecided
Agree	Yes
Strongly agree	Yes

response rate. This response rate is considered satisfactory, considering that industry participants in South Africa have a history of reluctance to participate in questionnaire surveys distributed by mail or other electronic means (Ugwu & Haupt 2007).

Method of data analysis employed

Analysis of data received from the questionnaire survey was carried out using frequency analysis and ranking. Most questions required answers to be provided by means of a Likert type scale. Three variants of the scale were used. The first was aimed at determining the frequency of occurrence, the second was to measure the extent to which respondents agreed with certain observations, and the third aimed at measuring impact. The method of combination and conversion of these scales for the purpose of qualitative and quantitative analysis is presented in Tables 3–5.

ANALYSIS AND SYNTHESIS OF SURVEY FINDINGS

Personal information

Analysis of personal information shows that the majority (65%) of respondents were active in the structures and building market, followed by the civil works market. They represented small, medium and large-sized consulting engineering firms. The personal information also defines the majority (75%) of respondents to be involved in decision-making and management roles within their organisations, and as such their responses

can be taken to be indicative of their organisation's position on the subject being investigated. Sixty one percent of respondents have been practising for over 15 years and have spent an almost equal number of years with their current employer. It is observed that the years of experience in the industry closely compare with the number of years most respondents had been with their current employer. This is indicative of the level of staff mobility within the sampled respondents' organisations.

Discounting practices in respondents' organisations

Type of clients and method of remuneration

Respondents were asked the type of clients who accounted for the bulk of their fee earning. It was observed that firms with less than ten employees all had private clients accounting for up to 90% of their fee earnings. The two firms that had public clients accounting for up to 90% of their fee earnings had similar profiles in terms of number of employees (50 to 99) and annual turnover of between ZAR 10 million and ZAR 100 million. Most of the firms with an annual turnover above ZAR 250 million serviced both public and private clients.

The methods of remuneration common to consulting engineering organisations was established. Table 6 presents the data received from respondents. Percentage fees based on the cost of the works were found to be the most common method of remuneration among respondents' organisations. This is followed by time-based fees, reimbursable expenses and fixed sum. Value-based fees are the least commonly used methods of remuneration.

Prevalence of discounting

The prevalence of discounted fees benchmarked against the ECSA recommended fees scale was assessed. Respondents were asked if their organisations offered discounts on the ECSA recommended fees scale during tender or negotiation with clients. Figure 1 presents the responses received, which suggest that the practice of discounting is quite prevalent, as 83% of respondents either frequently or often offer discounts on fees during tender or during negotiations with clients.

Responses to an open-ended question revealed that, even though some engineers do not explicitly offer discounts, they however reduced their fees. One respondent

Table 5 Likert scale conversion – Method 3

Frequency and impact scale		Weighting	
		Non-linear scale	Linear scale
Frequency	Frequently	1.0	1.00
	Often	0.8	0.66
	Seldom	0.3	0.33
	Never	0	0
Impact	Severe	1.0	1.0
	Significant	0.8	0.66
	Minimal	0.3	0.33
	No impact	0	0

Table 6 Methods of remuneration

Method of remuneration	Commonly used	
	Count	Percentage
Percentage fees based on the cost of the works	17	77.3%
Time-based fees	15	68.2%
Reimbursable expenses	12	54.6%
Fixed sum	10	45.5%
Value-based fees	5	22.7%

Table 7 Reason for offering discounts

Primary reasons	Yes		No		Undecided	
	Count	%	Count	%	Count	%
Secure new clients (client relations)	18	81.8%	0	0%	4	18.2%
Test a new market	7	31.8%	1	4.6%	14	63.6%
To keep staff busy and cover running cost	12	54.6%	3	13.6%	7	31.8%
Forced by prevailing market conditions	21	90.9%	1	4.6%	1	4.6%

had this opinion: "I run a cost-efficient small practice. I don't offer discounts, I just charge less than I should, because the profession has historically been abused by the client body. In my opinion this situation evolved because we, the professionals, allowed it."

