

JOURNAL OF CONSTRUCTION 2019

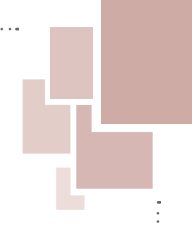


VOLUME 12
ISSUE 1
ISSN 1994-7402



Journal of Construction

VOLUME 12 | ISSUE 1



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ASSESSING STRATEGIES FOR IMPROVING THE SOCIAL SECURITY OF CONSTRUCTION WORKERS IN ZIMBABWE

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ABSTRACT

PURPOSE OF RESEARCH:

The aim of this research is to propose corporate social responsibility strategies that can improve social security of construction workers in Zimbabwe.

METHOD:

A questionnaire survey obtained perceptions from site/project managers and skilled and semi-skilled workers from construction companies and thirteen building projects, respectively, in Harare, Bulawayo and Shurugwi.

FINDINGS:

Site and project managers prioritised training workers on effects and the need for minimisation of consumption of natural resources within the communities while the workers considered outplacement services, retraining and severance benefits as most essential to them.

RESEARCH LIMITATIONS:

Responses were generated from site/project managers who may not be owners of construction companies, but have considerable influence on ways to improve the productivity and welfare of workers.

PRACTICAL IMPLICATIONS:

The study encourages inclusive and well-resourced social responsibility programmes for construction workers.

ORIGINALITY/VALUE:

The corporate social responsibility strategies identified will positively enhance the welfare of workers.

KEYWORDS: Construction, Social security, Sustainability, Workers, Zimbabwe

INTRODUCTION

Social responsibility in Zimbabwe is so fundamental that organisational resources may depend mainly on their level of social commitment. This entails undertaking actions that earn trust and respect from all stakeholders^[1]. Construction companies need to improve on implementing strategies that address social issues for their employees and the communities in which they operate^[2]. While corporate social responsibility strategies in Zimbabwe are confined to an altruistic end (philanthropy) and an ethical obligation, sustainable development activities are preferred as they contribute more to good management practice and societal welfare^[3,4]. Workforce treatment changes are indeed a result of such strategic organisational improvements in a company^[5]. Thus, construction companies should maintain favourable relationships with their communities to promote their business interests. However, corporate social responsibility in Zimbabwe has been increasingly used for enhancing corporate images as opposed to ensuring local communities acquire meaningful engagement through bidirectional communication^[4,6].

Despite social security systems being fundamental to ensure decent living conditions for workers, their inadequacy in the provision of social protection for the economically active population is evident^[7]. The focus of social security within the decent work agenda is widened to include the identification of socio-economic vulnerabilities of workers, linking social security and development, and combining agendas of poverty reduction, human development and social integration^[8].

These elements of social security could be promoted with a range of strategies. Therefore, this article sought to determine social responsibility strategies that would significantly enhance the welfare of construction workers in Zimbabwe, from the perspective of both managers and construction workers. Challenges due to demographics were noted and alluded to, and remain contentious^[9]. Negative experiences of employee well-being are borne in untrained individuals^[10]. Positive strides taken towards flexible work arrangements for low-level staff and different employees have also been noted^[11]. Such demographic connotations require a careful investigation within the Zimbabwean construction industry to unravel any specific inadequacies and differences and inform interventions concerning the designation of the different respondent groups.

The aim of this research is to propose corporate social responsibility strategies that can improve social security of construction workers. Productivity enhancement can be achieved by improving social security and the growth of social justice^[12]. Firms that explore how to build corporate social responsibility into strategy are likely to reap rewards of improved competitive advantage that benefit the society^[3]. Therefore, to augment the shortcomings of the public social systems, private construction firms can implement social security systems that are propagated through corporate social responsibility strategies. The interrogation of practices that benefit the communities in which the companies operate, ensure decent work for construction workers and maintain positive relationships within those communities is paramount^[13].

Succeeding sections of this article address the social security concept and corporate social responsibility strategies. The research method is then revealed through justification of the constructs within which the significance of corporate social responsibility strategies towards enhancing social security was undertaken. The findings from the data collection are subsequently presented, analysed and interpreted, resulting in the extraction of conclusions. Finally, implications for implementation by stakeholders and recommendations for further research and practice are offered.

SOCIAL SECURITY

Social security seeks to protect workers through society's providing measures against the economic and social distresses that would emanate from the stoppage or substantial reduction of earnings^[14]. Social security is recognized by the International Labour Organisation constitution. The Social Security Convention 1952 (No. 102) establishes nine classes of benefits: medical care, sickness benefit, unemployment benefit, old-age benefit, employment injury benefit, family benefit, maternity benefit, invalidity benefit and survivor's benefit^[15]. The National Social Security Authority partially caters for construction workers but fails to provide for benefits such as unemployment benefits, family benefits, and maternity benefits^[13].

On the other hand, the construction industry has a poorly subscribed pension scheme mostly owing to the nature of intermittent employment structures^[16]. Failure to adequately cater for construction workers drastically compromises their social protection as destitution and poverty take centre stage. This is exacerbated by the lack of adequate capacity of the construction industry pension scheme, which requires reformation to a more inclusive social security system^[16]. Therefore, there is a need to operationalise social security systems that care for construction workers in Zimbabwe with regard to accessing these benefits. The interventions can take the form of corporate social responsibility strategies implemented by construction companies to facilitate the realization of essential benefits that are not forthcoming from the established social security schemes.

CORPORATE SOCIAL RESPONSIBILITY STRATEGIES

The vision to attain sustainable communities acknowledges the need for social cohesion and inclusion, but this has its challenges shrouded in ethnicity and poverty^[17]. Corporate social responsibility activities cover environmental (covering aspects of energy, water use, emissions, effluents and waste), social (including labour practices, decent work, human rights, society and product responsibility) and economic (the impact of economic conditions and systems) aspects^[13]. Entrepreneurs, including construction companies, are generally viewed as part of the problem in the practice of sustainability^[18]. While activities in the construction industry are acknowledged to have an injurious effect, increased pressure from stakeholders continues to encourage companies to act in socially responsible ways^[2].

The ability of corporates to address these needs sufficiently is also subject to rationalisation and compromises, and these should be properly documented and communicated before any engagement. Various authors have proffered corporate social responsibility strategies that can potentially directly or indirectly enhance the welfare of construction workers at the workplace and within their communities, and these are subsequently discussed.

ENVIRONMENTAL ISSUES THAT TRANSFER GOOD PRACTICES TO COMMUNITIES

Employees' lifestyles are dependent on surrounding economic, social and environmental factors^[19]. The interface between community participation and environmental management is paramount for a holistic and consensus-based approach towards achieving sustainable development at the local level^[20]. Such training should include the conservation of natural resources during construction work and the safe handling of hazardous substances. Thus, an environmental management culture is established within the communities and this guarantees the welfare of workers, their families and the citizenry.

INVOLVE EMPLOYEES IN DECISIONS THAT AFFECT THEIR WORK ENVIRONMENT

The well-being of employees is negatively affected by poor work environments^[21]. The work environment and employee outcomes improve as employees are provided with autonomy in decision making^[22]. The workers themselves can contribute towards their work environment by being given opportunities to contribute their innova-

tiveness. When these work environments are sufficient for workers to express themselves fully, their well-being is improved, and this cascades to their immediate families and society.

OUTPLACEMENT SERVICES, RETRAINING AND SEVERANCE BENEFITS

Outplacement is the providing of support to redundant employees through facilitating transition and re-orientation in the job market^[23]. Outplacement services are essential as they provide an opportunity for retrenched to be skilled in new jobs to enable them to be re-employed^[22]. Further to this, the critical humanistic approach is the provision of such an opportunity to do so. However, in times of economic depression, companies may desist from such facilitations as they fear that their workers can end up being their competitors in the industry. This, however, can be circumvented by establishing a symbiotic relationship characterised by trust through such corporate responsibility strategies. However, outplacement does not assist retrenched or mitigate the effects of retrenchment through counselling, and it lacks a holistic approach to the retrenched's job loss^[24]. Further to outplacement services, employers offer severance benefits to employees as a social responsibility and as a way of maintaining an excellent reputation within the labour market as opposed to compensation for past work performance^[25]. Failure to regulate the offering of severance benefits by companies has affected retrenched workers as they are disadvantaged by either failing to receive their severance packages or to receive these in cash amounts that cannot sustain them and their families.

LIFE MANAGEMENT, FLEXI-TIME AND WORK-LIFE BALANCE POLICIES

Employees and retirees in Nigeria are increasingly calling for more training in retirement planning^[19]. While retirement planning can be considered essential, the duty of undertaking it is not regulated by law and construction companies are not inclined to provide for it. This continuous advocacy can, however, comprehensively aid the workers but considering it within social dialogue deliberations could immensely motivate for its widespread implementation. Related to this, childcare provisions are affected owing to lack of training in balancing work and life of most single parents as well as dual-earning parent households^[10]. This equips workers for adequate standards of living beyond their active work lives and to appreciate the value of investing in the adequate care of dependents. Work-life balance policies are described as organisational programmes that enhance employees' performance by reducing work-life conflict through maintaining satisfactory levels of employees' involvement in their multiple roles in life^[26]. They further pronounce flexi-time as an organisational strategy that allows employees to self-determine their working time to enable them to meet both foreseeable and unforeseeable personal and family commitments. Addressing work-life elements through candid interest from managers in the well-being of their employees' families and their own lives leads to the retaining of most talented staff and contributes to continuity within the organization^[27]. The changing socio-economic and environmental pressures are pertinent for employers to embrace work-life balance issues^[28]. Work-life balance and organisational pride lead to improved workers' job satisfaction^[22]. Implementation of policies that consider flexi-time and work-life balance is pertinent owing to the benefits alluded to. However, this requires an overhaul of the whole construction workers' policies so that adequate alignment is achieved.

POLICIES THAT ENSURE WELL-BEING OF EMPLOYEES

Well-being has become paramount in recent years with the thrust towards the development of a meaningful and sustainable society^[29]. Invariably, both the organisational and workers' well-being are intricately interconnected towards exploiting return on capital and delivering commercial success. The social context within communities contributes to the personal well-being of workers in the workplace. However, workers look to employers to achieve basic physical and mental needs, physical safety, health and a feeling that they can cope with life^[9]. The necessity of employee treatment of respect, dignity and an open-door policy enhances job satisfaction and overall employee well-being within their workplace and community^[30]. Owing to the absence of a standard framework for measuring employee well-being, a plethora of concepts has been widespread with no definitive conclusion^[10].

DISCRIMINATION, CORRUPTION AND HARASSMENT POLICIES

Management attitudes and organisational climate concerning harassment of employees need to be addressed as these contribute to the financial loss of an organisation^[31]. Organisational justice positively affects the well-being of workers through protecting them from corruption, discrimination, victimisation and harassment^[30]. The existence of legislation on discrimination, harassment and victimisation in Zimbabwe seems sufficient. However, regulation needs to be enhanced, and punitive measures for non-compliance need interrogation. If construction companies improve in terms of regulation, the welfare of the workforce can thus be guaranteed.

ENCOURAGING LOCAL EMPLOYABILITY SCHEMES AND QUALITY WORK EXPERIENCE FOR CONSTRUCTION TRADES STUDENTS

Employees affirm that training through local employability schemes is appropriate to grow them into competent workers^[32]. Adequate development of student self-efficacy is greatly achieved through high-quality work experiences^[33]. Society must invest in the development of local human capital to cope with prevalent socio-economic and technological changes^[32]. However, the need to monitor the quality of these work experiences within the different communities as they must transcend known

cultural differences is advocated for^[34]. The need for the development of smart policies that enhance students' self-efficacy through encouraging youth work experiences within these communities is justified^[33]. The contribution by the various authors of various corporate social responsibility strategies is appropriate to motivating Zimbabwean construction companies towards their implementation.

RESEARCH METHOD

The study followed a deductive approach. The positivist view, explained as the pursuit of natural science progressing social science research, was utilised in this study^[35]. Thus, a quantitative strategy was adopted through a cross-sectional survey^[36]. Insights were obtained from site and project managers from construction companies registered with the Construction Industry Federation of Zimbabwe. Skilled and semi-skilled workers from thirteen building projects in Harare, Bulawayo and Shurugwi were also approached for participation. These construction sites were purposively selected from the National Social Security Authority database. While site/project managers represented the construction

companies' managerial views, the trades of bricklayers, carpenters and painters were selected based on the premise that these are related to the critical path of construction projects.

