

Multi-criteria decision analysis in public procurement – a plan from the South

J.C. Pauw* & J.S. Wolvaardt**

* Department of Public Administration and Management

** Department of Decision Sciences

University of South Africa

(*pauwjc@unisa.ac.za)

(**wolvajs@unisa.ac.za)

Abstract

The South African constitution prescribes five principles of public procurement without defining the relationship between them: the public procurement system must be fair, equitable, transparent, cost-effective and competitive. The authors show that techniques derived from utility theory provide the analytical tools for analysing and applying these potentially conflicting constitutional requirements. The current regulatory regime around the Preferential Procurement Policy Framework Act is analysed and found to be satisfactory. Competing legislation found in the Broad-Based Black Economic Empowerment Act and its Codes of Good Practice is unlikely to provide such a good fit with the Constitution.

Keywords: Constitution, multi-criteria decision analysis, public procurement, South Africa, utility theory

1 INTRODUCTION

Public procurement decisions often require the simultaneous application of a set of criteria. The section in the Constitution of the Republic of South Africa (1996) (henceforth ‘Constitution’) dealing with public procurement, namely Section 217, provides for this. However, the implementation of these provisions is not without problems. Our intention with this article is to test whether the legislation promulgated in terms of Section 217 of the Constitution does indeed give effect to that section. This is important because the principle of political supremacy has, since the new dispensation of 1994, been trumped by the principle of constitutionality. We execute the test by applying techniques developed in the Decision Sciences, more particularly in Multi-Criteria Decision Analysis (MCDA). The application of techniques from

another discipline is in line with Public Administration's 'fundamental heterodoxy and interdisciplinarity' (Raadschelders 2008: 925).

We conclude that the legislation gives effect to crucial aspects of this section of the Constitution, but that it remains in need of constant monitoring. At the same time, we warn that competing legislation is highly unlikely to be such a good fit to the five requirements.

Our paper has the following structure:

- A brief overview of Section 217 of the Constitution;
- A brief overview of applicable basic strategies in Multi-Criteria Decision Analysis (MCDA);
- An analysis of the five principles or, as we refer to it in the MCDA context, 'criteria' of public procurement in South Africa;
- A matching of these criteria as a value system for the procurement system;
- Solutions that have been identified in South Africa;
- The way forward.

2 SECTION 217 OF THE CONSTITUTION

When South African government officials procure goods or services they must do so within a system that is fair, equitable, transparent, competitive and cost-effective. This is required by Section 217 of the Constitution, which reads:

217. (1) When an organ of state in the national, provincial or local sphere of government, or any other institution identified in national legislation, contracts for goods or services, it must do so in accordance with a system which is fair, equitable, transparent, competitive and cost-effective.

(2) Subsection (1) does not prevent the organs of state or institutions referred to in that subsection from implementing a procurement policy providing for

Categories of preference in the allocation of contracts; and

The protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination.

(3) National legislation must prescribe a framework within which the policy referred to in subsection (2) may be implemented.

We accept that the five criteria (fair, equitable, transparent, competitive and cost-effective) are set for the system as a whole as well as for each individual procurement decision. Both the promulgation of legislation and the awarding of a tender that clash

with these five criteria would be unconstitutional, and therefore legally invalid. We distinguish between two systemic levels: regulation and actual procurement. The level of regulation consists of Acts promulgated in legislatures, regulations made by the Executive, and directives issued by other procurement regulators, for example a tender board. The level of procurement comprises decisions by end-users, tender committees and procurement officials to buy something from a specific supplier. These are administrative actions as contemplated in the Promotion of Administrative Justice Act (Act 3 of 2000). Bolton's (2005: 56) view on the law of government procurement in South Africa, is correct that all principles 'always find application when organs of state contract, but that the weight attached to each principle will differ depending on the circumstances'. However, her very next sentence (Bolton 2005: 56) – 'All the principles therefore need not always be complied with at the same time' – does not appear to follow logically on this: although it may be given a low weight, a principle cannot be ignored. The reason might be that the relevant concept of *weight*, as used by lawyers, is underdeveloped. In this article the concept will be afforded a quantitative treatment.

Our topic is a classic example of decision making where various criteria, which are not reducible to one another *tout court* and may even conflict in part, must be taken into account. A glance at the criteria shows that some of them go hand in hand (such as fairness and equitableness – we prefer this noun to *equity* for a closer fit with the adjective *equitable* of the Constitution). Sometimes the synergies must be forced, for example, when asset specificity seems to endanger the co-relationship between cost-effectiveness and competitiveness regulations can obligate organs of state to increase the duration of contracts for which tenders are invited appropriately (Neumann and Von Hirschhausen 2006). However, sometimes trade-offs between two or more criteria will be inescapable. For example, too much transparency may hamstring competitiveness and the consideration of too many tenders will work against cost-effectiveness (Pouris 2001: B9); more important for our analysis, there is a conflict between equitableness and cost-effectiveness.

The Constitution does not indicate how these criteria should be handled vis-à-vis one another. This apparently leaves regulators and officials with an unsolved problem squarely in the field of Multi-Criteria Decision Analysis (MCDA) – a sub-discipline of Decision Sciences (better known as Operations Research) (Lootsma 1999). Our analysis will show that the South African government has found a way to harmonise all of the criteria structurally, with only the value of the weights remaining an open question. We make a formal mathematical derivation to show that the formulae used in current preferential procurement practices are equivalent to a value function as used in MCDA to handle more than one criterion.

We have already noted that the application of Section 217 of the Constitution lies at two levels: the level of creating a framework of legislation and procedures, and the level of making individual procurement decisions. We will critically describe the work already completed on the framework level. Our discussion of the constitutional principles for procurement and their interrelationships should also be useful in making individual procurement choices, where departments draw up preferential procurement policies as required by Section 217(3) and when they draw up bid evaluation criteria.