Reason for offering discounts

The primary reason why discounts are offered in the industry was assessed by way

of a structured question. Table 7 presents the responses received.

An analysis of the responses suggests that prevailing market conditions and clients' demands for discounts were the main reasons why consulting engineers offer discounts on fees.

This trend is further supported by responses to an open-ended question which allowed respondents to provide

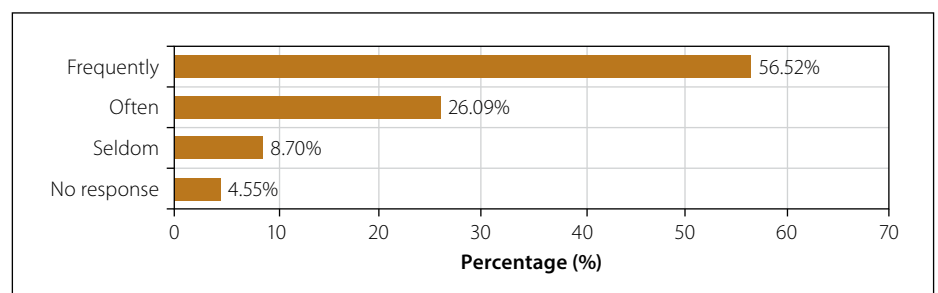


Figure 1 Prevalence of discounting practice among respondents

additional information on the reason they offer discounts. A total of nine respondents completed the open-ended questions. The majority (56%) of the comments referred to pressure from clients to offer discounts. Three respondents identified non-regulation of the different civil engineering disciplines as worsening the impact of competitive tendering on the pricing of consulting engineering services. Some of the responses that point to client factors include:

“I don’t like the concept of offering discounts, but clients often insist on discounted fees.”

“For private clients, discounts are expected. Many private clients even expect free work (work done at risk) during the feasibility stage, with a promise to appoint the consultant to the project should it go ahead.”

“In some markets the fees are simply stated by the client / project manager / QS, and if you want the job you must accept a certain percentage fee. This is common on commercial projects such as shopping centres.”

Some other respondents argue that the market is unregulated, and as such the discounting practices are influenced by prevailing market conditions.

Amount of discount offered

Respondents were asked about the average and maximum amounts of discount they offered as a percentage of their fees. Responses received are presented in Figure 2 and Figure 3.

Analysis of the data shows that the majority of the respondents offered an average discount of between 16% and 30% on the ECSA-approved fees scale. A substantial proportion of respondents reported that they have offered discounts of between 46% and 60% on the ECSA-approved fees scale. No trend was observed regarding the amount of discount offered by small, medium and large firms, as no range of discount was particular to any category of firm irrespective of size, the market segment they operated in or the type of client they serviced.

Impact of discounted fees on risks to the consulting engineer’s practice

Analysis of impact of discounted fees on project specific risks

Project-specific risks particular to consulting engineers were identified from the review of literature conducted, and the