A total of 135 respondents participated in the study, as shown in Table 1. The samples were computed from a confidence interval of 95%, with the margin of error of 5%^[36]. The overall response rate for participation was 78.5%, and this was satisfactory and acceptable according to a suggested response rate of 60% with a standard deviation of 20% as a standard norm for populations of employees, managers or professionals^[37].

The nature of the collected data result in descriptive and inferential analysis. The data was analysed through the normality test, the Pearson chi-squared test, ranking, and the Mann-Whitney U test. For normality, the Kolmogorov-Smirnov test and the Shapiro-Wilk test were used, where a non-significant result (sig value > 0.05) indicates normality^[38]. Using the Shapiro-Wilk test results, a sig value of 0.00 indicated that the data was not normally distributed. However, using the Kolmogorov-Smirnova (K-S) test, a sig value of 0.061 indicated that the data was normally distributed. In such instances, the Shapiro-Wilk test takes precedent for samples greater than 50, as this test is always more sensitive compared to the K-S test^[39]. Therefore, non-parametric tests such as the Pearson Chi-squared test and the Mann-Whitney U test were utilized. The Pearson Chi-squared test was

used for goodness of fit where the divergence between the expected significant outcome and the observed outcome was established, and the significant variables were selected with the parameters set at a 5% level of significance^[40]. Cramer's statistic was utilised to measure the size of the association between the dependent and independent variable^[41]. The highest Cramer value, between 0 and 1, was considered to have the highest significance with significance set at 5%. Ranking is described as a product of the respondents' rating according to numbers that represent their attitudes, opinions, perceptions or prefer-

ences^[42]. The Mann-Whitney U test is a test for comparing the central tendency of two independent samples, which were perceptions from site/project managers and construction skilled and semi-skilled workers^[43]. The statistical significance level for the test was based on a standard value of $p < 0.05$. A Cronbach alpha reliability test was also undertaken for the thirteen corporate social responsibility strategies within the study with a computed value of 0.807 which was within the "good" range of > 0.80 ^[44].

TABLE 1: Response rate

Respondent Group	Population	Sample Size	Responses	Response Rate (%)
Site Managers/ Project Managers	83	68	54	79.4
Skilled and Semi-Skilled Workers	142	104	81	77.9
Total		172	135	78.5

The questionnaire utilised in the survey consisted of two sections. The first section dealt with demographic issues while the second section dealt with corporate social responsibility strategies extracted from the literature reviewed herein. A five-point Likert scale was used to collect quantitative data on the respondents' insights on how the strategies would improve construction workers' social security. Respondents were requested to rate within the parameters of 1- insignificant, 2 – of little significance, 3 - somewhat significant, 4 –significant, 5 –very significant, U – unsure.

RESULTS AND DISCUSSION

A Pearson chi-squared test was undertaken to ascertain goodness of fit of corporate social responsibility strategies to an expected outcome of significance. Cramer's values for each corporate social responsibility strategy was ascertained to show the size of association between the variables. "Zero tolerance for corruption, discrimination, victimisation and harassment through open processes" and "Encourage local employability schemes" for managers and construction workers respectively, were insignificant. However, all other strategies were significant with $p < 0.05$. This confirms intimations on the need to attain sustainable communities through inclusive sustainability practices utilising company-instituted resolutions^[2,17,18]. It further supports the importance of implementation of social responsibility strategies within the Zimbabwean construction industry.

A Mann-Whitney U test was undertaken to ascertain statistically significant differences due to designations. Statistically, significant differences were determined in corporate social responsibility strategies that are discussed hereafter. Table 2 and 3 shows Cramer's values and ranking for managers and construction workers respectively. The site and project managers perceived training staff on the effects and the need for minimisation of consumption of natural resources within their communities, as the most significant strategy which leads to social security of construction workers, with a Cramer's value of 0.825. Construction workers perceived offering of outplacement services, retraining and severance benefits, when closures and retrenchments are imminent as the most significant strategy which leads to the social security of construction workers, with a Cramer's value of 0.837.

Managers had higher Cramer's values, as compared to construction workers, for all the environmental-related strategies that included training staff on strategies to reduce the emission of hazardous substances and to encourage implementation in communities, training staff on ways to reduce environmental footprint, and training staff on the effects of and need for minimisation of consumption of natural resources within their communities. Managers have a better understanding that employees' lifestyles are dependent on surrounding environmental factors that include the reduction of the environmental footprint^[19]. Managers perceive that provision of such training assists the workers in protecting themselves from exposure to sickness and health issues at the workplace first, before permeating to the communities. In addition, such training is paramount for a holistic and consensus-based approach towards achieving sustainable development within the communities^[20].

Workers potentially need environmental sustainability

training to be able to enhance their appreciation of benefits that can accrue from such training. Utilising construction workers through adequately equipping them is an invaluable approach to enhancing sustainability within communities and also safeguarding them within the workplace.

As shown in Table 2 and 3, construction workers had higher Cramer's values for the strategies on extending training to life management, retirement planning and care of dependents and offering outplacement services, retraining and severance benefits when closures and retrenchments are imminent, as compared to managers. Managers are likely to view these strategies as a cost to the company, which they are not prepared to meet, and beyond that, they do not seem to appreciate that the human resource is worth the effort. This conforms with the view that construction companies are part of the problem in the practice of sustainability^[18].

TABLE 2: Ranking of corporate social responsibility strategies by site management

Strategy	Site and Project Managers		
	Cramer's value	Asymp. Sig.	Rank
Train staff on the effects and the need for minimisation of consumption of natural resources within their communities	0.825	0.000	1
Offer quality work experience for construction trades students on apprentices within local communities	0.816	0.000	2
Encourage local employability schemes	0.814	0.000	3
Train staff on ways to reduce the environmental footprint of construction activities	0.813	0.000	4
Offer outplacement services, retraining and severance benefits, when closures and retrenchments are imminent	0.789	0.000	5
Encourage employee volunteering in the community with financial contributions and help in kind	0.780	0.000	6
Establish policies to ensure the well-being of all employees and the public	0.761	0.001	7
Train staff on strategies to reduce the emission of hazardous substances	0.752	0.001	8
Establish an environmental management system that transfers good practices to the communities	0.743	0.000	9
Be open to flexi-time and other work-life balance policies for construction workers	0.719	0.001	10
Extend training to life management, retirement planning and care of dependents	0.711	0.001	11
Involve employees in business decisions that affect them and improve the work environment	0.673	0.041	12
Zero tolerance for corruption, discrimination, victimisation and harassment through open policies	0.617	0.222	13

Workers are the most affected by closures and retrenchments and thus prefer strategies that assist them to be re-engaged elsewhere or re-trained, or allow them to receive financial benefits.

Provision of up-skilling facilities, opportunities for acquiring new skills and job centres within the Zimbabwean construction industry would be beneficial in this regard. These have positive advantages for workers as they can be skilled for new jobs and their economic sustainability can be ensured^[24,25]. Unfortunately, workers' training does not extend to social aspects such as life management,

retirement planning and care of dependents. However, its importance has been revealed.

This training need conforms with the nature of the industry in terms of stability of work, the physicality of work, mobility and short-term labour contracts and emanates from a desire for self-sustenance and the ability to care effectively for others^[9,19]. Construction workers' need to secure social benefits is evident and construction companies can satisfy this need and consequently benefit through enhanced performance from a contented workforce^[11,14].

TABLE 3: Ranking of corporate social responsibility strategies by the construction workers

Strategy	Construction Workers		
	Cramer's value	Asymp. Sig.	Rank
Offer outplacement services, retraining and severance benefits, when closures and retrenchments are imminent	0.837	0.000	1
Encourage employee volunteering in the community with financial contributions and help in kind	0.820	0.000	2
Train staff on the effects and the need for minimisation of consumption of natural resources within their communities	0.818	0.000	3
Train staff on ways to reduce the environmental footprint of construction activities	0.805	0.000	4
Extend training to life management, retirement planning and care of dependents	0.778	0.000	5
Establish an environmental management system that transfers good practices to the communities	0.773	0.000	6
Zero tolerance for corruption, discrimination, victimisation and harassment through open policies	0.724	0.000	7
Establish policies to ensure the well-being of all employees and the public	0.712	0.000	8
Train staff on strategies to reduce the emission of hazardous substances	0.695	0.001	9
Be open to flexi-time and other work-life balance policies for construction workers	0.607	0.000	10
Involve employees in business decisions that affect them and improve the work environment	0.558	0.020	11
Offer quality work experience for construction trades students on apprentices within local communities	0.521	0.043	12
Encourage local employability schemes	0.469	0.248	13

Managers had higher Cramer's values for the strategies on establishing policies to ensure the well-being of all employees and the public, to encourage local employability schemes, and to offer quality work experience for construction trades students within local communities higher than construction workers. However, the perception by construction workers on encouraging local employability schemes was considered insignificant due to the p value > 0.05. The necessity of ensuring employee well-being in the workplace and within the community requires policies that are worker-sensitive^[21,29,30]. However, from the Cramer's values, it can be deduced that managers perceive that the current policies are important to ensure the well-being of workers and the public. It is imperative that local employability schemes grow local human resources into competent workers^[32].

Furthermore, managers are more in support of developing policies that enhance students' self-efficacy through encouraging work experiences within their communities^[33]. These strategies, hypothetically, solidify construction companies' human resources bases^[4,32].

Though the strategies' size of significance varies between managers and workers, it is evident that their implementation will benefit both parties and the communities in which they operate. Construction workers in Zimbabwe have focused on fundamental aspects that affect their social security, even beyond their working life. Thus, social security systems are necessary to ensure decent living conditions for workers and include identifying socio-economic vulnerabilities of workers, linking social security and development, and combining agendas of poverty reduction, human development and social integration^[7,8].

CONCLUSIONS

There is consensus that corporate social responsibility strategies are significant for sustaining the well-being of construction workers. The site and project managers identified training staff on the effects and the need for minimisation of consumption of natural resources within their communities as the most significant strategy, which leads to social security of construction workers.

Such training assists the workers in protecting themselves and communities from effects of challenges related to environmental degradation and climate change. This also allows them to inculcate such knowledge for enriching their communities. When closures and retrenchments are imminent, the construction workers perceived that offering outplacement services, retraining and severance benefits are the most significant strategy for assuring social security. The unpredictability of the Zimbabwean construction industry in terms of conditions of contract and availability of work for construction workers supports this strategy. For instance, during periods of unemployment, workers desire the ability to sustain themselves and their dependents. This would also allow them to enhance their skills during times of unemployment.

PRACTICAL IMPLICATIONS

The implication of this study pertains to the need to encourage a deliberate policy shift towards the implementation of corporate social responsibility strategies by construction companies. Prioritising strategies that benefit the workers is important because the majority of workers tend to live below the poverty line.

The continued worrisome state of the Zimbabwean construction sector requires inclusive and well-resourced.

REFERENCES

- [1] Chaneta, I. (2013) "Organisations' social responsibility." *University of Zimbabwe Business Review* 1(1), 55-61.
- [2] Bevan, E.A.M. and Yung, P. (2015) "Implementation of corporate social responsibility in Australian construction SMEs." *Engineering, Construction and Architectural Management* 22(3), 295-311.
- [3] Galbreath, J. (2009) "Building corporate responsibility into strategy." *European Business Review* 21(2), 109-127.
- [4] Masuku, C. and Moyo, P. (2013) "Corporate social responsibility as an invention of public relation: A case of Econet and National Railways of Zimbabwe (NRZ)." *Journal of Media and Communication Studies* 5(8), 113-122.
- [5] Piercy, N. and Rich, N. (2015) "The relationship between lean operations and sustainable operations." *International Journal of Operations and Production Management* 35(2), 282-315.
- [6] Msweli, P. and Wushe, T. (2014) "An analysis of corporate community engagement in Zimbabwe." *Environmental Economics* 5(4), 44-51.
- [7] International Labour Organisation (2018) *Decent work and the sustainable development goals: A guidebook on SDG labour market indicators*. International Labour Office: Geneva. Available at: https://www.ilo.org/WCMS_647109/.
- [8] Ghai, D., Godfrey, M., Hepple, B., Kuruvilla, S. and Saith, A. (2006) "Pedagogical Materials on Decent Work". *International Institute for Labour Studies*, Geneva, Switzerland.