3 BASIC STRATEGIES OF MULTI-CRITERIA DECISION ANALYSIS (MCDA)

One of the most frequently occurring decision problems in the presence of more than one criterion is the choice of one item from many contenders. This is also the best researched problem (Lootsma 1999; Belton and Stewart 2002). The purchase decision, which is part of the subject of this article, falls in this category. A typical tender presents the procurer with a number of bids from which a winner must be selected – and price is seldom the only criterion.

Although lexicographic rules (see below) may be applied, methods used in practice usually are of the weighted average type, with the most prominent being SMART (Simplified Multi-Attribute Rating Technique) (Von Winterfeldt and Edwards 1986) and some variation or other of the Analytic Hierarchy Process (the AHP) (Saaty 1980).

Lexicographic rules are based on an ordering of the criteria without attaching weights to the criteria. The competing items are first evaluated under the highest criterion, and if there is a single winner the process stops there. Should there be more than one item with the same performance under this criterion, they proceed to the second highest criterion where the process is repeated until a winner is found. This approach is followed when a good performance under one criterion cannot compensate for underperformance under a higher-ranking criterion.

We follow the Multi-Attribute Utility Theory tradition originating with Von Neuman and Morgenstern (1944) in explicitly constructing a value function that is a weighted average of marking functions. By so doing we solve certain interpretation problems presented by Section 217 of the Constitution, and model the decision procedure used in the current preferential procurement practices.

A value function is the sum of the weighted marking functions of the criteria. A weight is allocated to a criterion indicating its relative importance or contribution to the overall objective. (Weights are positive numbers adding up to one.) Then a marking function for each criterion is constructed in terms of which a mark

out of 100 can be calculated for any of the competing items under that criterion. The marking functions are multiplied by their weights and added to get the value function. This means that an item's value is found by multiplying its mark under a particular criterion with the weight of that criterion and adding up all of these products. This is rather like averaging the percentages that a student gets in different papers, where some papers are more important than others.

Note that we make a distinction between simply allocating marks and weights, and the allocation of marks and weights in terms of a function. Constructing a function helps in formalising the process; not only subjecting it to the strict mathematical treatment of the problem, but also ensuring that 'the rules of the game' are set before adjudication begins.

A well-thought-out value system has criteria that overlap as little as possible (Belton and Stewart 2002). One of the difficulties of constructing value functions is that an MCDA consultant is often forced to sort out overlaps between criteria that have been formulated at a higher managerial level without taking implementation issues into account.

Example 1

Supposing there were only the two criteria of equitableness and competitiveness and three bids X, Y and Z are considered. Suppose that the two marking functions allocate the marks

$$x_{\text{equit}} = 75, y_{\text{equit}} = 72, z_{\text{equit}} = 75 \text{ and } x_{\text{compet}} = 71, y_{\text{compet}} = 86, z_{\text{compet}} = 73.$$

Supposing the weights are Equitableness 0.55 and Competitiveness 0.45, then the following Table 1 shows the calculations of a value function and the outcome with Y as the clear winner.

Table 1: Hypothetical consideration of equitableness and competitiveness criteria

Criteria	Weight	Bid X	Bid Y	Bid Z
Equitableness	0,55	75	72	75
Competitiveness	0,45	71	86	73
	Value	73,2	78,3	74,1

In contrast, a lexicographic procedure in its pure form would require a ranking of the two criteria. Supposing that equitableness is ranked the highest, X and Z would tie on this criterion and go through to the next step. Here Z performs better than X and would win the contract.

The choice of the decision procedure and its parameters makes a significant difference in practice. It should be pointed out that the procedure (with its parameters) represents a particular way of thinking or policy choice. In mathematical terms, the procedure is supposed to be a model of the policy and a particular selection of a bidder would be an instance of the policy. A numerical study of a number of the instances may lead to a new procedure that models the policy better, as intended – for example in the context of this article – by the Constitution. We will return to this later.

The question arises whether the Constitutional Assembly had a decision procedure in mind when setting the five principles of Section 217. It is hard to answer. However, somebody must provide a procedure. Somebody should try to determine whether these five principles inherently point in a certain direction as regards their application. This is one reason why we need to investigate these five principles in the next section.

4 AN ANALYSIS OF THE FIVE PRINCIPLES (CRITERIA) OF PUBLIC PROCUREMENT

It is necessary to know what the five principles mean to make an estimation of the intentions of the lawgiver and to determine possible synergies and conflicts between them. What is of particular interest from a statecraft point of view is that the five principles were not explicated in detail in the 1997 *Green Paper* on public sector procurement reform postdating the Constitution (South Africa 1997). It is assumed that concepts like ‘transparency’ and ‘fairness’ permeate the Constitution. However, to expect exact definitions of these concepts in official documents is overly optimistic. They are assumed in political processes like constitution-making. The meaning of words is in the hands of those with power. This does not preclude debate, because the semantic power game can be as dangerous for the powerful as it is for the powerless.

4.1 Fairness

Fairness is a very basic concept in public administration and the law. It has a larger scope of application than all the others, in that not only public procurement, but all government action must comply with it. In fact, it is much more than a legal requirement: it is the basis of civility. However, systematic discussions explaining the concept are scarce.

Perhaps we should regard ‘fair’ (fairness) as a primitive term in the discourse on the proper conduct of human affairs. Perhaps it is like ‘true’ (truth) in the discourse

on knowledge or ‘beautiful’ (beauty) in aesthetics. Solving the philosophical puzzle on the meaning of truth and beauty does not seem to be a prerequisite for their correct use. As far as we can determine, definitions of fair (fairness) are absent from South African statutes. Fairness is therefore a lot like democracy – everybody is supposed to know what it means. This does not mean that definitions are nonexistent, though.

Bolton (2005: 46) devotes a section to fairness in the context of Section 217. As a lawyer, her exegesis starts with the dictionary meanings of the word. She writes:

Most relevant to the government procurement context are arguably the following: free from discrimination, just and appropriate in the circumstances, impartial, in conformity with rules or standards, treating people equally, unbiased, uncorrupted, and unprejudiced.