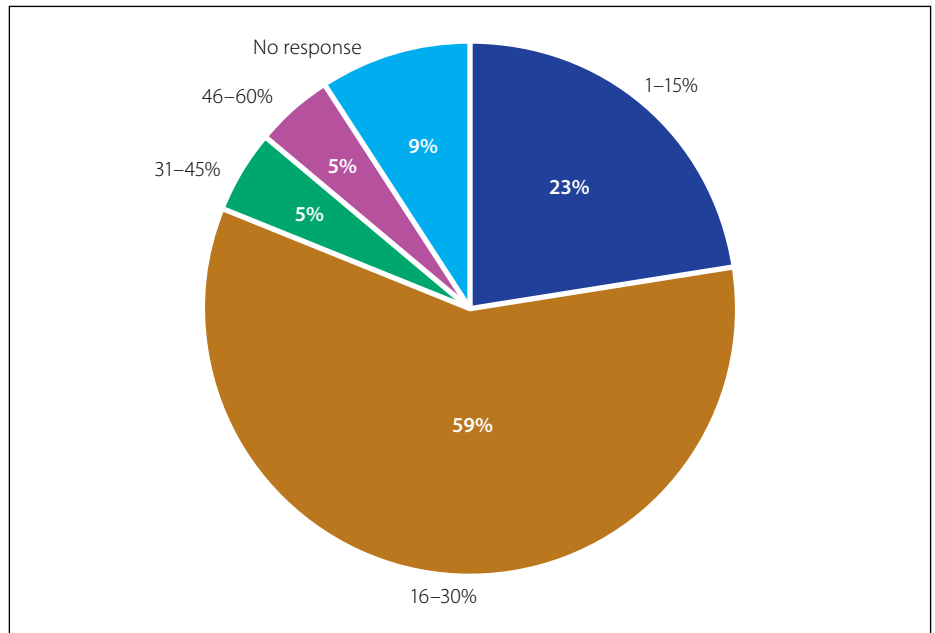


Figure 2 Average percentage of discount offered on fees

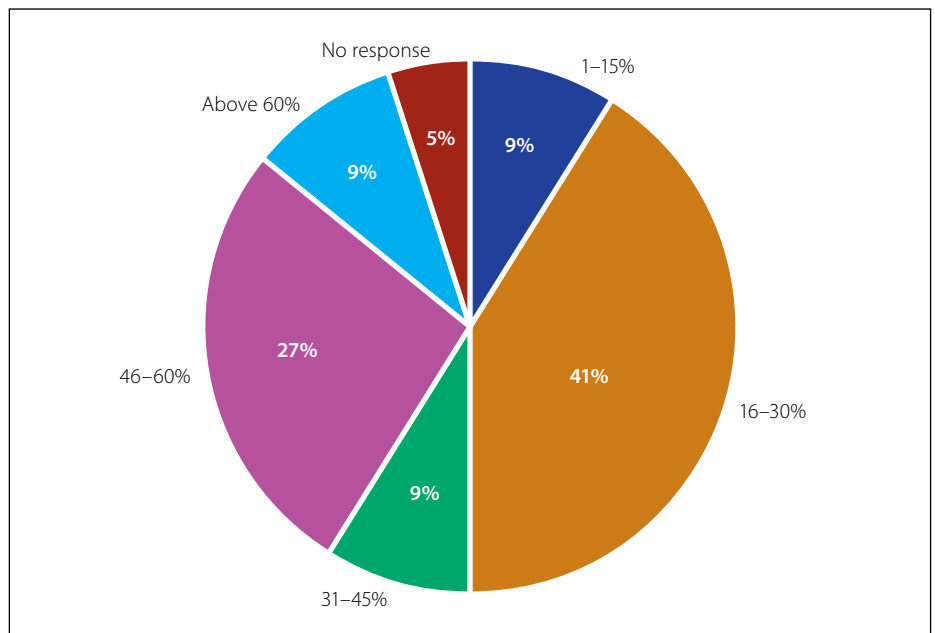


Figure 3 Maximum percentage of discount offered on fees

influence of low professional fees on these risks quantitatively assessed. Their frequency of occurrence on projects with low professional fees, and their impact on the consulting engineer’s practice were assessed using a Likert-type scale (see Table 5). The objective was to rank the various project risks in an order of perceived importance by obtaining risk values for each project risk considered. In order to obtain risk values the different response options were weighted using a linear and non-linear weighting scale. A non-linear weighting scale was introduced to accentuate the significance of frequently occurring risk with high impact; this approach is consistent with the methodology employed by Jerling (2009) in ranking the risk generated for contractors by clients.