- [9] Baptiste, N.R. (2008) "Line management leadership: Implications for employee well-being." In Clarkson, G.P. (ed.), *Developing Leadership Research, Papers from the Northern Leadership Academy Fellow 2007 Conference*, Leeds University Press Financial Services, Leeds
- [10] Sutherland, J. (2017) "Employee well-being in Britain: Perspectives from the margins of the labour market." *International Journal of Social Economics* 44(12), 2378-2395.
- [11] Doherty, L. (2004) "Work life balance initiatives: Implications for women." *Employee Relations* 26(4), 433-452.
- [12] Despotovic, D., Cvetanovic, S., Nedic, V. and Despotovic, M. (2015) "Economic, social and environmental dimension of sustainable competitiveness of European countries." *Journal of Environmental Planning and Management* 12(2), 100-118.
- [13] Zahid, M. and Ghazali, Z. (2015) "Corporate sustainability practices among Malaysian REITs and property listed companies." *World Journal of Science, Technology and Sustainable Development* 12(2), 100-118.
- [14] International Labour Organisation (1992) "Social security. A workers' education guide". International Labour Office, Geneva. Available at: www.ilo.org/public/libdoc/ilo/1992/92B09_397_engl.pdf
- [15] Anker, R., Chernyshev, I., Egger, P., Mehran, F. and Ritter, J. (2003) "Measuring decent work with statistical indicators." *International Labour Review* 142(2), 147-77.
- [16] Uzhenyu, D. and Marisa, J. (2017) "The challenges of pension benefits facing the construction industry pension fund in Zimbabwe." *Journal of Business Management* 19(11), 91-99.
- [17] Murtagh, B. and Ellis, G. (2010) "The skills agenda and the competencies for managing diversity and space." *The Town Planning Review*, Liverpool University 81(5), 563-583.
- [18] Wyness, L., Jones, P. and Klapper, R. (2015.) "Sustainability: What the entrepreneurship educators think." *Education + Training* 57(8/9), 834-852.
- [19] Iyortsuun, A. S. and Akpusugh, K.T. (2013) "Effective management of life after retirement and its impact on retirees from the public service: A case study of Benue State, Nigeria." *Global Journal of Management and Business Research* 13(5).
- [20] United Nations Environmental Programme (2005) "Environmental Management and Community Participation: Enhancing Local Programmes", *UNEP-IETC Urban Environment Series*. International Environment Technology Centre (IETC)
- [21] Rucker, M.R. (2017) "Workplace wellness strategies for small businesses." *International Journal of Workplace Health Management* 10(1), 55-68.
- [22] Mas-Machuca, M., Berbegal-Mirabent, J. and Alegre, I. (2016) "Work-life balance and its relationship with organizational pride and job satisfaction." *Journal of Managerial Psychology*, 31(2), 586-602.
- [23] Doherty, N. (1998) "The role of outplacement in redundancy management." *Personnel Review* 27(4), 343-353.
- [24] Gribble, L. C. and Miller, P. (2009) "Employees in outplacement services, do they really get the help they need?" *Australian Journal of Career Development* 18(3), 18-28.
- [25] Alewell, D, and Hauff, S. (2013) "Employers' motives behind outplacement activities: A theoretical and empirical investigation." *Personnel Review* 42(4), 466-487.
- [26] Lazar, I., Osoian, C. and Ratiu, P. (2010) "The role of work-life balance practices in order to Improve organizational performance." *European Research Studies* 13(1).
- [27] Deery, M. and Jago, L. (2015) "Revisiting talent management, work-life balance and retention strategies." *International Journal of Contemporary Hospitality Management* 27(3), 453-472.
- [28] Pasamar, S. and Cabrera, V.R, (2013) "Work-life balance under challenging financial and economic conditions." *International Journal of Manpower* 34(8), 961-974.
- [29] Litchfield, P., Cooper, C., Hancock, C. and Watt, P. (2016) "Work and wellbeing in the 21st century." *International Journal Environmental Research and Public Health* 13, 1065 (1-11).
- [30] Le, H., Zheng, C. and Fujimoto, Y. (2016) "Inclusion, organisational justice and employee well-being." *International Journal of Manpower* 37(6), 945-964.
- [31] Worsfold, P. and McCann, C. (2000) "Supervised work experience and sexual harassment." *International Journal of Contemporary Hospitality Management* 12(4), 249-255.
- [32] Verhaar, C.H.A. and Smulders, H.R.M. (1999) "Employability in practice." *Journal of European Industrial Training* 23(6), 268-274.
- [33] Cunnien, K. A., Martin-Rogers, N. and Mortimer, J. T. (2009) "Adolescent work experience and self efficacy." *International Journal of Sociology and Social Policy* 29(3/4), 164-175.
- [34] Leslie, D. (1999) "Quality assurance and student work experience." *Quality Assurance in Education* 7(4), 209-215.
- [35] Babbie, E. and Mouton, J. (2015) *The Practice of Social Research*. South African Edition. Oxford University Press, Cape Town.
- [36] Saunders, M., Lewis, P. and Thornhill, A. (2009) *Research Methods for Business Students*. 2ed. Pearson Education, Essex.
- [37] Baruch, Y. (1999) "Response rate in academic studies - A comparative analysis." *Human Relations* 52(4), 421-438.
- [38] Ghasemi, A. and Zahediasl, S. (2012) "Normality tests for statistical analysis: A guide for non-statisticians". *International Journal of Endocrinology Metabolism* 10(2), 486-489.
- [39] Razali, N. M. and Wah, Y.B. (2011) "Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling Tests." *Journal of Statistical Modelling and Analytics* 2(1), 23-33.
- [40] Kothari, C. R. (2009) *Research Methodology: Methods and Techniques*. 2ed. New Age International Publishers, New Delhi.
- [41] Field, A. 2014. *Discovering statistics using IBM SPSS statistics*. 4th ed. Los Angeles: Sage Publications.
- [42] Naoum, S. G. (2013) *Dissertation Research and Writing for Construction Students*. 3ed. Butterworth-Heinemann, Oxford.
- [43] Blumberg, B., Cooper, D. R. and Schindler, P. S. (2008) *Business Research Methods*. 2ed. McGraw-Hill Higher Education, Berkshire.
- [44] George, D. and Mallery, P. (2003) *SPSS for Windows Step-by-Step: A Simple Guide and Reference*. 11.0 update. 4ed. Allyn and Bacon, Boston.

A MIXED METHOD STUDY ON SOCIAL SUSTAINABILITY CONSIDERATION BY PUBLIC SECTOR ORGANIZATIONS DURING INFRASTRUCTURE PROCUREMENT

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ABSTRACT PURPOSE

Although adequate consideration is being accorded to economic and environmental aspects of sustainable development (SD) during infrastructure procurement, the opposite seems to be the case with social sustainability aspects (SSA). This study elicits the perspectives of procurement officials working in public sector infrastructure client organizations (ICOs) as it concerns the factors influencing the incorporation of SSA during infrastructure procurement.

RESEARCH METHOD

A mixed method research design was adopted. Qualitative data was sourced from purposively selected interviewees whilst quantitative data were obtained from respondents within selected ICOs. Qualitative data were analysed thematically and, descriptive statistics was deployed in the analysis of the quantitative data.

FINDINGS

Results indicate a lack of awareness and a knowledge gap concerning social sustainability aspects. Furthermore, the results highlight the influence of the levels of understanding within the ICOs on the degree of incorporation of SSA aspects during infrastructure procurement.

It is expected that these findings will contribute to the development of awareness and, subsequent incorporation of SSA by relevant stakeholders during infrastructure procurement in the Free State Province.

VALUE FOR AUTHORS

The findings reveal how procurement personnel of infrastructure client organizations view the concept of sustainability and factors, which influence the approach of various infrastructure client organizations in engaging with the incorporation of SSA during the procurement processes of the infrastructure projects.

KEYWORDS

Procurement, sustainable infrastructure development, procurement methods, public procurement, social sustainability aspects

1. INTRODUCTION

The construction industry plays a salient role in sustainable infrastructure delivery. It contributes towards the economic development especially through the delivery of infrastructure projects. Despite this contribution, the industry has been noted to negate the pursuit of sustainability during infrastructure development. The concept of sustainability is seen as a most crucial and yet, most misunderstood topic among construction industry professionals. The Brundtland report's definition remains widely accepted among a plethora of definitions of sustainable development. According to the report, sustainability can be defined as "meeting the needs of the present without compromising the ability of future generations to meet their needs"¹. This definition provides a shift from the ecological aspect of sustainability and explores the social and economic aspects of sustainability, thereby trying to achieve a balance between the three dimensions².

Sustainability-oriented practices have been adopted within the South African context since the Agenda 21³ era. According to the National Development Plan (NDP)⁴ it is stated that, for South Africa to achieve a sustainable economic growth by 2030, it needs to prioritize its economic infrastructure. It is evident that most organizations within the country are driving their operations towards sustainability. Therefore, expectations are rife that considering the multiplicity of emerging innovative practices in the contemporary construction industry, projects will be delivered in a more sustainable manner thereby facilitating to sustainable societies. It is important to take advantage of extant policies and procurement strategies in developing and developed countries to boost the incorporation of sustainable development-related practices during the infrastructure delivery in a manner that contributes towards the resolution of societal challenges⁵. One of the biggest problems still facing South Africa is poverty eradication. Undoubtedly, effective incorporation of SD aspects will contribute towards reducing the burgeoning poverty and unemployment rates. However, the attainment of effective SD incorporation remains a mirage in most ICOs as more emphasis is being placed on environmental and economic aspects whilst SSA is seemingly neglected. This observation has culminated in the conduct of this study.

2. LITERATURE REVIEW

2.1. SUSTAINABLE INFRASTRUCTURE

Infrastructure delivery is seen as a driver for the economic growth. It also serves as a platform for the delivery of basic services such as health, education, sanitation, transportation, communication, electricity and clean water amongst others. Nevertheless, public infrastructure delivery is challenged by poor planning, cost overruns, poor quality of work done and project failure. The mandate of government is to deliver services effectively and efficiently, as there are systems, tools and guidelines in place for infrastructure delivery²⁰. The tools seem inadequate in making provisions for incorporating sustainability aspects to benefit the end users. Berry and McCarthy²¹ opine that procurement of these infrastructure projects should generate benefits not only to the organization but also ensure that the procurement processes consider the natural environment and how people move around, work and play, thereby shaping the advent of sustainable communities. Generally, the construction industry's approach to construction will influence the sustainability outcome of the infrastructure project and affect the ability of the end users to engage in sustainable livelihoods. Byrne and Glover⁶ reiterate the need to engage with the concept of sustainability in a holistic and integrated manner. They maintain the need for the three dominant dimensions of sustainability to be implemented in a manner that allows for trade-offs, based on the situational or contextual peculiarities. In the case of public procurement of infrastructure, the background and nature of sustainability can be two-dimensional, giving insight as to how procurement staff and the end users perceive and understanding the concept of sustainability throughout the delivery of infrastructure projects⁷.

The Treasury Department⁸ defines the infrastructure as fixed assets that are products of construction operations including:

- Buildings, structures as well as facilities,
- Water supply, sanitation, electricity supply, transportation and storm water drainage systems, and;
- The permanent fixated items that cannot be economically removed or that may be re-used.

The UNDP⁹ described the process of buying sustainably as comprising of the procurement of goods and services that have minimal impact on the environment, with the greatest economic value and having a positive impact on beneficiary communities. They have termed this concept, sustainable procurement. Considering the many benefits associated with sustainable procurement, there is a huge shift towards understanding and implementing sustainable infrastructure procurement in public sector ICOs, especially within South Africa.

2.2. Benefits of incorporating sustainable development principles in the infrastructure life cycle

SD involves the process of understanding the aims of environmental management, social responsibility and economic solutions by changing societal thinking¹⁰. Therefore, it is evident that one dimension cannot work without the other as a balance should always be struck between these dimensions. This view is encapsulated in the triple bottom line (TBL) praxis. However, this appears not to be the case. Brammer and Walker¹¹ highlights that, public sector organizations tend to consider some sustainability dimensions in their procurement whilst neglecting others. The TBL expresses that there should be a constant balance between the three dimensions whenever sustainability incorporation is concerned.

