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KEY INPUTS INTO A DESIGNING FOR CONSTRUCTION HEALTH, SAFETY, AND ERGONOMICS MODEL IN SOUTH AFRICA

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Introduction (1)

- Despite regulation, architectural design practice in South Africa insufficiently considers construction health, safety, and ergonomics
- Research indicates that:
  - There is a lack of appropriate education and competencies
  - Mitigation of hazards and risks is possible through design
  - The development of a user friendly model suited to the South African situation is expected to encourage architectural designers to prepare healthy and safe designs
  - The model could be integrated into architectural education and training programmes

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Introduction (2)

As part of a PhD (Construction Management) study incorporating three prior preliminary studies, this study set out to:

- Establish the dynamics of a likely model
- Consider the extent to which architectural designers embrace the SACAP work stages
- Consider the application of the NBR as the most widely used construction documentation during the design process in order to consider it toward a model framework
- Ultimately to identify a range of key inputs suited to a recommended model framework

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Review of the literature

The literature review considers a range of possible key inputs suited to a proposed framework for an architectural design model aimed at improving construction health, safety, and ergonomics:

- Local and international literature
- Causes of construction accidents
- Hazard identification and risk assessment
- International models
- Design recommendations

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Method

This study contributes as a fourth preliminary study as part of the greater study and:

- **Makes use of a questionnaire survey, due to cost effectiveness and to afford respondents the opportunity to respond within their own time and in privacy**
- **Uses percentages and a mean score (a measure of central tendency)**
- **Was conducted among a regional group of architectural designers in the Border region of the Eastern Cape Province in South Africa, registered with the SACAP**
- **Rates 18 statements on a 1 to 5 Likert Scale and includes an 'unsure' option to exclude 'forced' responses, and**
- **Concludes with open ended questions to solicit qualitative 'themes' for the greater study**

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Research (1)

- A 20.5% response to questionnaires was received, which is considered as typical from the South African construction industry
- In the split table which follows discussion, the degree of concurrence is represented in terms of percentage responses to a scale of 1 (TD = totally disagree) to 5 (TA = totally agree), and a related mean score (MS) between 1.00 and 5.00, based upon the percentage responses. Allowance has been made for unsure (U) answers
- For purposes of discussion, the findings are elaborated in terms of themes as opposed to MSs

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Research (2)

Theme 1 - The dynamics of a model:

- Architectural designers would be encouraged to design for construction health, safety, and ergonomics if they had a technologically grounded, flexible model which promotes a buy-in situation without stifling architectural freedom to assist the process
- A flexible process is required which includes the need for checklists and allows opportunity for capturing of design notes
- Less enthusiasm was expressed relative to the need for prompts and keywords, but some doubt existed in this area
- It was made clear that the model must not be prescriptive and regulatory in nature, if a buy-in is to be expected

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Research (3)

Theme 2 - The framework for a model:

- Architectural designers suggest a model framework which is familiar to them and offers ease of use
- The SACAP work stages and the NBR strongly lend themselves as a model framework, which will be familiar and offer ease of use
- It is clear that BoQs, Preambles for Construction Trades, and WBSs will not form a suitable model framework

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Research (4)

Theme 3 - The range of key inputs:

- The causes of construction accidents predominated
- Consideration of existing design recommendations followed
- Consideration of local and international literature trailed closely
- The need to identify hazards and undertake risk assessments and consideration of international models thereafter scored equally

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Research (5)

The open ended qualitative data suggests:

- **Importance of the study as accidents and death rates are 'far too high'**
- **Exposure and enhanced understanding by designers is required**
- **International benchmarking such as the UK's CDM Regulations**
- **It is a 'good idea' to relate the model framework to the NBR**

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Research (6)

Statement	Response (%)						
	U	TD	D	N	A	TA	MS
Architectural designers would be more encouraged to design for construction health, safety, and ergonomics if they had a guiding model to assist them	6.7	0.0	0.0	0.0	73.3	20.0	4.18
A guiding model should be technologically grounded and should not stifle architectural freedom	0.0	0.0	0.0	0.0	40.0	60.0	4.60
Architectural designers would like a guiding model which includes 'prompts or keywords' in order to engender deeper thinking during the design process	13.3	0.0	0.0	26.7	40.0	20.0	3.40
A guiding model should be flexible in nature and should promote a buy-in situation making architectural designers more willing to use the model	6.7	0.0	6.7	13.3	20.0	53.3	4.00
A guiding model should be prescriptive and regulatory in nature whereby architectural designers are forced by regulation to use the model	0.0	13.3	33.3	20.0	26.7	0.0	2.64
A guiding model should have a framework which is familiar to architectural designers and offers ease of use	0.0	0.0	0.0	0.0	66.7	33.3	4.33
Architectural designers use the application of the National Building Regulations (NBR) during the design process	0.0	6.7	6.7	13.3	26.7	46.7	4.00
Architectural designers use a Bill of Quantities (BoQ) during the design process	0.0	13.3	26.7	53.3	6.7	0.0	2.53
Architectural designers use a Work Breakdown Structure (WBS) during the design process	6.7	13.3	33.3	40.0	0.0	6.7	2.33

Table 1A: Degree of concurrence with statements related to the development of a model

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Research (7)

Statement	Response (%)						
	U	TD	D	N	A	TA	MS
Architectural designers use the Preambles for Construction Trades during the design process	0.0	20.0	26.7	40.0	13.3	0.0	2.47
Architectural designers follow the SACAP 'work stages' during the design process	0.0	0.0	0.0	13.3	53.3	33.3	4.20
Architectural designers would need to understand the causes of construction accidents in order to design for construction health, safety, and ergonomics	0.0	0.0	0.0	26.7	40.0	33.3	4.07
Architectural designers would need to identify hazards and undertake risk assessments in order to design for construction health, safety, and ergonomics	6.7	0.0	6.7	20.0	53.3	13.3	3.53
Consideration of 'local and international literature' would prove beneficial to developing a guiding model suitable for use in the context of South Africa	6.7	0.0	0.0	20.0	53.3	20.0	3.73
Consideration of suitable 'international models' would prove beneficial to developing a guiding model suitable for use in the context of South Africa	6.7	0.0	0.0	26.7	60.0	6.7	3.53
Consideration of existing 'design recommendations' would prove beneficial to developing a guiding model suitable for use in the context of South Africa	0.0	0.0	0.0	40.0	33.3	20.0	3.79
A guiding model should include a process which architectural designers can follow in order to design for construction health, safety, and ergonomics	0.0	6.7	0.0	33.3	46.7	13.3	3.60
A guiding model should include 'checklists' and allow opportunity for 'design notes' in order to assist the process	0.0	0.0	6.7	6.7	60.0	26.7	4.07

Table 1B: Degree of concurrence with statements related to the development of a model

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Conclusions

- Architectural designers would be encouraged to design for construction health, safety, and ergonomics if they had an appropriate model to guide them
- The SACAP work stages are extensively followed during the design process
- The NBR is the most widely used form of construction documentation (reference) during the design process
- A range of key inputs suited to a proposed model framework were identified

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Recommendations

Further research is required and it is recommended that:

- **The structure of the NBR and the SACAP work stages be suitably integrated in order to form a model framework**
- **Such a format would be readily understood by architectural designers in South Africa**
- **The proposed range of key inputs be integrated with the proposed model framework toward developing a model**