The risk value of each risk group was obtained using the risk expression:

$$\text{Risk} = \text{Risk Frequency} \times \text{Risk Impact}$$

In order to compare the risk, the weighted value of the response option was multiplied by the number of responses for that option. A final risk value was obtained using the expression:

$$\text{Risk Value} = [(N_{\text{Number of responses}} \times \text{Frequency Weight}) \times (N_{\text{Number of responses}} \times \text{Impact Weight})]$$

Project risks with higher risk values are considered to be more influenced by low

Table 8 Ranking of project risk groups

Risk description (linear scale)	Rank		Risk description (non-linear scale)
Financial loss on the project	1	1	Financial loss on the project
Inability to perform value engineering	2	2	Inability to perform value engineering
Inadequate site supervision and quality control	3	3	Inadequate supervision and quality control
Rework of design and drawings	4	4	Rework of design and drawings
Poor quality of design and documentation	5	5	Poor quality of design and documentation
Legal liabilities (claims, disputes and litigation)	6	6	Legal liabilities (claims, disputes and litigation)
Professional indemnity cover	7	7	Professional indemnity cover
Unethical practices	8	8	Unethical practices

professional fees and are ranked above project risks with lower risk values. The ranking of project risks based on the risk values obtained using both the linear and non-linear weighting scales is presented in Table 8.

Financial loss on the project, inability to perform value engineering, inadequate supervision and quality control issues, rework of design and drawings, and poor quality of design and documentation are identified as the top five project risk groups impacted by low professional fees.

Impact of discounted fees on organisational business risks

Seven organisational risks were identified as being influenced by low professional fees. These seven organisational business risks were assessed in the questionnaire survey.

Organisational business risks are assumed to always be present in the organisation's day-to-day running. The managers of the business therefore need to constantly steer the organisation away from these threats. In this light, assessing these risks in terms of frequency of occurrence was not feasible; respondents were

therefore only asked to assess the impact of discounted professional fees on the identified organisational risk factors.

The impact of low fees on these identified risk factors was assessed quantitatively and ranked in an order indicative of the extent to which they are impacted by low fees. The linear and non-linear weighting scales previously employed and shown in Table 5 were also applied. A risk value was obtained for each risk factor using the expression:

$$\text{Risk Value} = [N_{\text{Number of responses}} \times \text{Impact Weight}]$$

Table 9 presents the results of the ranking process. Human resource issues (training and mentoring of young engineers, and attracting experienced engineers) appear to be impacted most by discounted fees, followed by business sustenance and technical innovation within the organisation. Staff morale, relationship with clients and the organisation's corporate reputation were ranked the least impacted organisational risks.

Two open-ended questions were also included in the questionnaire for the

purpose of obtaining additional information on project and organisational risks resulting from discounted professional fees. Respondents were asked to provide their perspective on the impact of discounted fees on the project risk and organisational risk exposure of consulting engineers. A total of 22 respondents provided answers to these questions.

The responses provided were not at variance with the project risks and organisational risks captured in the structured questions. Analysis of these responses was carried out qualitatively by interpreting respondents' opinions and categorising these into the identified common risk groups.

The majority of the opinions highlighted the limited resources and time deployed to projects, with low fees resulting in risks related to quality of design documents. Other risks that received considerable mention include business sustenance, ability to train young engineers and to retain the services of experienced engineers, all factors critical to the sustenance of the profession. Devaluation of the profession, relationship between engineer and client, increased workload for consulting engineers and

Table 9 Ranking of organisational business risks

Risk description (linear scale)	Rank		Risk description (non-linear scale)
Ability to train and mentor aspirant/graduate engineers	1	1	Ability to train and mentor aspirant/graduate engineers
Ability of organisation to attract and retain quality/experienced staff	2	2	Ability of organisation to attract and retain quality/experienced staff
Business sustenance	3	3	Business sustenance
Ability of organisation to be innovative in design	4	4	Ability of organisation to be innovative in design
Motivation of staff	5	5	Motivation of staff
Relationship with clients	6	6	Relationship with clients
Reputation of your organisation	7	7	Reputation of your organisation

demotivation of engineering staff were also mentioned. Analysis and collation of the responses received are presented in Table 10.