Traditionally, in the public sector, government system processes have been in use to procure the infrastructure projects, but concerns remain that even though infrastructure development boosts the economy, its negative effect on the environment led to a disruption of social ecosystems. Where scholars have done their research through document reviews, they have noticed that most construction projects have conducted environmental and economic impact analysis during the planning phase in order to mitigate the potential adverse effect that such development may have on the environment. This should be the case with the social sustainability aspect as well¹³.

2.3. Identification of SSA during the procurement of infrastructure projects

For effective implementation of sustainable infrastructure procurement and delivery, it is important to identify possible ways in which aspects of sustainability can be considered. It has been noted that during the pre-construction phase of the infrastructure project remains the most convenient phase to incorporate the social sustainability aspects¹⁴. Sustainable performance of infrastructure projects can be assessed by using key assessment indicators, which are able to gauge optimal performance during every stage in the project life cycle¹³. The consideration of SSA can have a significant impact

during the construction of the project as well as when the project has been delivered. During the consultation with the community members, the ICO is able to appraise the impact of infrastructure projects on the community through the responses obtained from members¹⁴.

To achieve sustainability outcomes during infrastructure procurement, social sustainability considerations cannot be the only aspects to be included to achieve a truly sustainable project. The impact of the project on the surrounding community, the project's impact on the environment, health & safety, and training and education of the labourers, need to be taken into consideration. When all these considerations are integrated across the project's life cycle, the sustainability performance of the project as well as the quality of life of the end users will be improved¹⁵. The fundamental principles of procurement have been described by Raymond¹⁶ as 1. Value for money, 2. Ethics 3. Competition 4. Transparency and Accountability. The practitioners must facilitate the processes from the inception up to the monitoring and evaluation of the infrastructure project and through these processes, they have to consider the culture and the ethical background of other stakeholders that are linked or benefitting to the project whilst abiding by the fundamental principles of procurement. Although there are many noticeable benefits associated with the attainment of sustainable infrastructure, the processes towards reaching that goal seems easily achievable. However, in practice, procurement practitioners are facing challenges in implementing identified social sustainability aspects during project delivery¹⁷.

2.3.1. Barriers to SSA incorporation

The introduction of new procurement practices in developing countries has been in line with the formulation of regulatory and legal frameworks that advocates transparency and accountability. The adoption of the new procurement practices could serve as a hindrance to the incorporation of SSA¹⁷. For instance, a study, which was conducted by Serpell, Kort and Vera¹⁸, revealed that most construction projects in Chile began without other stakeholder's integration and thereby making it impossible for the incorporation of sustainability aspects. Poor stakeholder integration acted as a barrier to the incorporation of the SSA. According to Ahsan, Ho and Khan¹⁹, it was observed that projects managers recruited for construction projects have mostly technical knowledge, skills and abilities (KSA) whilst lacking soft skills required for the successful incorporation of SSA in their projects. This challenge alongside the lack of knowledge serves as barriers to incorporation of SSA within the South African public sector ICO context.

2.3.2. Drivers for SSA incorporation

Government procurement relies on the guidelines enforced by the CIDB²⁰ and therefore for every procurement of goods and services, these guidelines has to be followed and adhered to. All the selected PSO's for this study complies with these CIDB guidelines. There are more social aspects that can be added according to the guidelines for procurement. The sustainable practices encompasses all the dimensions of sustainability always relay the importance of the preferential procurement guidelines to be followed when procuring for goods and services within government. These guidelines are already addressing other socio-economic issues. The Treasury Department⁸ enforces the need to adopt sustainable practices during the procurement of goods and services especially at the early stages of the project. The general behaviour of personnel is that they tend to overlook anything that is not mandatory and not binding on them. Therefore, government has emphasized the importance of sustainable practices and the utility thereof of its implementation to engender compliance.

Considerable effort is required for raising awareness regarding sustainability as a concept and as well as the sustainable processes through infrastructure development. This leads to increased compliance by relevant stakeholders with updated legislated frameworks. In order to avoid the misapplication of the procurement procedures, rules and regulations, government should make sure personnel is well equipped with the current practice notes as updated at the department of treasury. When organisations implement sustainable practice, it helps in improving the understanding and awareness of the concept of sustainability²¹. The personnel's knowledge and show of willingness to learn about the concept is positive to leverage upon the concept of sustainability and not wait for government to provide training and workshops. They should show the willingness to develop themselves for future projects. More training and workshops offered by government was to make procurement personnel aware of the policies and proposed framework to enhance the effectiveness of the processes under Supply Chain Management, including procurement. During training, procurement personnel is made aware if there are changes in the policies regarding the procurement procedures.

Little is said on what social sustainability aspects to consider during the procurement of the infrastructure. Although some of the SSA are embedded in the general policies of procurement, some of the procurement staff are not aware that they are SSA and also not aware of the benefits associated with the incorporation of these aspects especially at the procurement phase of the project life cycle. The procurement staff become only limited to

policies like Historically Disadvantaged Individuals (HDI), Broad-Based Black Economic Empowerment (BBBEE) redressing the socio-economic challenges faced by the communities and not addressing sustainability agenda.

3. RESEARCH METHOD

A sequential mixed method research design was adopted for this study. This design is used to explore and understand a phenomenon, make up themes from the data collected, design an instrument and test it²⁶. In order to successfully explore the factors influencing the incorporation of SSA during the procurement of public sector infrastructure in the Free State, South Africa, the study will be structured into three different facets; firstly to elicit the ICO's views on their understanding in their own context, as well as an identification of the aspects that they incorporate during project procurement. Secondly, to test the information emanating from this exercise to determine the order of priority accorded to the identified aspects.

Finally, the researcher expects to revert to these individuals in the form of semi-structured interviews to gain an insight into the rationale for the ranking of these aspects as deciphered from the second stage of the study.

3.1. Data Collection Procedure

Two different set of questions were asked to the chosen sample at two different intervals using two different techniques. The first phase of the data collection, interviews were conducted to elicit the level of knowledge of the interviewees concerning SSA and its subsequent incorporation during the procurement of infrastructure. This phase facilitated the identification of SSA as applicable within the FS context and national as well. The identification of the factors influencing the prioritization of these identified SSA during the procurement phases were also obtained from the interviews. The latter phase involved the use of questionnaires to assess the factors identified in the former stage. Efforts were made to use the questionnaires to rank the identified SSA in order of prominence during procurement. In addition, this data collection technique enabled the assessment of the factors influencing the prioritization of certain SS aspects above others.

Five (5) case studies of public sector organizations were identified. The first set of questions were administered to the staff appointed to serve on the procurement adjudication committees within the PSOs. After the identification of the SSA, the questionnaires were administered back to the PSOs to rank the identified SSA in order of their priority. The analysis for this study is based on interviews conducted and the questionnaires distributed

per ICO. Not all the members of the adjudication committee participated in the interviews when requested. Therefore, the questionnaires distributed further to the supporting staff working within the SCM section of the same ICO. The questionnaires were sent out after the interview stage to quantify which social sustainability aspects were identified prioritized and which of those that are prioritized are influenced by the given factors. This data collection technique enabled the assessment of the factors influencing the prioritization of certain SS aspects above others.

3.1.1 Interviews

The questions for the interviews were open-ended questions and aligned with the objectives of this research. The interview questions tested how well the respondents understood and were aware of the concept of sustainability and sustainable development. The researcher's questions were structured in such a way that the respondents elaborate more on sustainable dimensions, especially on social sustainability aspects, how, when and to what extent do they consider these aspects based on the societal needs. The interview questions tried to find out what factors influences the choice and prioritization of certain social sustainability aspects. The outcome of the interview process further highlighted which of those aspects they consider most when they procure the infrastructure projects.

The interview questions sought to find answers to the objectives of the research and the questions were themed as follows:

1. Level of understanding and knowledge of the concept of social sustainability
2. Identification of aspects of the social sustainability dimensions considered during the procurement of public-sector infrastructure in Free State
3. Assessment of the aspects identified in (2)
4. Factors influencing the prioritization of these aspects as provided in (3) above.

3.1.2 Questionnaires

The questionnaires were distributed to different ICO's in the Free State. The questionnaires comprised of two sections. The first section of the questionnaires outlined the demographics of the respondents from the adjudication committee. The idea of the demographics section described the position that the respondents occupied, how long have they occupied it. The second section was to answer the research questions. The section was broken down into three questions, which explored the ICO staff's perception of what sustainability is, which social sustainability aspects are identified and considered to be integrated during the procurement process, which of those aspects are prioritized and finally what factors influences the prioritization of these aspects.

4. DATA ANALYSIS

4.1 THEMATIC ANALYSIS

4.1.1 Understanding and Knowledge of the Concept of Sustainability and Social Sustainability Dimension

The findings from the interviews across the cases revealed that the staff were knowledgeable about the concept of sustainability. They attributed the level of awareness to the workshops, which had been given to all government staff to achieve the national mandate of the public sector: the provision of basic needs and services to the people. This mandate cascades from the national government, through provincial down to local government. Sustainability and Sustainable Development have been mentioned in the attainment of sustainable infrastructure delivery. It is also mentioned in the national documents like policy guides, regulations and integrated development plans and other strategic plans replete within the public sector. In these policy documents, supply chain management policies and treasury regulations explain how best procurement officials when procuring goods and services in their respective organizations can adopt practices. Throughout the cases, there is a general understanding of the concept of sustainability and sustainable development as the respondents across all the cases have confirmed that workshops and training had been conducted for them. They also affirmed that they had been urged to implement sustainability-oriented practices in the services that they offer²². Although sustainability-oriented practices are mentioned in the policy documents, it is not clear how and when the implementation of these practices should take place during the procurement phase.

“Sustainability has become a policy issue, and therefore requires a better understanding,” said one of the respondents who has worked for over 11 years at ICO (DOH)

Although there have been different levels of understanding about sustainability, the interpretation of the concept has been well understood from the workshops conducted. The implementation of the related concepts of sustainability and sustainable development can be realized by following the existing systems in place like the treasury regulations, the supply chain management practices, the IDP and the SDF as well as any specialised programmes from the national office⁸.

4.1.2 Identification of Social Sustainability Aspects

From what they have understood about the concept of sustainability and sustainable development, most interviewees across the ICOs could relate to the community as a greater part of social sustainability. Because the ICOs are under the national government, there are policies already in place to make sure of the integration of the social sustainability aspects, one of these policies is Preferential Procurement Policy Framework, of which its aim is to advance the development of small, macro and medium enterprises (SMME's) and historically disadvantaged individual (HDI), promoting women and the physically challenged and creating employment amongst others. Procurement also realises supply chain management (SCM) policy, and other practices notes as clearly indicated in the guidelines for procurement²⁰ that is updated by treasury department and this includes HDI. Although there are SSA that can be observed through these policies, it can be suggested that SSA are not fully explored as these policies are trying to address the socio-economic challenges of the past government only and not give emphasis to SSA such as community engagement, upskilling of the community members to be employed and contribution to local economic development. Through community engagement, the procurement staff indicated other related aspects such as open communication about the infrastructure projects with the stakeholders¹⁵ and Burdge¹⁴ highlights this aspect of community engagement and reiterate that once it is considered, it can be monitored, and its impact measured.

4.1.3 Prioritisation of Social Sustainability Aspects

The interviewees reviewed their day-to-day activities and the procedures they have to follow when adjudicating for a tender award. Most of the committee members approve what has been agreed upon from the demand or planning

phase of the project. The set social sustainability aspects as per procurement policies are considered during the planning phase and, the adjudicating committee has to approve these, subject to the set specifications of the project. The prioritization of social sustainability aspects is driven by the adherence to the policies, following the practice notes according to the supply chain management policies. “It is imperative that we adhere to the SCM policies and treasury regulations set for procurement of projects”, said one of the directors from the ICO (PMM).

Not only can the stakeholders who are involved with planning, developing and designing the project and local community members use policies to prioritize the social sustainability aspects but also to monitor and engender effective measurement. One of the reasons for prioritising certain social sustainable aspects can be related to the set criteria on the specifications of the infrastructure project during the planning phase⁸. The specification can include that, during the construction of the project, that local labourers be trained and employed by the contractor who will be awarded a tender. Other specifications included that the contractor must use local suppliers when procuring construction materials. If a set of criteria is used at the planning phase of the project, then the criteria can be used as a tool to broaden the specification to consider more SSA.