This may be read with the following description from a *World Bank Manual on Procurement* (2001: x)

Fairness: Good procurement is impartial, consistent, and therefore reliable. It offers all interested contractors, suppliers and consultants a level playing field on which to compete and thereby directly expands the purchaser’s options and opportunities.

The question regarding the meaning of the term ‘fairness’ in Section 217 may also be addressed by looking at the occurrence of the term or concept in the Constitution as a whole. Searching the Constitution one finds occurrences of ‘fair’, ‘unfair’, and ‘fairness’ in the following Sections: Ss 9, 33, 190, 192, 195, 197, and of course 217.

Section 9 provides for the fundamental right of equality. Fairness features as a protection of the individual against unfair discrimination. The crux is that a distinction between people is only allowed on appropriate grounds. Race, sex, gender and opinion are specifically noted as characteristics that are inappropriate or unfair grounds for making a difference between people.

Fairness is related to the fundamental right to administrative justice, provided for in Section 33:

33. (1) Everyone has the right to administrative action that is lawful, reasonable and procedurally fair.

The Promotion of Administrative Justice Act (Act 3 of 2000) was promulgated to give effect to this.

Reported court cases show that the fairness meant as a requirement of administrative justice is a significant use of the concept in our context. In our

context, this is directly related to fairness in public administration, which is required by Section 195.

The other occurrences in the Constitution use the word ‘fair’ in the ordinary sense of the word. Naturally, fairness in Section 217 is one of the main topics of this article.

Fairness is closely related to current conceptions of justice. A famous political philosopher of the previous century, John Rawls, developed a conception of justice as fairness in his classic *A Theory of Justice* (Rawls 1972, see also Rawls 2001). Rawls wants to counter the utilitarian view of an acceptable society. It is not sufficient for the rules governing societal intercourse to put the collective in a better position than before. It is not even sufficient to enhance the probability that every individual will be in a better position than before. Justice requires that the rules of societal intercourse should be fair. Applied to the drafting of a constitutional provision on procurement at the inception of a new South Africa, this means *we do not want public procurement to be driven by market forces alone under the argument that pure capitalism will ensure the greatest good for the greatest many. It is more important for us that the system is fair to all, especially to those who have been disadvantaged in the past.*

Fairness relates to getting what you deserve: procedural justice and just allocation. It refers to individuals in relation to the processes to which they are subject; for example, the just and unbiased treatment, free of corruption, of a potential supplier in a tender process. It also refers to the benefits that individuals gain or duties required from them in comparison to their fellows, for example, the way benefits of procurement processes are distributed in society and the distribution of the tax burden between suppliers. Procedural justice itself also has two parts, namely the fairness of the steps in the procedure and secondly the absence of partiality, bias or prejudice.

We thus propose that fairness be divided into two components. In the first instance fairness relates to proper procedure in all its aspects, for example *audi alterem partem*, consistency, the absence of bias and corruption and sufficient information. (See the judgment of Pienaar AJ in *Barkhuizen v Independent Communications Authority of South Africa* 25 June 2001.)

In the second instance, fairness relates to the benefits and duties one obtains in relation to your fellows. We propose that the term ‘equitable’, used in Section 217, should be reserved for this form of fairness, while the term ‘fairness’ is used for procedural fairness only. (We use the somewhat inelegant ‘equitableness’ instead of ‘equity’ due to other uses of this latter word in certain legal contexts.) For operational reasons we will suggest that equitableness, being a special case of fairness, should be handled separately in the application of Section 217. The

distinction that Bolton (2005: 46–47) makes is different, though not unrelated. She reserves ‘fairness’ for procedural fairness and denotes ‘equity’ as substantive fairness.

4.2 Equitableness

In many contexts, ‘equitable’ simply means ‘fair’ and ‘equity’ or ‘equitableness’ therefore means ‘fairness’. However, there are two concepts at play here and we are convinced that the lawgiver did not intend just to give the same idea two names from an abundance of caution. (There is a presumption in South African law that no clause, sentence or word shall be superfluous, void or insignificant (Bolton 2005: 40).) We also make our deduction regarding the separation of the two criteria from the working of the system as a whole, and from the political context at the time of drafting.

Equitableness, in our interpretation, is applied when equal shares (equal treatment on a numerical basis) are not fair. It is about allocation. In South Africa, certain groups were placed at a disadvantage by apartheid, for instance by means of government policies that under-funded black primary and secondary education. Many black contractors (‘historically disadvantaged individuals’ in the words of the legislation) have to compete with fellow countrymen who had a much better state-funded education than they. Therefore, it is fair (just, or equitable in our terminology) to give them an advantage in the tender process at this stage of the history of South Africa. Note that this is a right given to a group of people. (Should the current preferential procurement policies be carried on for decades, the situation might be seen as unfair and will have to be reversed.)

4.3 Transparency

Transparency is a later addition to the conceptual apparatus of democracy than fairness. However, its denotative meaning in public procurement is well established. In World Bank discourse, transparency of tenders requires advertising, pre-disclosure, public bid opening, accessibility of policies and regulations, use of standard bidding and contract documents, appeal mechanisms, debriefing and publication of awards.

Transparency is necessary for the open society that the Constitution purports to establish (Bolton 2005: 53). This concept relates to information, accountability and the prevention of corruption, as they intertwine. As in the case of fairness, we have a concept with various aspects: in this case economic, moral and political aspects. Reliable and open information about government procurement in general and tenders in particular contributes to better service delivery and firms that are more viable. In economics, it can be argued that a market is transparent if as many people

as possible know about what products and/or services are available and where. Therefore, a high degree of market transparency can result in disintermediation due to the buyer's increased knowledge of supply pricing. Disintermediation is the removal of intermediaries in the supply chain. (For a further discussion of the economic aspect, see Evenett and Hoekman 2005.)