Strategies employed for the management of risks associated with discounted fees

In dealing with risk associated with discounted fees, respondents either contractually limited their risk exposure, or mostly accepted the risks and employed various mitigation strategies, including:

- Avoiding innovative ideas in order to cut down on time spent on the project.
- Accepting financial loss on the project, but guarding against technical risks by dedicating adequate time and engineering input to the project.
- Negotiating reduced scope of service to accompany discounted fee.
- Recovering cost on future projects with the specific client.
- Charging inflated prices for variations and refusing to do work not included in the scope.
- Doing only jobs which are repetitive at low fees so that information can be used from previous projects.
- Improving organisational efficiency through the use of technology.
- Adopting a quality assurance system.

DISCUSSION AND IMPLICATION OF FINDINGS

Findings from the survey show that discounting practices are widespread among the structural and civil engineering services consulting firms represented in this survey. At least seven in every ten respondents reported that they either frequently or often offered discounts. Discounts of between 16 and 30% of the recommended fee scale are observed to be the industry's standard.

The majority of the respondent firms can be described as medium-sized firms judging by their staff strength and annual turnover. No clear dichotomy was, however, observed between the discounting practices of small, medium and large firms represented in the survey.

Percentage fees based on the cost of the works is by far the most common method of remuneration amongst respondent organisations, followed by time-based fees. The monetary value of remuneration under both these methods is informed by rates recommended in the fee scale guidelines

Table 10 Risk identified by respondents in the open-ended question

Risk associated with discounted fees identified by respondents	Number of times recorded
Marginal profit or financial loss on projects	11
Decreased quality of service/inability to perform value engineering	9
Ability to hire and retain highly qualified staff	8
Staff demotivation and fatigue resulting from increased workload on engineers	8
Design errors	6
Business sustenance (sustainability of the practice)	6
Poor quality design and documentation	5
Inability to afford staff training	5
Legal problems	4
Inability to afford competitive salaries	4
Client relationship suffers	4
Devaluation/deterioration of the profession	3
Professional indemnity claims	2
Absence of innovation in design	1
Inability to carry out proper quality control on site	1
Huge financial implication of redesigns can erode profit	1

published by ECSA. This further suggests that the ECSA fee scale is widely used in the industry.

Competition based on price appears to be a well-entrenched business strategy as over two thirds of respondents agreed that their firm competed based on price. This finding agrees with the assertion by Love and Edwards (2004), that consulting firms are increasingly adopting a 'market driven' strategy of price-based competition and no longer compete based on quality of service.

The study also found that prevailing market conditions characterised by competitive tendering and demands from clients for discounts are the leading reasons why respondents offer discounts. Responses to an open-ended question reveal that, because the ECSA fees scale is not enforceable and the practice of professional engineers within the various engineering discipline is unregulated, clients have a greater bargaining leverage when it comes to negotiating fees with the consulting engineer.

The level of discounts offered in the industry, evident in the findings of this research, calls to question the relevance of the ECSA fees scales. Some respondents argued in the open-ended questions that the fees scales are no longer relevant and that, rather than use fee scales, engineers should arrive at their own fees through a

careful consideration of the scope of the service they are to provide. This argument hinges on the fact that much of the fees determined in the industry are based on a percentage of the cost of work, but current realities, especially on building projects, show that ECSA-recommended percentage scales may not be an accurate reflection of the engineering input required from the consulting engineer.

It is found that the quality of professional service offered is impacted by discounted fees, especially as consulting firms do not spend enough time considering design options and carrying out value engineering on low-fee jobs. The implication of this is that the life cycle cost of projects increases on account of poor engineering inputs (Sternier 2000). When this becomes apparent to clients, they may no longer value the services of the engineering professional, leading to more design responsibilities being awarded to contractors in the form of design-build contracts.