4.1.4 Factors influencing the prioritisation of these Sustainability Aspects

The systems in place provide for an effective running of these organisations and therefore it is important that if social sustainability aspects are to be integrated in such processes for the greater sustainable outcome of the project, the factors influencing the choice for the particular project should be established at the outset.

Because of the need to comply with set policies, there are specialized or prioritised programmes from the national government office of the public sector that are ideally set out for empowering the youth, gender equity as well as to curb the unemployment rate in the communities. These can be seen in document such as IDP's and Strategic Plans. The policies influencing the prioritisation of SSA include the National Youth Plan 2020, which encourages youth innovation, entrepreneurship development and skills development; these policies can be implemented during the design phase of the infrastructure project. These policies are regarded as factors for enabling social sustainability aspects to be considered.

These aspects are seen as a need for the community for sustainability outcomes²³.

4.2 Descriptive Analysis

Information from the questionnaire is summarised by using descriptive analysis. The descriptive data were analysed using the mean calculation and standard deviation. The statistical information was summarised using the ANOVA table. A one-way analysis of variance (ANOVA) is used to compare more than two groups. For the purpose of this study, only five highest-ranking variables were used for each theme and will be used for the reporting and analysis of the results.

In the table below, 5(five) ICO's were compared based on the calculation from their variables using the mean and standard deviation to see which one had the highest mean amongst the others. The highest mean among the others meant that the ranking of the variable was high.

Table 1: Mean and Standard Deviation values from ICO's- ANOVA table

Variables	DOH	DOE	PW	DOT	PMM
Key concepts of Sustainability & sustainable developments	44.23 ± 9.001 ^a	47.25 ± 5.396 ^a	42.50 ± 6.681 ^a	44.33 ± 5.297 ^a	44.54 ± 4.737 ^a
Consideration of Social Sustainability Aspects	76.77 ± 3.468 ^a	75.42 ± 5.664 ^a	72.58 ± 7.489 ^a	73.83 ± 5.458 ^a	73.31 ± 4.906 ^a
Factors influencing prioritization of social sustainability aspects	27.77 ± 0.927 ^a	28.25 ± 1.658 ^a	27.67 ± 1.497 ^a	27.58 ± 2.234 ^a	27.69 ± 1.888 ^a

4.2.1 The level of understanding and the respondents' perception on key concepts of sustainability and sustainable development

Table 2 reports the information of the number of respondents (N) for the DOE ICO, only five (5) variables out of thirty (30) that has been ranked highest (in this case 1st) to the lowest, (in this case 5th), the mean and the standard deviation.

Table 2: Key concepts of sustainability and sustainable development for DOE

Variables	N	Mean	Std. Dev.	Rank
Equitable provision of basic needs	12	2	0	1
Best practices	12	2	0	1
Research and Development	12	1.92	0.289	3
Training workshops on sustainable project alignment with government basic needs	12	1.92	0.289	3
Enforcement of sustainable practices	12	1.83	0.577	5

Table 2 shows the results of the variables that were highly ranked which represented their level of understanding on sustainability. From the information given on the questionnaire, these top five variables are interrelated to how they understand the concept of sustainability. The results reveal that 'Equitable provision of basic needs' and 'sustainability and sustainable development mean best practices' were ranked first with a mean score of 2.00 and (SD) = 0.00 each. 'Research and Development' and 'Training workshops on sustainable project alignment' were ranked third with a mean score of 1.92 and (SD) = 0.289 each. 'Enforcement of sustainable practices' was ranked fifth with a mean score of 1.83 and (SD) = 0.577.

Table 3: Excerpt from the ANOVA table

Variables	DOH	DOE	PW	DOT	PMM
Key concepts of Sustainability & sustainable development	44.23 ± 9.001 ^a	47.25 ± 5.396 ^a	42.50 ± 6.681 ^a	44.33 ± 5.297 ^a	44.54 ± 4.737 ^a

Table 3 shows calculations of the overall mean and standard deviation of all the ICO's rating their level of understanding and the respondents' perception on key concepts of sustainability and sustainable development. The results from this table reveal DOE ranked highest with a mean score of 47.25 and (SD) = 5.396. The respondents from this ICO (DOE) seem to be well engaged in the procurement practices as "best practices" ranked first, they show the highest level of understanding of sustainability amongst the other ICO's. Not only are they aware and understand this concept, but it means that they the respondents have enabling platform that can allow them to integrate any sustainability aspect they can be aware of and related to the procurement of the infrastructure delivery.

4.2.2 The extent of identification and consideration of social sustainability aspects

Table 4 reports the information of the number of respondents (N) for the DOH ICO, only five (5) variables out of seventeen (17) that has been ranked highest (in this case 1st) to the lowest, (in this case 5th), the mean and the standard deviation.

The results reveals that 'Community Engagement' is ranked first with a mean score of 5.00 and (SD) = 0.000. 'Training and skills development' and 'Empowerment and Participation' were ranked second with a mean score of 4.92 and (SD) = 0.289. 'Employment of the affected stakeholders' ranked fourth with a mean score of 4.67 and (SD) = 0.492. 'Gender Balance' ranked fifth with a mean score of 4.58 and (SD) = 0.515.

Variables	N	Mean	Std. Deviation	Rank
Community Engagement	12	5	0	1
Training and skills development	12	4.92	0.289	2
Empowerment and Participation	12	4.92	0.289	2
Employment of the affected stakeholders	12	4.67	0.492	4
Gender Balance	12	4.58	0.515	5

Variables	DOH	DOE	PW	DOT	PMM
Consideration of Social Sustainability Aspects	76.77 ± 3.468 ^a	75.42 ± 5.664 ^a	72.58 ± 7.489 ^a	73.83 ± 5.458 ^a	73.31 ± 4.906 ^a

Table 5 shows calculations of the overall mean and standard deviation of all the ICO's rating on the extent of identification and consideration of social sustainability aspects. The results from this table reveal DOH ranked highest with a mean score of 76.77 and (SD) = 3.468. Although the respondents from this ICO (DOH) scored slightly lower with understanding the concept of sustainability, they were able to identify aspects relating to social sustainability more because they continually engage with the community and enforcing the employment of the local community for their infrastructure projects.

4.2.3 The degree to which some selected factors influence the prioritization of the aspects of sustainability

Table 6 below reports the information of the number of respondents (N) for the DOE ICO, only five (5) variables out of six (6) that has been ranked highest (in this case 1st) to the lowest, (in this case 5th), the mean and the standard deviation.

Table 6: Factors influencing the prioritization of Social Sustainability Aspects.

Variables	N	Mean	Std. Dev.	Rank
Treasury Regulations	12	5.00	.000	1
Prioritized Community projects	12	4.92	.289	2
Alignment with IDP and SDF	12	4.67	.492	3
Supply Chain Management Policies	12	4.67	.492	3
Specialized programmes	12	4.58	.515	5

Table 6 shows the results of the variables that were highly ranked which represented the factors influencing the prioritization of Social Sustainability Aspects. All the variables were ranked with accordance with the policies and strategic documents the ICO has to align itself with procurement procedures set by national organization. All the activities in all the supply chain management sections including procurement are guided by treasury regulations and SCM guidelines. The results reveals that 'Treasury Regulations' was ranked first with a mean score of 5.00 and (SD) = 0.000. 'Prioritized Community projects' ranked second with a mean score of 4.92 and (SD) = 0.289. 'Alignment with IDP and SDF' and 'Supply Chain Management Policies' were ranked third with a mean score of 4.67 and (SD) = 0.492. 'Specialized programmes' ranked fifth with a mean score of 4.58 and (SD) = 0.515.

Table 7: Degree to which some selected factors influence the prioritization of the aspects of sustainability

Variables	DOH	DOE	PW	DOT	PMM
Factors influencing prioritization of social sustainability aspects	27.77 ± 0.927 ^a	28.25 ± 1.658 ^a	27.67 ± 1.497 ^a	27.58 ± 2.234 ^a	27.69 ± 1.888 ^a

The table above shows calculations of the overall mean and standard deviation of all the ICO's, rating on the degree to which some selected factors influence the prioritization of the aspects of sustainability. The results from this table reveal DOE ranked highest with a mean score of 28.25 and (SD) = 1.658. Although the respondents from this ICO (DOE) scored slightly lower with the identification of social sustainability aspects, but higher with adhering to the set policies and guidelines set for procurement activities. Government policies in place are the ones that drive the implementation of public infrastructure projects. These might be projects that are identified specifically for an area within the community to solve an existing challenge in that area. Factors driving these procurement processes include treasury regulations, labour regulations, and adherence to health and safety regulations in line with supply chain management practices.

5. DISCUSSION OF FINDINGS

5.1 The Understanding and Knowledge of Sustainability and Social Sustainability Dimensions

Findings reveal that the staff are aware and knowledgeable of the concept of sustainability and have learnt other dimensions of sustainability by mentioning other aspects related to it. Through training and workshops offered to the procurement staff from the national office, some of the staff were able to understand the notion behind it and to explore the different dimensions of sustainability. This was because some of the management staff were working directly with the national office and had to do reports that had to include sustainability report in their final reporting. The challenge is that managers are reporting little about anything relating to activities or processes that are related to sustainability because of the lack of methods or tools to help in integrating sustainability aspects in their work activities as well as having a checklist or a scorecard were they can assess sustainability in their procurement processes. The aim of the workshops and training was to teach them and make them aware, but not necessarily be able to integrate them in their procurement process. Although there have been different levels of understanding about sustainability, the interpretation of the sustainability concept is well understood from the workshops conducted and implementing the related concepts of sustainability and sustainable development by following the existing treasury regulations, the SCM practices, the IDP and the SDF⁸.

5.2 Identification of Social Sustainability Aspects

From what they have understood about the concept of sustainability and sustainable development, most of the respondents across the ICO's could relate to the community as a greater part of social sustainability. Because the ICO's are under the national government, there are policies that recognizes the social sustainability aspects. SCM policy, the PPPFA, and other practices notes as clearly indicated in the guidelines for procurement²⁰. Some of the procurement staff find it difficult to recognize these SSA, as they only know them as policies that have to adhere to and not necessarily, that other SSA can be supplementary to them. Because they were never trained to look for other aspects other than those that appear in the policies, they become restricted into using those only. One aspect that was related from community engagement was open communication about the infrastructure projects with the stakeholders. Valdes-Vasquez and Klotz¹⁵ and Burdge¹⁴ highlights this aspect of community engagement and that once considered, it can be monitored, and its impact can be measured. McKenzie²⁵ buttresses this

notion when he identified social sustainability indicators of communities that are able to define their own activities, interests and social aspects.

5.3 Prioritisation of Social Sustainability Aspects

The respondents related their day-to-day activities and the procedures they have to follow when in different committees for a tender award. The prioritization of the social sustainability aspects is driven by the adherence to the policies, following the practice notes according to the supply chain management policies. In the committees the staff makes sure that, all their decisions and relevant policies are considered and adhered to, before an award can be tendered. Through these committees, one can take an advantage of using a score card to check if the staff has included all the SSA that are needed to be considered for a particular project. It is also emphasized that one of the reasons for prioritizing certain social sustainable aspects can be related to the set criteria on the specifications of the infrastructure project during the planning phase⁸. The specification can include that, during the construction of the project, the local labourers be trained and employed by the successful contractor to do the project. Whereas other specifications can include that, the contractor must use local suppliers when procuring construction materials. The procurement staff can leverage on using early stages of project lifecycle for incorporating SSA.

5.4 Factors influencing the prioritisation of these aspects

Any public procurement process has to align itself with regulations and guidelines of supply chain management. These are of great influence to the processes the procurement staff need to consider during the procurement of infrastructure projects. There are projects already identified for solving specific problems in an area, and these prioritized projects are already planned and budgeted for at the national office. These projects are placed in the five-year plan for Integrated Development Plan of a local government. These kinds of projects will precede the ones not in the IDP. Adhering to policies only during procurement, can also limit consideration of other aspects that are closely related to the policies but of different dimensions of sustainability. Procurement staff can opt to have a sustainable procurement approach that will see to it that it assesses and monitors any sustainability aspects that needs to be in the planning of a project. Specialized programmes would encourage more social sustainability aspects to be considered in the process of procuring them. These social sustainability aspects can be seen as a need for the community which when explained by Lee and Chan²³, are seen as indicators for social sustainability aspect.