Reliable and open information about government procurement gives the public a better idea of how government has used their tax revenues, and is a corruption disincentive – these are the political and moral aspects of the concept. Transparency is also a necessary condition for competitiveness, which is the next criterion to be discussed.

4.4 Competitiveness

This criterion also contains various elements: in this case the *procedural* meaning (again) and the *economic* meaning. When the government puts out a tender, competitiveness requires that a sufficient number of suppliers should be afforded the opportunity to make bids. Procedurally, competitiveness means that contracts are awarded on merit on level playing fields. This does not preclude the concept of handicapping. What it does preclude, however, is the initial disqualification of certain competitors on invalid grounds such as race. This is confirmed by the Practice Note issued by the National Treasury on 23 January 2006, prohibiting the so-called set-asides by which departments tried to reserve certain contracts for black firms only (South Africa 2006).

In economics, competitiveness refers to a complex composition of factors. This includes the number of viable firms active in a given market and their ability to offer goods and services of a high quality at economic prices at the right time. Below we will point out that bids may be rejected if certain basic quality conditions are not met. These quality conditions are known in the system as 'functionality criteria'. Since we use the term 'criterion' more formally, we will henceforth refer to these as 'functionality requirements'.

Competitiveness is good for a country. Not only does it bring about good products and services at low prices, but in the long run it contributes to the standard of living of all its inhabitants. It is better for the state to deal with many competitive suppliers than with monopolies or oligopolies. Competition between suppliers results in better efficiency within competing firms and better prices for the buyer – in our case, the state.

For this and other reasons, it is important for the government to facilitate business opportunities for historically disadvantaged groups. For example, small, medium and micro enterprises (SMMEs) must be put in a position to compete

with large established firms (South Africa 1997, Section 3.6). Porter (1990) has found that an increase in competition internally contributes to the competitiveness of a country in the global arena.

From the point of view of a firm, competitiveness consists of a number of factors. Competitive advantage may lie in location, timeliness, service, other quality factors and price. We will return to price and quality.

4.5 Cost-effectiveness

Cost-effectiveness is as basic a principle of economic life as fairness is of moral and political life. An increase in cost-effectiveness means that more can be acquired for the same amount, or that the same output costs less. Cost-effectiveness increases the public benefits derived from the spending of public money. We understand the term to be a synonym for efficiency. Increased efficiency means doing more with the same resources. Cost-effectiveness is particularly relevant where resources are limited.

Cost-effectiveness may be used as a management tool in comparing the outputs and inputs of two or more processes, and then making a pronouncement on which process has the highest output relative to its cost. However, the Constitution seems also to require the system as a whole to be cost-effective, which is something different.

Again, one may choose to divide cost-effectiveness into its various components, and analyse them. The World Bank (2001: x), for example, distinguishes between economy and efficiency in this context:

Economy: Procurement is a purchasing activity whose purpose is to give the purchaser best value for money. For complex purchases, value may imply more than just price, for example, since quality issues also need to be addressed. Moreover, lowest initial price may not equate to lowest cost over the operating life of the item procured. But the basic point is the same: the ultimate purpose of sound procurement is to obtain maximum value for money.

Efficiency: The best public procurement is simple and swift, producing positive results without protracted delays. In addition, efficiency implies practicality, especially in terms of compatibility with the administrative resources and professional capabilities of the purchasing entity and its procurement personnel.

From an economic perspective, cost-effectiveness suggests the concept of minimum cost. A market where prices are way above the minimum cost at which a certain product can be manufactured is clearly not cost-effective. In this article we treat price as a proxy and measure of cost-effectiveness (see below).

5 THE CRITERIA AS A VALUE SYSTEM

The Constitution sets five principles for government procurement. In the context of Multi-Criteria Decision Analysis, we may call these principles ‘criteria’; and the whole set constitutes a value system (Wolvaardt 1991). This system can be used to ‘measure’ the constitutionality of both legislation and the administration of the awarding of contracts. More importantly, the criteria can be used to compare bids for contracts in terms of the aims of the Constitution.

We now insert a diagram (Figure 1) anticipating the further development of our argument. The reader is already familiar with the five criteria depicted on the top tier of the diagram. At the bottom the basic components of the current administrative system are introduced. They are: prescribed general procurement procedures, explicit specifications for each contract, a formula to compare bids as for price and affirmative action, and a formula for evaluating the functionality of bids for the specific contract.

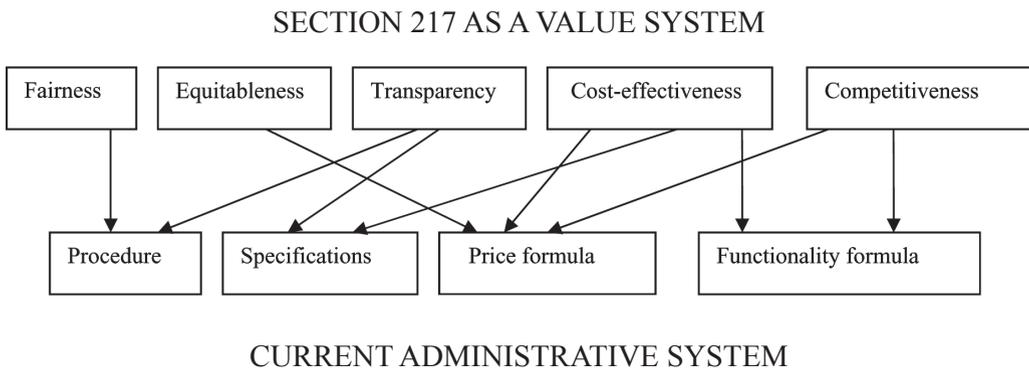


Figure 1: Fit between value and administrative systems

According to Figure 1 the administrative system models Section 217 adequately with certain provisos that will be indicated later. The procedure takes care of ‘fairness’ as we will reduce it, and ‘transparency’. ‘Equitableness’ is cared for by a term in the price formula favouring historically disadvantaged individuals (HDIs). Naturally, cost is handled by a term in the same formula. This term also handles the price part of ‘competitiveness’. The quality part of ‘competitiveness’ and the effectiveness part of ‘cost-effectiveness’ are taken care of by the specifications originally set in the request for tenders and the formula for functionality.

