

The role of procurement practices in occupational health and safety and the environment

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Abstract

Inadequate, or the lack of health and safety negatively effects both the construction and built environments resulting in fatalities, injuries and disease. Procurement practices encapsulate inter alia: bidding practices; contract documentation, and project leadership, which in turn influence: client involvement; co-ordination of design and construction; design, details and specification; project priorities; project duration and project relationships.

To this end the findings of various descriptive surveys will be presented which indicate, inter alia: bidding practices; client involvement; design and details; project duration; partnering and the incidence of subcontracting to influence construction and occupational health and safety, ergonomics and the environment.

The need for procurement practices which enhance the construction and built environment, health and safety, and ergonomics included, is amplified by: the total cost of accidents; the cost of redressing unsuitable or polluted environments and the synergy between occupational, health and safety, ergonomics, productivity, quality, schedule and the environment.

Keywords: Procurement practices, health and safety, environment, cost

1. Introduction

The World Commission on Environment and Development [1] defines sustainable development as “Development that meets today’s needs without compromising the ability of future generations to meet theirs”.

The construction industry has wide environmental impacts, originating in land use, energy and natural resources consumption, pollution and upstream industries [2]. However, often environmental concerns are interrelated with construction health and safety issues [3]. Accidents not only result in considerable pain and suffering but marginalise productivity, quality, schedule, and negatively affect the environment and consequently add to the cost of construction [4]).

Barrett & Curado (1996) maintain that in order to sustain the present levels of satisfaction of the individual’s higher level needs (social, esteem and self-actualisation) humankind is required to re-address the satisfaction of physiological and safety needs, by means of environmental preservation.

2. Impact of construction

Construction by its very nature represents an ergonomics, and health and safety problem as it requires, inter alia: bending; working in awkward or cramped positions; reaching away from the body and overhead; repetitive movements; handling heavy material and equipment; use of body force; exposure to vibration and noise, and climbing and descending [5].

According to March (1992) the industry impacts on the environment at a number of levels: globally; on the community at large, and finally on the individual (Table 1).

Impact	Process	Effect
Global	Extraction	Energy, Timber, Water
	Materials manufacture	Energy, CFCs
	Building in use	CFCs (Refrigeration etc), Energy, Sewage
	Demolition	CFCs, Burning
	Impact of planning	All those Below
Community	Extraction	Noise/Dust, Traffic, Landscape, Ecology, Water
	Impact of design	Ecology, Aesthetics
	Construction phase	Site activities (noise, dust) Waste disposal, Traffic
	Building in use and management of the built resource	Noise, Traffic, Legionella, Fumes/Dust, Sewage
	Demolition	Noise/Dust, Waste Disposal &/or Reduction
Individual	Construction operatives	Health hazards, Safety
	Building user	Sick Building Syndrome (SBS), Legionella, Allergies, Fibres, Dusts, Pesticides Gases (random/volatiles)

Table 1: The construction industry’s geographical impact [6].

3. cost

The cost of accidents can be categorised as being either direct or indirect. Direct costs tend to be those associated with the treatment of the injury and any unique compensation offered to workers as a consequence of being injured and are covered by workmen's compensation insurance premiums. Indirect costs which are borne by contractors include: reduced productivity for both the returned worker(s) and the crew or workforce; clean-up costs; replacement costs; stand-by costs; cost of overtime; administrative costs; replacement worker orientation; costs resulting from delays; supervision costs; costs related to rescheduling; transportation, and wages paid while the injured is idle [7]. Various studies have realised differing ratios between the indirect and direct costs: 1,67 times for non-minor injuries and more than 5 times for minor injuries with direct costs less than US\$50 [8], & 20 times [9]. Research indicates the total cost of accidents to constitute, *inter alia*, 6,5% of the value of completed construction [10] and approximately 8,5% of tender price [11].

4. Potential practices

The United States Civil Engineering Research Foundation (CERF) 1994 study of leading construction industry practitioners, academics and government officials worldwide analysed five distinct, but interrelated areas of practice: management and business practices; design technology and practices; construction methods and equipment; materials and systems, and public and government policy. According to Dreger [12] the study provides an excellent base of common goals and issues which can be addressed to realise significant environmental improvements in sustainable development.