6. CONCLUSION AND FURTHER RESEARCH

The objective of the study was to look at how the procurement staff perceive the social sustainability aspects embedded during the procurement of infrastructure project. The study was able to explore the perceptions of the ICO's about sustainability and sustainable development. The literature explored the different definitions of the concept of sustainability and sustainable development, the dimensions of sustainability with a focus on social sustainability. It also explored the different drivers and barriers of considering social sustainability aspects during the procurement of infrastructure delivery. Despite the extensive definitions from the literature, there is still a knowledge gap of understanding and identifying these aspects amongst the ICO's across all cases, as there are limitations to the identification of the SSA. Treasury regulations and policies govern public procurements and are directing the staff on how and what to consider during the process of procurement.

There are vast SSA to consider during the planning phase of a project and if the procurement staff are not given the platform to explore ways to enable them to consider SSA and be able to assess and monitor them, they will be limited to the policies and guidelines only. The drivers of considering the social sustainability aspects might not be motivating enough to enhance the level of commitment to sustainable practices. There is a huge opportunity to integrate SSA during the early phases of the project, especially where staff are enablers of accelerating this move. The procurement staff need to adopt and deploy a proper approach for considering the incorporation of all the sustainability aspects and be able to know what to consider as an aspect of each of the three dimensions. Top management also need to enhance their top-bottom communication and education, about the sustainability agenda and the level of impact it can make on the processes of procurement and to the stakeholders of the project. Sustainable procurement is a cross function concept and therefore the staff needs to be innovative, engaged and informed in sustainability matters.

1. REFERENCES

- [1] WCED, (1987). World commission on environment and development, Our common future. 17, pp. 1-91.
- [2] Dimitriou, H. T.; Harman, R.; Ward, E. J. (2010). Incorporating Principles of Sustainable Development within the Design and Delivery of Major Projects: An International study with particular reference to major infrastructure projects, Report prepared for the Institution of Civil Engineering and Actuarial Profession as part of the OMEGA-RAMP Study, OMEGA, pp. 3.
- [3] Sitarz, D. (1993). Agenda 21: The earth summit strategy to save our planet.
- [4] National Planning Commission (2013). National Development Plan Vision 2030.
- [5] Plooy, M. D. (2018). Rethinking the value of Infrastructure in South Africa.
- [6] Brammer, S.; Walker, H. (2011). Sustainable procurement in the Public sector: An International comparative study, International Journal of Operations & Production Management. 31, pp. 452-476.
- [7] Shen, L.-Y.; Hao, J. L.; Tam, V. W.-Y.; Yao, H. A (2007). Checklist for Assessing Sustainability Performance of Construction Projects, Journal of Civil Engineering and Management. XIII, pp. 273-281.
- [8] The Treasury (2012). Infrastructure Delivery Standard Management System
- [9] United Nations Development (2007). Fighting climate change: Human solidarity in a divided world: Springer.
- [10] Yılmaz, M.; Bakış, A. (2015). Sustainability in Construction Sector, Procedia - Social and Behavioral Sciences. 195, pp. 2253-2262.
- [11] Brammer, S.; Walker, H. (2011). Sustainable procurement in the public sector: An international comparative study, International Journal of Operations & Production Management. 2011, 31, pp. 452-476.
- [12] The Brundtland Commission (1987). Our common future: the brundtland commission: Oxford University Press.

- [13] Shen, L.; Wu, Y.; Zhang, X. (2011). Key Assessment Indicators for the Sustainability of Infrastructure Projects, J Constr Eng Manage. 137, pp. 441-451.
- [14] Burdge, R. J. (2004) The concepts, process, and methods of social impact assessment: Social Ecology Press.
- [15] Valdes-Vasquez, R.; Klotz, L. E. (2013). Social Sustainability Considerations during Planning and Design: Framework of Processes for Construction projects, J Constr Eng Manage. 139, pp. 1.
- [16] Raymond, J. (2008) Benchmarking in public procurement, Benchmarking: An International Journal. 15, pp. 782-793.
- [17] Munyasya, B.; Chileshe, N. (2018). Towards Sustainable Infrastructure Development: Drivers, Barriers, Strategies, and Coping Mechanisms, Sustainability. pp. 10.
- [18] Serpell, A.; Kort, J.; Vera, S. (2013). Awareness, Actions, Drivers and Barriers of Sustainable Construction in Chile, Technological and Economic Development of Economy. 19, pp. 272-288.
- [19] Ahsan, K.; Ho, M.; Khan, S. (2013). Recruiting Project Managers: A Comparative Analysis of Competencies and Recruitment Signals from Job Advertisements, Project Management Journal. 44, pp. 36-54.
- [20] CIDB Construction Procurement, (2007). Pretoria.
- [21] Berry, C. (2011). The Sustainable Procurement Guide - Procuring Sustainably using BS 8903, LONDON: British Standards Institution.
- [22] Karani, P.; Jewasikiewitz, S. M. (2007). Waste management and sustainable development in South Africa, Environ Dev Sustainability. 9, pp. 163-185.
- [23] Lee, G. K. L.; Chan, E. H. W. (2008). A sustainability evaluation of government-led urban renewal projects, Facilities. 26, pp. 526-541.
- [24] Municipal Systems Act 32 Of 2000. The Republic of South Africa
- [25] McKenzie, S. (2004). Social Sustainability: Towards some definitions., Australia: University of Australia, Adelaide.
- [26] Creswell, J. W.; Fetters, M. D.; Ivankova, N. V. (2004). Designing a mixed methods study in primary care, The Annals of Family Medicine. 2, pp. 7-12.

Cognitive Loading and Schema Development due to Complex Questions in Students of Construction Programmes

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ABSTRACT

PURPOSE OF THE PAPER:

The research aimed to assess the extent of cognitive loading and schema development which can be attributed to complex questions. The research also assessed whether cognitive loading mediates the relationship between complex questions and schema construction.

DESIGN:

A self-administered questionnaire survey was used to collect data from a purposively selected sample of university students.

The students were drawn from three public universities in South Africa studying towards undergraduate degrees in construction studies. The data were analysed using structural equation modelling.

VALUE:

The findings inform both literature and education practice about the effect of complex questions on cognitive load and schema development.

KEYWORDS:

Cognitive Load, Complex Questions, Schema Construction, Construction Education

1. INTRODUCTION

Research evidence from cognitive science shows that when complex questions are administered to students who have little prior subject knowledge, the complex questions lead to high levels of cognitive load [e.g. 1,2,3]. Research evidence also shows that when students are exposed to high levels of cognitive load, their ability to learn effectively is hampered [1,2,3]. Conversely, it follows that administering complex questions to students with little subject prior knowledge will hamper effective learning. However, there are no empirical studies which show evidence that complex questions impeded learning.

Also, considering that complex questions are criticised for not attaining sufficient levels of learning or schema construction and also lead to high levels of cognitive load and since high levels of cognitive load impeded learning, it is very probable that cognitive load mediates the relationship between complex questions and schema construction. Therefore, this study sought to provide empirical evidence that complex questions impeded learning and also assess whether cognitive load mediates the relationship between complex questions and schema construction. The study also assessed the relationships between complex questions and cognitive load and between cognitive load and schema construction which are already fairly well reported in literature but are conceptualised and operationalised differently in this study.

The resulting conceptual model for the research is shown in Figure 1.

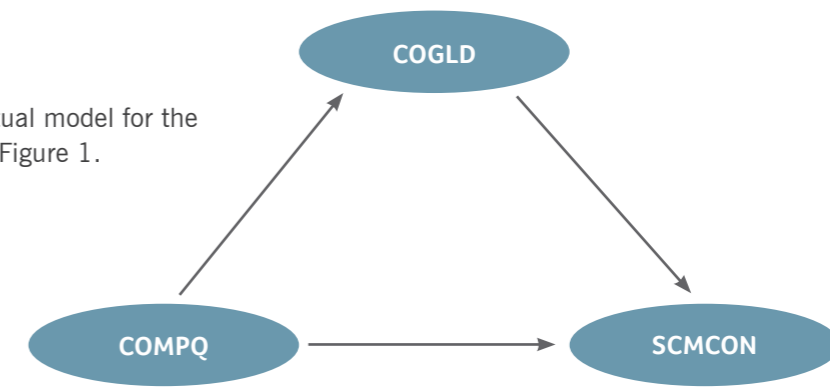


Figure 1: Conceptual Model of the Mediating Role of Cognitive Loading on the Relationship between Complex Questions and Schema Construction

Legend: COMPQ = Complex Questions; COGLD = Cognitive Load; SCMCON = Schema Construction

Research on whether or how complex questions impede learning is important because literature from cognitive science and from inquiry based learning (IBL) is diametrically opposed on the matter [c.f. 4,5,6]. Cognitive scientists insist that complex questions impede learning [4,1,2,3] while proponents of IBL mostly ignore this criticism [e.g. 6,7] or argue that the scaffolding in IBL mitigates against the effect of cognitive load from complex questions [5]. Also, the mediating role of cognitive loading on the relationship between complex questions and schema construction is important because it is not reported in extant literature. A significant moderating role by cognitive load in the relationship between complex questions and schema construction could suggest that cognitive load is in fact the *raison d'être* why complex questions stifle schema construction. While the association between complex questions and cognitive load and between cognitive load and schema construction are fairly well reported in literature, the different conceptualisation and operationalisation of these variables in this study could provide validation from a different perspective.

An understanding of the relationships highlighted above also has the potential to inform educational practice. At present, cognitive scientist educators insist that complex questions impede learning while constructivist educationalists largely ignore ascertainment by cognitive scientists. A better understanding of the associations among the variables could inform education practice by providing empirical evidence to either support or refute the ascertainment that complex questions impede learning. The assessment of the mediating role of cognitive load on the association between complex questions and schema construction could also inform educational practice on the extent to which cognitive load affects learning and so highlight the importance of managing cognitive load in students especially when complex questions are administered.

2. COGNITIVE LOAD THEORY

The architecture of human memory is comprised of a long-term memory (LTM) and a short-term memory also known as working memory. Working memory is what is used for conscious activity in organizing, contrasting, comparing and working on information. Its capacity is limited to about seven items at a single time but it can only process about two or three items simultaneously [8,9]. It is also the only memory which can be monitored [8,9]. In contrast, the capacity of LTM is unlimited but its contents cannot be monitored directly unless they are loaded onto working memory. Because the capacity of working memory is very limited, it easily gets overloaded and overwhelmed [10].

Based on this conceptualisation of the human memory architecture, the cognitive load theory (CLT) posits that ignoring the working memory limits of students in instructional design and delivery leads to high levels of cognitive load which impede learning [11,10,8]. Cognitive load is the mental effort exerted on working memory when performing cognitive functions such as perceiving, thinking and learning [11]. Students with lower levels of cognitive load will achieve more effective learning than students whose memory limits are ignored and the cognitive load in working memory is left to exceed the working memory limit.

3. HYPOTHESIS DEVELOPMENT

3.1 Cognitive Load and Schema construction

While cognitive functions take place in working memory, knowledge is stored in LTM. The information processing theory suggests that knowledge is stored in LTM as schemata. A schema is cluster of anything that is learnt and treated as a single entity by working memory^[8,12]. A schema can comprise of a large and complex amount of information treated as a single entity in memory^[8,12]. A schema can also combine elements of information and become automated thereby requiring less storage capacity and processing since it is treated as a single entity in memory^[12]. Subsequently, based on the CLT, effective learning takes place when the cognitive load in working memory is focused on the construction and automation of schemata^[9]. For this reason, it was hypothesised that; H₁-Cognitive load has a negative significant association with schema construction.

3.2 Complex Questions, Cognitive Load and Schema Construction

In order to achieve learning or schema construction, students are often administered complex questions^[6,7]. Questions are considered to be complex when their solutions have to be obtained from information spread in different documents^[13] or from different disciplines^[14]. It is argued that using complex questions will challenge students to acquire knowledge they previously did not possess and therefore achieve schema construction^[6,7]. However, based on the CLT, it is argued that complex questions induce large amounts of cognitive load and so impede learning. Based on this argument, it was hypothesised that; H₂ – Complex questions has a positive significant association with cognitive load and H₃ – Complex questions have a negative significant association with schema construction.