We have already indicated that the five criteria may stand in various relations to one another, for example, transparency promotes competition, and competition may promote or counter cost-effectiveness, depending on the circumstances.

Putting ourselves in the position of an MCDA consultant, we must comment on the composition of the value system that our client (the Constitution) has defined. Belton and Stewart (2002) identified the following considerations for criteria that are relevant to all MCDA approaches: value relevance, understandability, measurability, non-redundancy, judgmental independence, balancing completeness and conciseness, operationality, and simplicity versus complexity.

In practice, the consultant will try to influence the decision maker to choose criteria that satisfy the requirements of Belton and Stewart (2002). Our position is different. Due to the status of the Constitution, we cannot apply all of Belton and Stewart's requirements rigorously. However, we interpret the relevant section of the Constitution with the intention to produce maximum sense and purpose in the light of our MCDA interrogation. In particular, we deal with understandability and non-redundancy.

To understand the value system one must understand the situation of the constitution makers in the period 1994 to 1996. Certainly, procurement was not a major issue in drafting the new Constitution. Nevertheless, one can reconstruct some of the considerations that led to the formulation of the value system encapsulated in Section 217. Although the constitution-making process in South Africa was a consensus-seeking exercise among all parties that were members of the Constitutional Assembly, we can discern more than one ideological strand in the set of criteria. (In the end, the Constitution was indeed accepted with the consent of all the parties in Parliament, except for the small African Christian Democratic Party.)

The two ideological strands that had to be accommodated in Section 217 can be characterised as affirmative action and a free market. Affirmative action – in this case of the majority – is specifically represented by the criterion of equitableness; and free-market thinking is specifically represented by competitiveness and cost-efficiency. Subsections 2 and 3 of Section 217 specifically make provision for the administration of affirmative action. Depending on the interpretation, fairness and transparency can serve both ideologies. The situation is not unlike what an MCDA consultant may find in assisting a large corporation to develop its value tree, where divisions in particular have different agendas, and some horse-trading is needed to get to a value tree at all. Our analysis in the next section shows that the two strands have, with some success, been balanced in the value system.

After our brief discussion of the value system in terms of political imperatives, we now consider the interrelationship in terms of its application. In terms of Belton and Stewart's (2002) consideration of judgemental independence, the following question arises to start off the analysis at the macro or system level: do any of the criteria overlap?

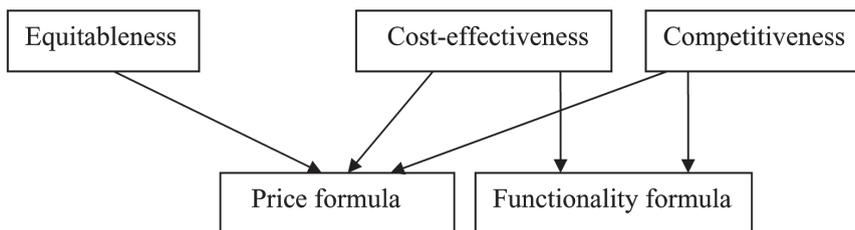
An example of overlap is found between the criteria ‘fairness’ and ‘equitableness’. Intuitively, fairness consists of procedural justice plus just allocation (equitableness). However, if we maintain this interpretation in our value system that treats equitableness as a separate criterion, a double count will arise as follows: for a specific tender, its just allocation attributes will be counted twice – once under fairness and once under equitableness. Then just allocation would assume a higher than intended importance. This explains why we remove just allocation from fairness and subsume it under equitableness when we operationalise the criteria.

Fairness has a special relationship to the other criteria. In a constitutional state, a government can brook no compromise on this criterion. We cannot compensate for a lack of fairness by increased compliance with the other criteria. To paraphrase Rawls (1978: 3): fairness is the first virtue of procurement systems, as truth is of systems of thought. Neither a system nor a contract that is unfair can be constitutional. In this sense, evaluation starts in a lexicographic way.

The second criterion that we investigate for overlap is transparency. In fact, it overlaps with all four of the other criteria. Transparency is part of fairness in the sense of ‘justice must be seen to be done’. Transparency is an inherent component of competitiveness in that there can be no competition without some market transparency (e.g. information on prices). Exactly the same consideration applies to cost-effectiveness. To achieve cost-effectiveness one must know what is available and at what price. To achieve an equitable allocation of contracts and shareholding, information should be available on who gets what and who owns what. Transparency is, therefore, a component of all criteria. We assume that transparency as a criterion is served by the procedures of the system, including the explication of specifications in tender invitations, as depicted in Figure 1. We will therefore – as in the case of the foundational criterion fairness – neither allocate a weight for transparency nor create a marking function. (The same applies to that part of cost-effectiveness that is served by the explication of specifications in tender invitations.)

To focus the reader on the quantitative treatment of the system that follows, we show Figure 2, which results when the aspects discussed earlier are removed from Figure 1.

SECTION 217 AS A VALUE SYSTEM



CURRENT ADMINISTRATIVE SYSTEM

Figure 2: Reduced figure to show quantified elements

We now deal with the interrelationships between equitableness, competitiveness and cost-effectiveness – stripped of their fairness and transparency components and that part of cost-effectiveness taken care of by specifications. Equitableness involves, as we will explain, paying a premium for goods and services by the government in the South African system, for the sake of affirmative action. Therefore, it militates against cost-effectiveness. Equitableness makes it more difficult for white males and white-owned companies to win public sector contracts – there it militates against competitiveness at a certain stage and under a certain interpretation of the term. Competition and cost-effectiveness are on the same side of the scale. They do not militate, they mitigate. These three criteria must be balanced – par for the course for MCDA.