The construction industry is reputed to be plagued by adversarial relationships between project participants leading to conflicts (Black *et al* 2000). Findings here have shown that discounted fees negatively impact on the relationship between the consulting engineer and the client. This is a disincentive for consulting engineers to embrace partnering philosophies and

collaboration on projects, as they will naturally spend less time and deploy fewer resources on projects with low fees.

These findings strongly indicate that government's procurement legislations, including those of the Competition Commission, that encourage competitive procurement based on cost have engendered price-based competition in the consulting engineering industry. Two key implications for the industry and the country as a whole are discussed below:

- a. **Increase in the life cycle cost of projects:** Although the cost of professional engineering services on projects constitutes a very small portion of the life cycle cost of engineering projects (Shrestha & Mani 2013), requiring consulting engineers to compete based on cost rather than quality to secure contracts inherently requires that the amount of engineering input (by way of considering design alternatives and carrying value engineering) on the project is reduced to enable the engineer to bid low and still make a profit. This can lead to increased operation and maintenance cost in the long run, and hence increased life cycle cost of the project.
- b. **Shortage of professionals:** When company profits are low, remuneration for consulting engineers will be affected. To maximise profit, individual personnel within the firm will hence have to take on responsibilities not commensurate with remuneration, which otherwise could have been delegated to other personnel. Similarly, the ECSA remuneration scale makes certain types of projects (e.g. building projects) in certain markets less profitable than others. If consulting engineers operating in that market are not protected, a shortage of professionals on such projects may be recorded.

These ultimately make the profession unattractive to young engineers, and could lead to capital flight of existing engineers and lack of enrolment of younger minds in engineering training. As such, fewer engineers are available to design and implement engineering projects required for national development.

RECOMMENDATIONS AND FUTURE RESEARCH

Based on the findings of this study, the following recommendations are suggested:

- a. The ECSA fees scale tariff has become a tool in the hands of clients to exploit consulting engineers, as it is neither enforceable nor mandatory. Its relevance in the face of the current procurement legislation under which it is implemented hence needs to be questioned.
- b. In countries such as the USA and Japan, which are recognised as technologically advanced, quality-based selection is law for the procurement of consulting engineering services. It is recommended that procurement legislation for professional engineering services be amended to allow the selection of consulting engineers based solely on qualification, experience and competence. Fees can subsequently be determined based on the cost of providing the service required under a well-defined scope of work
- c. Registered professionals who do not possess the correct experience and training have often been accused of offering reckless amounts of discounts because they are sometimes unaware of the amount of engineering input required and the level of risk involved. Civil engineering is a broad field of engineering that encompasses many sub-disciplines. Regulating the practice requirements within the various sub-disciplines in the field of civil engineering, such as structural engineering, is recommended. It is believed that properly qualified professionals will be unwilling to offer ridiculous discounts.
- d. Further research on the implication in South Africa of lower quality service by the consulting engineer, engendered by discounted fees, on the risk encountered by other project participants such as clients and contractors, is also recommended.

CONCLUSION

Research on construction industry risks have focused much on client and contractor risks. The research conducted in this study investigated risks to the consulting engineer's practice, with focus on the impact of discounted professional fees on the consultant's risks.

Using survey questionnaires, the study yielded information on the local experience of consulting engineers in South Africa, and ranked project and organisational risks encountered by consulting engineers based on how they are perceived to be impacted

by low fees. A key finding of this study suggests that discounted professional fees accentuate the risk exposure of structural and civil engineering consulting professionals. This is consistent with widely held perceptions amongst structural and civil engineering professionals within the South African industry. The study hence confirms anecdotal expectations, using empirical methods, and provides an academic condensation of industry-wide practices and challenges concerning consulting engineering practice. These findings are relevant, not only for industry consulting professionals, but also for other stakeholders in the construction industry, particularly policy makers, client bodies and regulators. The significance of this study furthermore lies in the fact that, to the best of the authors' knowledge, this study provides the first known empirical and academic work for the South African construction consulting environment, and even for Africa and the Third World, offering relevant information representing the realities in these less-researched environments.

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