3.3 Mediating Role of Cognitive Load

Since it is expected that complex questions would lead to high levels of cognitive load and also expected that high levels of cognitive load would impede schema development as would complex questions^[11,10,8], it was further hypothesised that; H₄ – Cognitive load would mediate the association between complex questions and schema development.

4. RESEARCH METHODOLOGY

4.1 Research Design, Strategy and Procedures

The research used a quantitative research design and a positivist philosophy with a deductive approach to test hypothesized relationships among the research constructs. Data collection was through a cross sectional questionnaire survey which was favoured because of the objectivity and low cost associated with its' use compared to other methods of data collection. Non probability sampling was used for convenience and economy.

The research population was all students undertaking construction programmes at public universities in South Africa. The sample was drawn from three public universities in the KwaZulu-Natal province which were conveniently selected for economy. All the students present during data collection were sampled. Students were informed of their right to not participate in the study and to withdraw at any time for whatever reason in tandem with ethical research conduct. Students were assured of confidentiality and anonymity if they chose to participate. A sample of 543 students studying towards bachelor's degrees in either Construction Management, Quantity Surveying, Property Studies or Architecture at the three public universities was obtained.

4.2 Respondent Profile

The profile of the respondents is shown in Table 1. First year students accounted for the highest number (34.10%) followed by fourth year students (23.00%) and then second year students (23.20%). First year students accounted for the highest number because subsequent years of study always reduce due to attrition from failure or having to repeat a whole year of study. Fourth year students accounted for the second largest group because the fourth year is a post-graduate year and so accepts graduates who opted to work after the bachelors degree which increases the size of the cohort relative to the third year of study. Therefore, the sample distribution of the academic year of study is representative of a typical four years' university program in South Africa. The gender distribution has more males (59.80%) than females which is consistent with the general gender distribution at public universities in South Africa.

Therefore, the gender distribution is also representative of the population of interest. Based on the programme of study, the highest number of respondents came from the discipline of Construction Management (47.70%) while Property Studies accounted for only 8.80% and Architecture only 14.90%. Property studies accounted for the smallest number because it was offered only at one of the three universities sampled and is only available for three years.

Year of Study	Frequency	%
1	185	34.10
2	126	23.20
3	107	19.70
4	125	23.00
Total	543	100
Gender	Frequency	%
Male	324	59.80
Female	219	40.20
Total	543	100
Programme of Study	Frequency	%
Construction Management	259	47.70
Quantity Surveying	155	28.60
Property Studies	48	8.80
Architecture	81	14.90
Total	543	100

Even though Architecture was offered at two of the three universities sampled, it was the second smallest because class sizes in Architecture are generally smaller than in other construction related programmes to accommodate the studio mode of instruction in Architecture.

Construction management accounted for the largest number because it was offered at all three universities and the class sizes at two of the universities were greater than 100 students per class. Therefore, based on the demographic information collected, the sample is fairly representative of the population of interest.

4.3 Questionnaire Design

The scales in the questionnaire were developed by the authors because no suitable measure were found. The resulting questionnaire is shown in Table 2. Cognitive loading was conceptualised and operationalized as the extent to which students were overwhelmed by the amount of work assigned to them and the extent to which they were expected to rely on remembering a lot of information which they considered complex, difficult and confusing to understand. This conception is supported by research evidence which shows that attempting to remember a lot of information leads to high levels of cognitive load and to students being overwhelmed^[15,16].

Table 2: Measurement Model

Research Constructs		Mean	Std. Dev	Skewness	Kurtosis	
Cognitive Loading		COGLD				
1	I was expected to remember too many things from each lecture	COGLD1	3.497	1.056	-0.233	-0.649
2	I was overwhelmed with the amount of information I was expected to remember	COGLD2	3.461	1.037	-0.294	-0.443
3	I was given too much information during the lectures	COGLD3	3.298	1.020	-0.065	-0.533
4	The information I was given during lectures was confusing	COGLD4	2.789	1.087	0.121	-0.528
5	The information I was given in class was complicated and difficult to understand	COGLD5	2.785	1.085	0.154	-0.538
Complex Questions		COMPQ				
1	I was given assignments and tests which were difficult to understand and solve	COMPQ1	2.829	1.076	0.130	-0.431
2	I was given problems which did not have enough information for me to solve them	COMPQ2	2.693	1.119	0.304	-0.501
3	I was required to solve questions which were not clear as to what I was expected to do	COMPQ3	2.837	1.119	0.151	-0.640
4	I was given questions which could be interpreted in more than one way	COMPQ4	3.108	1.063	-0.042	-0.515
5	I was given problems which were not easy to understand clearly	COMPQ5	2.875	1.098	0.091	-0.566
6	I was given questions which were not expressed clearly	COMPQ6	2.772	1.163	0.137	-0.725
Schema Construction		SCMCON				
1	My lecturers concentrated on making me understand the basic concepts and principles (points) of a module/subject	SCMCON1	3.779	0.950	-0.640	0.297
2	My lecturers concentrated on making me connect new concepts and principles (points) with what I already knew	SCMCON2	3.733	0.911	-0.488	-0.091
3	I connected points that I already knew with what I was being taught in class	SCMCON3	3.791	0.877	-0.438	-0.032
4	I organised, categorised or connected anything new that I learnt with what I already knew	SCMCON4	3.695	0.916	-0.428	0.010
5	My lecturers clearly highlighted the main concepts and principles	SCMCON5	3.944	0.936	-0.666	0.000

The concept of complex questions was conceptualised and operationalized as the extent to which students were presented with assessment tasks which were difficult to understand, had no defined solution and required combining information from different disciplines and resources in tandem with the conception of complex questions by Zulu et al. [14] and Chali et al. [13].

Schema construction was conceptualised based on the definition of a schema from schema theory. It was operationalised as the extent to which students attempted to or were encouraged to connect any new information learnt with knowledge they already possessed in order to create or automate schemata. The instrument was anchored on a 5-point Likert scale with 5=almost always; 4=often; 3=sometimes; 2=seldom; and 1=almost never. The questionnaire, along with the entire study, were reviewed by the university research ethics committee and approved.

5. DATA ANALYSIS

The results were analysed with Structural Equation Modeling (SEM) using IBM SPSS AMOS v25 software. SEM was used to assess how well the empirical data fit the hypothesised conceptual model and also to assess reliability and validity from the resulting factor loading and to test the structural relationships among the variables.

5.1 Structural Equation Modeling

SEM was performed using Maximum Likelihood Estimation (ML) with 500 bootstrap samples. The recommended two step approach to SEM was followed where the measurement model was first assessed using confirmatory factor analysis (CFA) and the structural relationships were assessed using structural path analysis [17,18,19,20,21]. A selection of absolute and incremental fit indices were

used to assess model fitness for both the CFA and the structural paths. The selected indices were the Chi-square significance (χ^2), Relative Normed Chi-Square value (χ^2/df), Random Measures of Sample Error Approximation (RMSEA), Root Mean Square Residual (RMR), Goodness of Fit Index (GFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), Tucker Lewis Index (TLI). The indices were same for both the CFA and the structural paths. The fit indices are shown in Table 3 and the structural model is shown in Figure 2. The fit indices in Table 3 show that the overall conceptual model exhibited a good fit with the empirical data based on recommended model fitness index thresholds [17,18,19,20,21]. While the Chi-square significance (χ^2) did not meet the recommended threshold of being non-significant, the index is criticised for failing to be non-significant for samples larger than 200 [25]. In cases where the sample size is larger than 200 and the χ^2 fails the recommended thresholds, the Relative Normed Chi-Square value (χ^2/df) is considered a better measure of fit because it compensates for the sample size [17, 18, 19]. Therefore, notwithstanding that the χ^2 did not meet the recommended threshold, based on the relative normed chi-square and other fitness indices and considering the criticism around the χ^2 , the conceptual model exhibited good fit and inferences made from the model are both theoretically and empirically valid.

The test statistics were subsequently assessed for reliability and validity. Table 4 reports the results of the reliability and validity tests. Reliability was assessed using Cronbach's alpha and Composite Reliability (CR) while validity was assessed using Average Variance Extracted (AVE). Cronbach's alpha ranged between 0.735 and 0.841. Therefore, all the constructs exceeded the recommendation of 0.70 by Byrne [22]. Hulland [20] recommended a threshold of 0.70 for CR and all the constructs exceeded this threshold.

Table 3: Model Fit Indices

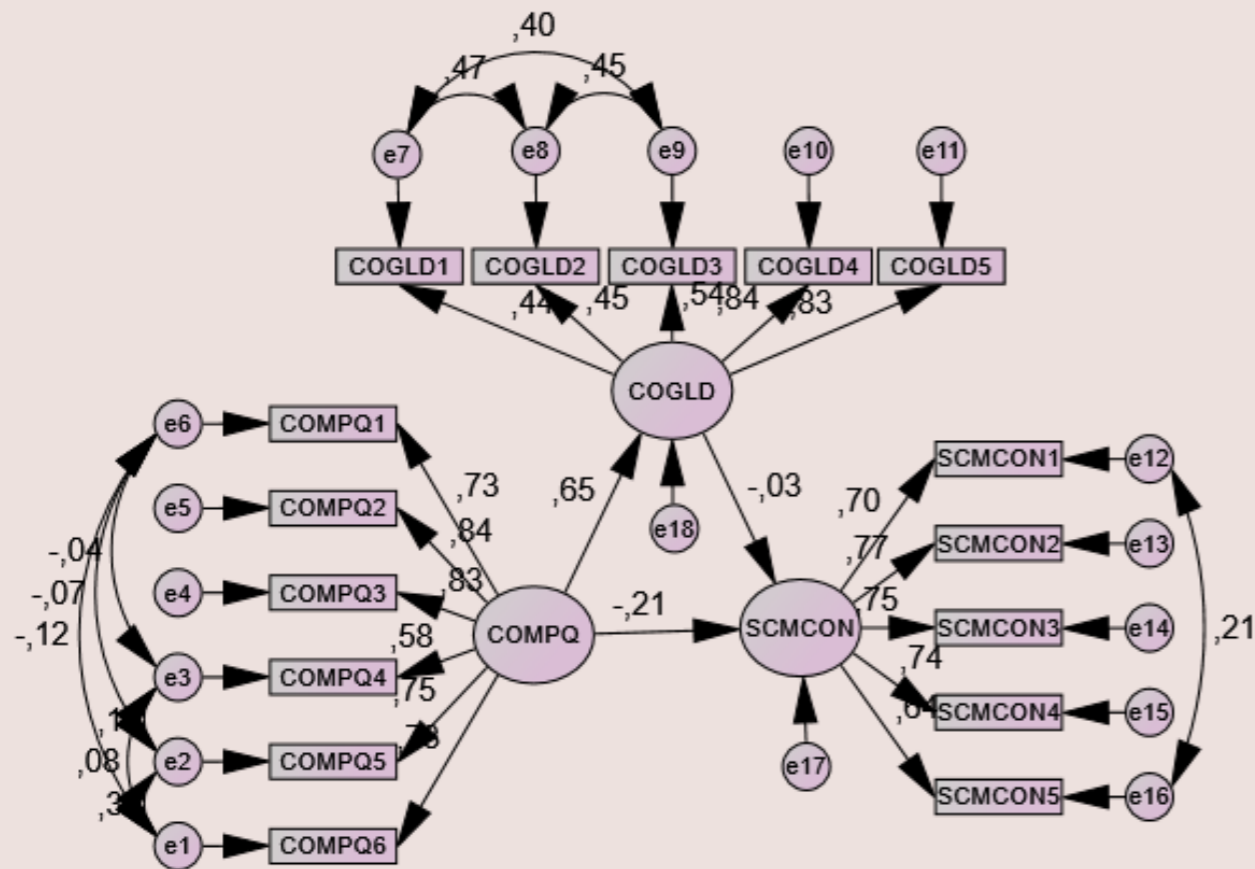
Model Fit Index	Acceptable Threshold	Study Threshold	Met/Not Met
χ^2	$p > 0.05$	$p = 0.000$	Not Met
χ^2/df	< 3	2.575	Met
RMSEA	< 0.080	0.055	Met
RMR	> 0.0	0.053	Met
GFI	> 0.900	0.946	Met
IFI	> 0.900	0.964	Met
CFI	> 0.900	0.963	Met
TLI	> 0.900	0.952	Met

Therefore, based on the Cronbach's alpha and the CR, the research constructs exhibited good reliability. For validity, Fornell and Larcker^[18] recommended that AVE values should be greater than 0.50 which all the constructs exceeded. Therefore, based on the reported measures and recommended thresholds, the measurement instrument is both reliable and valid.