6 THE PLAN FROM THE SOUTH

In the South African government procurement system, an attempt has been made to strike a balance in quantitative terms between equitableness, cost-effectiveness and competitiveness. This is achieved by (a) an open functionality formula determined by the purchasing institution for every tender, and (b) a prescribed set of four price formulae (South Africa 2000a, 2001). (Since the highest value wins, buying and selling requires separate formulae. In addition, a distinction is made between smaller and larger tenders.) Our example (in Box 1) below is the price formula for bigger purchases.

The price formulae result from the Preferential Procurement Policy Framework Act (Act 5 of 2000). It forms part of the regulations promulgated by the Minister of Finance in terms of this Act. The formula either has the parameters of 90 and 10 (the form we reproduce in the box below), or 80 and 20. (The term ‘parameter’ differs from ‘variable’ in that each bid is described by its own variables of price,

quality and skin colour, while all bids for a particular contract are measured by a formula having the same parameters of either 90 and 10, or 80 and 20.) In the rest of the article, we, for explanatory purposes, consider only the case of 90 and 10. The argument is similar for the other set of parameters.

Formula (1) is presented in the regulations in precisely this form. Formulae (2) and (3) provide formal notation for the application of Formula (1).

$P_s = 90 \left[1 - \frac{P_t - P_{\min}}{P_{\min}} \right] \quad \dots\dots\dots(1)$ <p>Where</p> <p>P_s = Points scored for price of the tender under consideration</p> <p>P_t = Rand value of tender under consideration</p> <p>P_{\min} = Rand value of lowest acceptable tender</p> $P_f \leq 10 \quad \dots\dots\dots(2)$ <p>Where</p> <p>P_f = Preference points</p> $P_{pr} = P_s + P_f \leq 100 \quad \dots\dots\dots(3).$ <p>Where</p> <p>P_{pr} = Adjusted price points</p>

Preference points, P_f , are awarded in the first instance on the grounds of the make-up of persons involved in a bid as individuals, shareholders or managers, to level the playing field. Although the Act in Section 2(1)(d) stipulates persons who were made historically disadvantaged individuals (HDIs) by apartheid, other categories of preference are also possible – the so-called Reconstruction and Development Programme (RDP) points (the detail of this is set out in the *Preferential Procurement Regulations* (South Africa 2001)). Organs of state are free to decide on the composition of the preference points, provided that at least one point is awarded for HDI status. The other goals that may be taken into account in terms of paragraph 2(1)(d)(ii) of the Act, include the promotion of South African-owned enterprises, the promotion of SMMEs and the upliftment of local communities through various

measures. The definition of HDI is interesting from a political point of view. It is not a definition based on race, but on the nature of the discrimination that persons were subject to in the past. The three categories are disenfranchised people, women, and disabled people. The disenfranchised category is delineated to exclude black people who were not subject to apartheid legislation (i.e. non-South Africans).

Formulae (1), (2) and (3) enable officials to calculate points in accordance with the provisions of the Act. If a bidder offers the lowest price (when the state is buying) and achieves full preference points, the bid will score the maximum of 100 points for price (see the box above). Other bidders will score fewer points commensurate to their offers in terms of price and their number of preference points.

For smaller contracts the affirmative action impact is stronger (20 per cent) than for bigger contracts (10 per cent).

Example 2

Consider a case where three bidders compete for a big contract to supply the state with something (10-and-90-system applies) and the following bids are made:

Table 2: Hypothetical bidding process

Bid	Price per item	Preference points	Price formula points
A	R100	0	90,0
B	R105	5	90,5
C	R110	10	91,0

In our putative example, preference points do give their recipients an advantage, but not dramatically so. Sensitivity analysis shows that should bidder B have bid R104,40 per item, the formula points would have been 91,04, thereby winning the contract *ceteris paribus*.

The parameters of 10 and 90 represent the weights (balancing factors) between the criteria of equitableness and price in the awarding of public tenders. The price component of Formula (1) adequately represents the cost component of cost-effectiveness from a purchasing point of view. If minimum specifications and functionality requirements are satisfied, price becomes a valid proxy for cost-effectiveness as a whole. The Act applies the concept ‘acceptable tender’. The formula only applies to acceptable tenders: that ‘means any tender which, in all respects, complies with the specifications and conditions of tender as set out in the tender document’ (South Africa 2000a: Section 1).

Price is also a proxy for competitiveness in Formula (1). If a bid is an acceptable tender, it will perform better than other bids of identical quality. However, there are other aspects of competitiveness not captured in Formula (1), as we have suggested above.

In Section 2(1)(f), the Act allows for the introduction of ‘objective criteria in addition to’ HDI status and RDP goals. These requirements, which became known as ‘functionality criteria’, refer to considerations such as the track record (of the bidder), the design (of a product) and quality relevant to the particular contract (see the block on the bottom right-hand side in Figure 1). This simply means that the price formula points do not necessarily have the last say. In the case of weapon systems, for example, functionality of design in comparison to what the enemy has available may be an overwhelming consideration. Although there are different ways of evaluating military systems (Wagner and Wolvaardt 1990), price cannot compensate for the fact that the enemy’s fighter jet is deadlier than yours. This trade-off between price and functionality should ideally be different for every kind of tender. The principle has found a bizarre application in the notorious arms deal in South Africa, where a Cabinet committee allegedly decided to pay 72 per cent greater cost for 17 per cent greater technical value in aircraft not wanted by the Air Force (Feinstein 2007: 165). In the case of mass-produced goods such as drinking glasses, price is overwhelming because once a drinking glass has met the specifications nothing really is left to evaluate in terms of functionality. The formula for calculating functionality and the formula for calculating price are allocated complementary weights to handle the trade-off, as shown in Formula (8) below. This reflects the current usage in the advertisement of tenders.