4.1 Total Quality Management (TQM)

According to Levitt & Samelson [13] TQM has as its main thrust continuous improvement in customer satisfaction, employee satisfaction, productivity, and health and safety. The TQM mission in construction is to realise a quality product i.e. an error-free one for the user by preventing errors in the construction process by integrating health and safety, productivity and quality.

Dreger [12] maintains the application of its principles has the potential of realising a quality project in all respects and beneficial results to all stakeholders. Preference should be given to designers and constructors who practice TQM.

4.2 Constructability

Constructability is a system for achieving optimum integration of construction knowledge and experience in planning, engineering, procurement and site operations, and the balancing of various project and environmental constraints to achieve overall project objectives [14].

The benefits of applying constructability management on the Toyota Car Manufacturing Facility at Altona, Australia include: completion ahead of schedule; below budget; to quality and health and safety standards [14].

4.3 Client influence

Clients influence health and safety both positively and negatively, either directly or indirectly. Indirectly through: project documentation; optimising project schedule; requiring of quality management systems (QMS's), and pre-qualifying contractors on health and safety. Directly through: imposition of permit systems; conducting health and safety audits; educating and training the personnel of contractors and referring to health and safety throughout the construction process [4].

4.4 Design influence

Designers influence construction health and safety and sustainable development as a result of project concept, design and -details, specifying materials and processes, advising regarding procurement systems including project documentation and project duration and interacting with clients with respect to health and safety [15].

4.5 Procurement systems

According to Dreger [12] the form of construction delivery affects contractual relationships and the development of mutual goals. Within the context of sustainability the Design-Build contract form, which establishes one entity to provide both design and construction, has the greatest potential for success as it creates common project goals.

Generally, although references are made to health and safety in standard South African contract documentation, it is indirect, hardly coercive, and depending upon the level of commitment, contractors continue to address health and safety to varying degrees. With the exception of indirect references to the construction environment, no references are made to the environment per se. Procurement systems are such that contractors frequently find themselves in the iniquitous position, that should they make the requisite allowances for health and safety, they run the risk of losing a tender or negotiations to a less committed competitor [16].

4.5.1 Pre-qualification

The purpose of pre-qualification in the health and safety sense is to provide a standardised method for selecting contractors on the basis of demonstrated safe work records, health and safety commitment and knowledge and the ability to work in a healthy and safe manner [17].

4.5.2 Partnering

Partnering brings the various stakeholders involved in a project: client; designers; general contractor; subcontractors, and suppliers together and entails inter alia, developing mutual goals and mechanisms for solving problems, which effectively complements health and safety [13].

4.5.3 Project duration

Project duration can influence health and safety as a shortened project period invariably results in an increase in the number of workers; the number of hours worked per worker, or even a combination of the two; the amount of plant and equipment, and the number of subcontractors simultaneously undertaking work per period of time. This intensification increases the possibility of incidents [16].

4.6 Systems

Problems related to health and safety, productivity and quality can frequently be traced to substandard, inconsistently applied or non-existent operating procedures and practices. Standard operating practices and procedures are the core component of quality management and health and safety management systems as they guarantee uniformity of operation throughout an organisation. They effectively ensure that each time a task is performed it is done consistently, correctly and safely [18].

Ultimately the implementation of a quality management system (QMS) on a project will ensure that construction conforms to specified requirements in all respects as it identifies the procedures, checklists, resources, activities and responsibilities [16].

4.7 Legislation

The promulgation of the Construction (Design and Management) (CDM) Regulations 1994 in the United Kingdom is attributable to two aspects. First the need for a radical improvement in health and safety resulting from a cultural change and adoption of a health and safety culture by all stakeholders in the industry: clients; designers, and contractors, from inception through to execution. Second, the Temporary or Mobile Construction Sites Directive (TMCSA).

The contractor no longer takes sole responsibility for site health and safety as there is now a statutory link between clients and designers, site health and safety, fatalities and injury [19].