The structural relationships from the SEM analysis in Figure 2 are tabulated in Table 5 and show that COMPQ

is significantly negatively associated with SCMCON ($R^2=-0.207$, $p=0.005$) consistent with hypothesis 3. COMPQ is also significantly positively associated with COGLD ($R^2=0.651$, $p=0.0001$) consistent with hypothesis 2. While COGLD shows a negative association with SCMCON, the relationship is not statistically significant ($p=0.714$).

The results therefore do not support hypothesis 1.



MEDIATION

For mediation to exist, there must be significant association between the independent variable and the dependent variable, between the independent variable and the moderator variable and between the moderator variable and the dependent variable^[23]. Results from the SEM analysis in Table 5 show that only two out of three of these associations are statistically significant. Therefore, based on the results from this study, cognitive loading does not mediate the association between complex questions and schema construction.

Research Constructs	Item-total	Cronbach's Test		C.R.	AVE	Item Loadings
		□ Value				
Cognitive Loading	COGLD1	0.585	0.822	0.734	0.558	0.441
	COGLD2	0.605				0.446
	COGLD3	0.659				0.545
	COGLD4	0.617				0.844
	COGLD5	0.608				0.834
Complex Questions	COMPQ1	0.638	0.885	0.841	0.651	0.731
	COMPQ2	0.756				0.837
	COMPQ3	0.767				0.827
	COMPQ4	0.579				0.583
	COMPQ5	0.744				0.745
	COMPQ6	0.704				0.729
Schema Construction	SCMCON1	0.665	0.848	0.817	0.626	0.704
	SCMCON2	0.701				0.771
	SCMCON3	0.650				0.745
	SCMCON4	0.658				0.745
	SCMCON5	0.611				0.635

Table 5: Structural Relationships

	Proposed Hypothesis	R ² Estimate	P Level
1	SCMCON <--- COMPQ	H ₁	-0.207 0.005
2	COGLD <--- COMPQ	H ₂	0.651 0.000
3	SCMCON <--- COGLD	H ₃	-0.027 0.714

6. DISCUSSION OF FINDINGS

Using a different methodology from established studies, the aim of this study was to assess whether cognitive load mediates the association between complex questions and schema construction. The study also assessed the extent to which complex questions achieve learning. The results support two out of the three hypotheses which were postulated. Hypothesis 3 postulated that administering complex questions to students would lead to impediments in schema construction and hypothesis 2 postulated that administering complex questions to students would lead to high levels of cognitive load in the students. These two hypotheses were supported. The results are therefore consistent with findings which show that administering complex questions to students with little subject prior knowledge induces significant amounts of cognitive load in the students and that the high levels of cognitive load subsequently impede learning^[24,10,11]. Therefore, complex

questions do not help to achieve learning but in fact work against learning while inducing quite large amounts of cognitive load.

Hypothesis 1 which postulated that high levels of cognitive load in students would lead to reduced schema construction was not supported by the findings. While the association between cognitive load and schema construction was negative, it was not statistically significant at 95% confidence interval. The absence of a statistically significant association means that the negative association is not likely to be consistently found with other samples and is likely to be a sampling chance. Therefore, the findings from this research do not support findings which show that cognitive load impedes learning.

Studies which concluded that high levels of cognitive load impede learning are based on inferences from experimental research designs which did not explicitly relate cognitive load to academic achievement.

This study, on the other hand, used a correlation design with new measures for schema construction and cognitive load. Therefore, one reason for the departure from accepted findings could be that the self-report measures for schema construction and cognitive load may not wholly and validly capture the target phenomenon. Notwithstanding, based on results from this study, cognitive load is not a mediator of the association between complex questions and schema construction. Therefore, when complex questions are administered to students, attempts to improve the level of schema construction by initiating measures to reduce cognitive load are unlikely to be effective. This is because the results suggest that cognitive loading in itself does not necessarily hinder learning since the association is not statistically significant. It was expected, based on other studies, that cognitive loading would be significantly negatively associated with schema construction.

7. CONCLUSION

Cognitive scientists argue that complex questions impede learning due to the consequent cognitive load associated with complex questions while proponents of constructivism mostly ignore this criticism or argue that the scaffolding in constructivist pedagogy mitigates the effect of cognitive load from complex questions. The relationship between complex questions and learning is important because students are frequently subjected to assessment questions which they perceive as being complex in contemporary constructivist pedagogy.

Consistent with other findings, it was found that complex questions lead to high levels of cognitive load and at the same time impede effective learning. However, in this study, the negative effect of complex questions on learning cannot be attributed to cognitive loading because the negative association between cognitive loading and schema construction was not statistically significant. Subsequently, cognitive load does not mediate the relationship between complex questions and learning.

Therefore, attempts to improve learning by managing subsequent cognitive load when complex questions are administered to students are unlikely to be effective.

While these findings corroborate other findings on the relationship between complex questions and learning and with cognitive load, more research is needed to establish whether cognitive load does not mediate the relationship between complex questions and learning especially considering this study has some limitations which may have affected the validity of the results.

Notwithstanding, the findings contribute to the fairly new body of knowledge on cognitive loading. The findings also have practical implications for educational practice. Questions which are perceived as being complex by students should be avoided as they lead to high levels of cognitive load and also impede effective learning.

8. LIMITATIONS

While this study makes contributions to the body of knowledge and to educational practice, it has some limitations. Firstly, the data were purposively collected using instruments which have not been extensively tested. Therefore, future studies may validate the instruments used in this study or use other established instruments for the constructs under study to test the validity of the results and conclusions arrived at by this study. Future studies could also test to establish whether cognitive load has a moderating effect on the relationship between complex questions and schema construction.

9. ACKNOWLEDGEMENTS

The authors gratefully acknowledge the financial support of the South African National Research Fund (NRF) through the Knowledge Interchange and Collaboration (KIC) grant. The authors also thank the universities which gave gatekeeper permission for the study and the students who responded to the questionnaire.

10. REFERENCES

- [1] Mulder, Y. G., Lazonder, A. W., & de Jong, T. (2014). Using heuristic worked examples to promote inquiry-based learning. *Learning and Instruction*, 29, 56-64. doi:<http://dx.doi.org/10.1016/j.learninstruc.2013.08.001>
- [2] Mihalca, L., Mengelkamp, C., Schnotz, W., & Paas, F. (2015). Completion problems can reduce the illusions of understanding in a computer-based learning environment on genetics. *Contemporary Educational Psychology*, 41, 157-171. doi:<http://dx.doi.org/10.1016/j.cedpsych.2015.01.001>
- [3] Hoogerheide, V., Loyens, S. M. M., & van Gog, T. (2014). Comparing the effects of worked examples and modeling examples on learning. *Computers in Human Behavior*, 41, 80-91. doi:<http://dx.doi.org/10.1016/j.chb.2014.09.013>
- [4] Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching. *Educational Psychologist*, 41(2), 78-86. doi:10.1207/s15326985ep4102_1
- [5] Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller and Clark. *Educational Psychologist*, 42(2), 99-107. doi:10.1080/00461520701263368
- [6] Harinarain, N., & Haupt, T. C. (2016). Mission: studio based learning in construction. The University of KwaZulu-Natal case study. *Journal of Engineering, Design and Technology*, 14(1), 160-181. doi:<http://dx.doi.org/10.1108/JEDT-05-2015-0031>
- [7] Kahn, P., & O'Rourke, K. (2004). Guide to Curriculum Design: Enquiry-Based Learning. Higher Education Academy. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwj8zOu_uYHMAhWCz-QKHVV4AvMQFgggMAA&url=http%3A%2F%2Fwww2.glos.ac.uk%2Foffload%2Fceal%2FKarenORourke-GuideToCurriculumDesignEnquiryBasedLearning.doc&usq=AFQjCNFWPNSyOVFGbxNAERPVG05Quu8D-Jg&sig2=CFLBJDABcyuo0MGgEXVSKg
- [8] Kirschner, P. A. (2002). Cognitive load theory: implications of cognitive load theory on the design of learning. *Learning and Instruction*, 12(1), 1-10. doi:[http://dx.doi.org/10.1016/S0959-4752\(01\)00014-7](http://dx.doi.org/10.1016/S0959-4752(01)00014-7)

- [9] Sweller, J., van Merriënboer, J.J.G. and Pass, F.G.W.C. (1998). Cognitive Architecture and Instructional Design. *Educational Psychology Review*, 10(3).
- [10] Leppink, J. (2017). Cognitive load theory: Practical implications and an important challenge. *Journal of Taibah University Medical Sciences*. doi:<https://doi.org/10.1016/j.jtumed.2017.05.003>
- [11] Sweller, J., & Paas, F. (2017). Should self-regulated learning be integrated with cognitive load theory? A commentary. *Learning and Instruction*. doi:<https://doi.org/10.1016/j.learninstruc.2017.05.005>
- [12] van Bruggen, J. M., Kirschner, P. A., & Jochems, W. (2002). External representation of argumentation in CSDL and the management of cognitive load. *Learning and Instruction*, 12(1), 121-138. doi:[http://dx.doi.org/10.1016/S0959-4752\(01\)00019-6](http://dx.doi.org/10.1016/S0959-4752(01)00019-6)
- [13] Chali, Y., Hasan, S. A., & Mojahid, M. (2015). A reinforcement learning formulation to the complex question answering problem. *Information Processing & Management*, 51(3), 252-272. doi:<https://doi.org/10.1016/j.ipm.2015.01.002>
- [14] Zulu, E., Haupt, T.C. and Tramontin, V. (2018). Cognitive Loading due to Self-directed Learning, Complex Questions and Tasks in the Zone of Proximal Development of Students. *Problems of Education in the 21st Century*, Vol. 76, No. 6
- [15] Scheiter, K., Gerjets, P., Vollmann, B., & Catrambone, R. (2009). The impact of learner characteristics on information utilization strategies, cognitive load experienced, and performance in hypermedia learning. *Learning and Instruction*, 19(5), 387-401. doi:<https://doi.org/10.1016/j.learninstruc.2009.02.004>
- [16] Hadie, S. N. H., & Yusoff, M. S. B. (2016). Assessing the validity of the cognitive load scale in a problem-based learning setting. *Journal of Taibah University Medical Sciences*, 11(3), 194-202. doi:<https://doi.org/10.1016/j.jtumed.2016.04.001>
- [17] Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. *Psychological Bulletin*, 103, 411-423. doi:10.11.540.4887
- [18] Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, 18(1), 39-50.

- [19] Hu, L., & Bentler, P. M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives. *Structural Equation Modeling*, 6(1), 1-55.
- [20] Hulland, J. (1999). Use of Partial Least Squares (PLS) In Strategic Management Research: A Review of Four Recent Studies. *Strategic Management Journal*, 20, 195-204.
- [21] Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics*: Pearson Education.
- [22] Byrne, B. M. (2006). *Structural Equation Modeling with EQS: Basic Concepts, Applications, and Programming (2nd ed.)*. Mahwah, NJ: Lawrence Erlbaum Associates.
- [23] Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- [24] Huang, Y.-M., Shadiev, R., & Hwang, W.-Y. (2016). Investigating the effectiveness of speech-to-text recognition applications on learning performance and cognitive load. *Computers & Education*, 101, 15-28. doi:<https://doi.org/10.1016/j.compedu.2016.05.011>
- [25] Schumacker R.E. and Lomax R. G. (1996). *A beginners guide to structural equation modelling*. Lawrence Erlbaum Associates Publishers, Mahwah, New Jersey.

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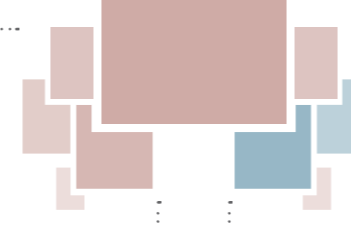


Table 1 Components of expenditure

Component	Expenditure (%)
Cleaning works	40,9
Mechanical services	37,7
Building works	13,6
Civil works	7,8
Total	100,0
Source ¹	

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