The functionality requirements are quantified by our Formula (4) which finds a score (functionality points) for $\text{bid}(\text{tender})$ for the functionality requirements specified in the invitation. A particular bid gets a mark (out of 100), provided by a marking function for each of the functionalities. Using the weights made known in the invitation, an average is calculated. This gives the functionality value of $\text{bid}(\text{tender})$ requirements.

$$f_{qu}(tender) = \sum_{i=1}^n \lambda_i f_i(tender) \quad \dots\dots\dots(4)$$

Where
i is an index running over the *n* different functionality requirements specified in the tender invitation
f_i is the marking function for functionality requirement *i*
 λ_i = the weight of the *i*-th functionality requirement as made known in the invitation and
f_{qu} is the value function for quality.

Figure 4 – Value function representation of scores for functionality

Having presented the evaluation of quality (or functionality) as a value function, we now proceed to show that the procedure for evaluating price and equity can also be expressed as a value function which finds a weighted average between a marking function for price, and one for equitableness.

One: Let $g_{eq}(tender)$ be the present procedure allocating an equitableness value (the preference points P_f) between 0 and 10 to a particular tender. Then the expression

$$f_{eq}(tender) = 10g_{eq}(tender) \quad \dots\dots\dots(5)$$

defines the marking function f for equitableness that scales equitableness up to lie between 0 and 100.

Two: Let $f_p(tender) = 100(1 - \frac{P_{tender} - P_{min}}{P_{min}})$ (6)

be the marking function for the raw price, then, for any tender, the formula (3) for the adjusted price can be written as

Three: $f_{pr}(tender) = 0,9f_p(tender) + 0,1f_{eq}(tender)$ (7)

which is a typical value function with weights 0,9 and 0,1, and with marking functions $f_p(tender)$ and $f_{eq}(tender)$. A function like this is applied in MCDA in the problem of choosing one from many according to a rule.

The formula currently in use, recast in its form as a value function, (7), is now easy to interpret: $f_p(tender)$ is a function of raw price and provided $P_{tender} \leq 2P_{min}$ it allocates a mark between 0 and 100 reflecting how well P_{tender} compares with P_{min} .

(In practice, a price of more than twice the lowest bid is sometimes considered. Its negative ‘mark’ for price may be outweighed by good marks for equity and quality in the final value allocated by (8) below. Confining our analysis to bids priced lower than twice the lowest bid satisfies the technical niceties of utility theory without loss of generality – our argument follows *mutatis mutandis* for the higher bids with their negative ‘marks’.) Since $f_{eq}(tender)$ is a marking function for equitableness, (7) tries to balance equitableness and price.

Bringing everything together, we can now specify the value function that enables officials in the South African public procurement system to choose one bid from a number of competitors taking into account equitableness, cost-effectiveness and competitiveness

$$f_{value}(tender) = \alpha f_{pr}(tender) + (1 - \alpha) f_{qu}(tender) \quad \dots\dots\dots(8)$$

where α is the weight of the adjusted price in the final decision. This formula makes it clear that it is not necessary to afford peremptory status to price as Bolton (2005: 290) might be claiming, or to boldly state that it is and should be the most important criterion (Bolton 2005: 273) – α is a weight chosen for the particular item to be acquired.

At this stage, an MCDA consultant would ask him- or herself two questions. First: does the current system (including the above value function) satisfy the basic aims of Section 217 of the Constitution? Second: do the parameters of the value function balance the relevant criteria?

The article has answered the first question in the affirmative. The system satisfies the Constitution. The design of the system can be labelled an emphatic MCDA success. However, we will show in conclusion that developments that have taken place outside the context of the Preferential Procurement Policy Framework Act are less supportive of the intentions of the Constitution.

As for the second question regarding the parameters, it cannot be addressed without, among others, empirical information about actual bids and the awarding of contracts (see Pauw and Wolvaardt 2008).

7 THE WAY FORWARD

In the Introduction we referred to ‘competing legislation’ that may cancel the good work that has been done. In 2003, the Broad-Based Black Economic Empowerment Act (Act 53 of 2003), was passed. This Act also provides for preferential procurement

without specifying what the relationship is between its provisions and the legislation that we discussed.

Under the general principles of the interpretation of statutes one must assume that the later legislation would take precedence over the earlier legislation. In Section 9, Act 53 of 2003 provides that the Minister of Trade and Industry may promulgate so-called Codes of Good Practice in terms of which, among others, targets and qualification criteria for Broad-based Black Economic Empowerment (BBBEE) may be set. Section 10 of the Act is draconian. It rules that every organ of state and every public entity must take into account and, as far as possible, apply any relevant Code of Good Practice – not only in developing and implementing a preferential procurement policy, but also when ‘determining qualification criteria for the issuing of licences, concessions or other authorisations in terms of any (sic) law’!

The first Code of Good Practice was published on 9 February 2007 (South Africa 2007a). The Code affects procurement in two ways. First, an enterprise’s mark or compliance score on the Generic Scorecard is partially determined (the weight is 0.2) by its own preferential procurement practices – the extent to which enterprises buy goods and services from BEE (black economic empowerment)-compliant suppliers. Second, the intention is that public procurement officers use the BEE scores of suppliers in making public procurement decisions (South Africa 2007b: 14–18).

In the interpretative guide to the first Code (South Africa 2007b: 14), the following telling formulation is found, ‘Assuming that pricing, quality and other factors are similar across ... three potential suppliers, the final decision will be based on BEE credentials.’ The BEE credentials of the officers’ suppliers will determine the extent to which they meet their own targets or ‘BEE procurement percentage’ (South Africa 2007b: 17).