5. Research

The salient findings of a number of descriptive postal surveys conducted nationally among various survey populations in South Africa are presented.

5.1 Project Management Practitioners

47 members of the Project Management Institute (SA Chapter) responded to this survey to determine the role of project managers in contractor health and safety.

5.1.1 Productivity and quality were the aspects identified most frequently as being negatively affected by inadequate health and safety (Table 2).

Aspect	Response (%)			Total
	Yes	No	Don't know	
Cost	72,3	19,2	8,5	100,0
Environment	66,0	23,4	10,6	100,0
Productivity	87,2	10,6	2,2	100,0
Quality	80,8	17,0	2,2	100,0
Schedule	57,4	29,8	12,88	100,0
Client perception	68,1	19,1	12,8	100,0

Table 2: Aspects negatively affected by inadequate health and safety

Health and safety is a prerequisite for productivity and quality as, housekeeping, inter alia, complements access and ergonomics.

Accidents result in increased cost, damage to the environment and can substantially retard progress.

Clients' requirements include not only completion on time, to quality standards, within budget, but also without fatalities and injuries which can have a negative effect not only on a client's perception of a contractor, but on the contractor's and client's image as well.

5.1.2 95,8% responded that inadequate or the lack of health and safety increased project risk. Accidents and disease result in variability of resource which in turn increases project risk.

5.1.3 66% stated that health and safety is negatively affected by competitive tendering.

5.1.4 Pre-qualification of contractors on health and safety was advocated by 68,1%. Pre-qualification will ensure that health and safety conscious contractors are engaged. A contractor's commitment to health and safety is also an indicator of their likely approach to the environment and management in general.

5.1.5 Only 51,1% responded that health and safety is negatively affected by short project periods.

5.2 General Contractors

71 contractors who are members of the Building Industries Federation of South Africa (BIFSA) or the South African Federation of Civil Engineering Contractors (SAFCEC) responded to this survey to determine the influence of design on health and safety.

5.2.1 Table 3 tables the frequency to which aspects of design can negatively affect health and safety.

Aspect/Factor	Frequency (%)
Design	50,0
Method of fixing	47,1
Content of material	38,6
Mass of material	38,6
Size of material	37,1
Edge of material	35,7
Position of components	28,6
Surface of material	27,1
Details	17,1
Area of components	14,3

Table 3: Aspects which can negatively affect health and safety

Design and method of fixing were probably identified due to it being difficult, or impossible to circumvent problems arising therefrom, whereas the wearing of personal

protective equipment can circumvent, inter alia, edge and surface of material, albeit at expense, and in cases to a degree.

5.2.2 68% stated that health and safety is negatively affected by competitive tendering.

5.2.3 Pre-qualification of contractors on health and safety was advocated by 58,6%.

5.2.4 56,3% responded that health and safety is negatively affected by short project periods.

6. Conclusions

Construction impacts on both health and safety and the environment during the construction process and in the built environment. Accidents, disease and damage to the environment contribute to the cost of construction. Health and safety complements the environment, cost, productivity, quality, schedule, the environment, and therefore customer satisfaction.

Procurement systems, practices and legislation influence health and safety and environmental practices, all stakeholders – state, clients, designers, contractors, subcontractors and suppliers playing a role.

Design-Build contracts are the preferred procurement system as common project goals result more readily from the integration of design and construction. Health and safety and sustainability of the environment are enhanced by: constructability management which affords / engenders prioritisation of health and safety and the environment; partnering which facilitates multi-disciplinary contributions; pre-qualification which ensures committed contractors are engaged; TQM which is the strategy to facilitate continuous improvement: OMS's which assure that work is executed correctly and consistently, and safe work procedures (SWP's) which assure that work is executed in accordance with process proved steps.

7. Recommendations

Legislation should be evolved that engenders prioritisation of health and safety and the environment by all stakeholders.

Health and safety and the environment should be included as project requirements.

Procurement systems should be evaluated in terms of their influence on health and safety and the environment prior to their selection for projects.

Practices such as constructability management, partnering, and pre-qualification should be implemented on projects.

The implementation of QMS's and SWP's should be made project requirements.

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