The Codes of Good Practice thus create a dynamic that will drive officials to overemphasise equitableness to the cost of the other constitutional imperatives. What if pricing, quality and other factors are not similar for three potential suppliers? In this legislation and Codes, the value functions that are operative only take equitableness (such as it is) into account. Cost-effectiveness and competitiveness must apparently look after themselves. In contrast, the value function (8) that we have constructed and that is used in practice satisfies the requirements of the Constitution in its architecture. At the same time, its parameters can, in all probability, be evaluated empirically and, if necessary, changed to find the correct balance.

In as far as the preferential procurement elements of Act 53 of 2003 and its subordinate legislation is a procurement system, it appears to be unconstitutional.

As pointed out to us by Marika van der Walt (2008), these provisions can only be constitutional if they are applied within the ambit of the Preferential Procurement Policy Framework (Act 5 of 2000) ; and the Department of Trade and Industry does not appear keen to do so (see, for example, South Africa 2007c). We believe that the current ascendancy of BEE legislation (a product of the Department of Trade and Industry) over the *Preferential Procurement Policy Framework* legislation (a product of National Treasury) should be reversed. This would be in the interest of constitutionality and democracy in South Africa.

BIBLIOGRAPHY

- Belton, V. and T.J. Stewart. 2002. *Multiple Criteria Decision Analysis – an integrated approach*. Dordrecht: Kluwer Academic Publishers.
- Bolton, P. 2005. *The Law of Government Procurement in South Africa*. Durban: LexisNexis Butterworths.
- Evenett, S.J. and B.M. Hoekman. 2005. Government procurement: market access, transparency and multilateral trade rules. *European Journal of Political Economy* 21(1): 163–183.
- Feinstein, A. 2007. *After the Party*. Johannesburg: Jonathan Ball.
- Lootsma, F.A. 1999. *Multi-criteria decision analysis via ratio and difference judgement*. Dordrecht: Kluwer Academic Publishers.
- Neumann, A. and C. von Hirschhausen. 2006. *Long-term contracts and asset specificity revisited – an empirical analysis of producer-importer relations in the natural gas industry*. Cambridge Working Papers in Economics from Faculty of Economics, University of Cambridge. <http://www.electricitypolicy.org.uk/pubs/wp/eprg0610.pdf> (accessed 13 October 2008).
- Pauw, J.C. and J.S. Wolvaardt. 2008. The determination of the weight of a Preferential Procurement Parameter in a Price Formula for Awarding Contracts: The Case of South Africa. Third International Public Procurement Conference Proceedings. <http://www.ippa.ws/IPPC3/Proceedings/Chaper 2024.pdf> (accessed 13 October 2008).
- Porter, M.E. 1990. *The competitive advantage of nations*. New York: Free Press.
- Pouris, A., J.C. Pauw and J.S. Wessels. 2001. Winning public sector tenders (a course in procurement). Reference Manual. Unpublished manuscript, produced by Unisa and Ntsika Enterprise Promotion Agency, Pretoria.
- Raadschelders, J.C.N. 2008. Understanding government: four intellectual traditions in the study of Public Administration. *Public Administration* 86(4): 925–949.
- Rawls, J. 1978 (1972). *A theory of justice*. Oxford: Oxford University Press.
- _____. 2001. *Justice as fairness: a restatement*. Cambridge, MA: Harvard University Press.
- Republic of South Africa. 1996. *Constitution of the Republic of South Africa 1996*. Pretoria: Government Printer.

- _____. 2000a. *Preferential Procurement Policy Framework Act, 5 of 2000*. Pretoria: Government Printer.
- _____. 2000b. *Promotion of Administrative Justice Act, 3 of 2000*, as amended. Pretoria: Government Printer.
- Saaty, T.L. 1980. *The Analytic Hierarchy Process*. New York: McGraw-Hill.
- South Africa, Department of Trade and Industry. 2007a. *Broad-Based Black Economic Empowerment Act (53/2003): Codes of Good Practice on Black Economic Empowerment*. Gazette 29617, February (General Notice 112).
- _____. 2007b. *Broad-Based Black Economic Empowerment Act: The Codes of Good Practice: Interpretative Guide*, June. Pretoria.
- _____. 2007c. Background to, intention & application of the codes of good practice. <http://www.dti.gov.za/bee/Inside.pdf> (accessed 21 October 2008)
- South Africa, Ministry of Finance and Ministry of Public Works. 1997. *Green Paper On Public Sector Procurement Reform In South Africa*. Pretoria: Government Printer.
- South Africa, National Treasury. 2001. *Preferential Procurement Regulations*. Pretoria: Government Printer.
- South Africa, National Treasury (Supply Chain Management Office). 2006. Practice Note Number SCM 2 of 2006. Pretoria: Government Printer. [http://www.treasury.gov.za/divisions/sf/sc/practicenotes/Practice 20note 20SCM 202 20of 202006.pdf](http://www.treasury.gov.za/divisions/sf/sc/practicenotes/Practice%20note%20SCM%2020of%202006.pdf) (accessed 29 October 2007).
- Van der Walt, M. 2008. Personal communication, 21 October.
- Von Neumann, J. and O. Morgenstern. 1944. *Theory of games and economic behaviour*. Princeton: Princeton University Press.
- Von Winterfeldt, D. and W. Edwards. 1986. *Decision analysis and behavioural research*. Cambridge: Cambridge University Press.
- Wagner W.J. and J.S. Wolvaardt. 1990. Uitrustings-evaluering: 'n Kwantitatiewe Benadering. *Militaria* 20(4): 18–26.
- Wolvaardt, J.S. 1991. I_k^+ -metrics for ratio scale estimation. Research Report QM101 Pretoria: University of South Africa.
- World Bank. 2001. Draft Procurement Policy and Services Group Operations Policy and Country Services VPU, July. <http://siteresources.worldbank.org/PROCUREMENT/Resources/pm7-3-01.pdf> (accessed 27 October 2008).

Court case

- Barkhuizen v Independent Communications Authority of South Africa and another*. 2002 All SA 483 (C).