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JOSEPHINE LLALE, DAVID ROOT, AND PAULIN WEMBE

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Experts' Perspectives on the Future of the Quantity Surveying Profession

Josephine Llale,[1] University of Pretoria, South Africa
David Root, University of the Witwatersrand, South Africa
Paulin Wembe, University of the Witwatersrand, South Africa

Abstract: Professions in society are being affected by the impact of current social-technical changes. Tasks that were previously the purview of certain professions are made redundant by technological achievement. Within the built environment, there are claims that the quantity surveying profession might not exist in the future because of the potential automation of some tasks. To test this claim, a qualitative research method has been used to determine possible futures for the quantity surveying profession in South Africa specifically. Data has been collected from semi-structured interviews conducted with built-environment experts. In spite of the encroachment of technology on some of the tasks of quantity surveyors, most experts are of the view that the quantity surveying profession will still exist in the future and that its professional status is not threatened. However, the need for quantity surveyors might reduce as certain tasks are automated. The findings of the study will assist the quantity surveying profession to continue to evolve with changes in its sociotechnical system, ensuring that it remains relevant in the future. Following from this research, further studies (such as scenario planning) are recommended to assist the profession in future planning.

Keywords: Automation, Experts, Quantity Surveying, Profession, Tasks

Introduction

Current technological advancements are causing disconcertion within professions. For instance, Susskind and Susskind (2015) claim that machines and systems will carry out tasks performed by professionals in the future. Many experts are suspicious of artificial intelligence (AI) (as it is currently instituted) and view it as one the greatest threats to professions. The medical, legal, library sciences, and accounting professions are some vocations compelled to rethink their future in response to this potential threat (Campbell, MacDonald, and Procopiou 2018; Desai 2018; Susskind and Susskind 2015; Wood and Evans 2018).

Within built-environment professions, quantity surveying has been cited as one most at risk of being replaced by technology (Luksha et al. 2015). The aim of this paper is to test this claim within the South African context. This paper investigates the mid-range future, which is a period of between five to twenty years from now (Masini 1993 as cited in Brier 2005). The reason for this is there have been numerous claims that this is the period in which most professions will become extinct (Luksha et al. 2015).

Data has been collected from twenty-three experts within the built environment through semi-structured interviews, and the results are analyzed using thematic content analysis. This paper is divided into the following sections: literature review, methodology, findings, and conclusion.

Literature Review

The narrative literature review is the methodology used to carry out this literature review. Google Scholar and the library guides from the University of the Witwatersrand were the primary databases employed for the search. Only articles that aligned with the objectives of this paper (namely, the future of quantity surveying in South Africa) were reviewed.

[1] Corresponding Author: Josephine Llale, Department of Construction Economics, University of Pretoria, Pretoria, Gauteng, 0002. email: josephine.llale@up.ac.za

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Professions

For years, professions were regarded as custodians of expert knowledge. In order to qualify as a professional, one usually has to undergo a process of professionalization, which generally includes tertiary education, sector training, evaluation of skills by a professional body, and finally certification. Only those certified as "professionals" can carry out work reserved for that designation. Therefore, a professional status carries with it certain privileges, such as prestige and, in some instances, a high income (Abbott 1988; Susskind and Susskind 2015).

Society has always relied on the expertise of professionals to solve various problems, including those related to health, the legal system, and tax issues, for example. The professions' claim to a privileged position in society is based on their ostensibly superior knowledge in particular areas (Hughes 1963). The word "profession" originates from the word "profess" (Hughes 1963). In recent times, however, the understanding of the term "profession," or the claim by the professionals to know more than the general society, has come under scrutiny.

Expert knowledge, once the sole province of professions, is now shared widely through technology, such as the Internet of Things (IoT) (Susskind and Susskind 2015). Technology, particularly AI, is also developing as an efficient substitute for certain professional tasks that were the prior responsibility of professionals (Brynjolfsson and McAfee 2014; Susskind and Susskind 2015). If technology removes the role of the professions in society, what role will they play in the future? Is there in fact a future for professions?

In the built environment, the quantity surveying profession has been cited as one the professions most at risk of extinction (Luksha et al. 2015). It is for this reason that it is used as the case study to test the above claim.

Quantity Surveying Profession

The quantity surveying profession is concerned primarily with costs and contractual matters related to construction projects (Ashworth, Hogg, and Higgs 2013). A major part of quantity surveyors' work includes measuring, quantifying, and costing construction work related to purposes such as estimating or tendering (Ashworth, Hogg, and Higgs 2013). For quantity surveyors, this type of work is most at risk of substitution from technology and automation.

Acemoglu and Autor (2011, 20) claim that a machine can function as a substitute for work that involves "adding a column of numbers." The measurements of quantities from the designers' drawings are often captured in a document called the bills of quantities. This is one of the main reasons the position of quantity surveyors, who are often regarded as "construction accountants" (Ashworth, Hogg, and Higgs 2013), is said to be at risk.

While bills of quantities are used sparingly in other countries (Rashid, Mustapa, and Wahid 2006), they are still used widely in South Africa. About 35 percent of the fees charged by South African quantity surveyors are derived from costs for the preparation of the bills of quantities (South African Council for the Quantity Surveying Profession [SACQSP] 2015). Substituting the manual preparation of the bills of quantities with a technological process could mean a substantial loss of work for quantity surveyors in South Africa. Amongst those systems and technologies with the potential to substitute the bulk of the work of quantity surveyors is Building Information Modeling (BIM) (Kulasekara, Suranga Jayasena, and Ranadewa 2013). BIM is a potential threat to how the South African quantity surveying profession is currently instituted. In addition to BIM, changes to the arrangement of construction's sociotechnical system are another potential threat to the South African quantity surveyor's professional status.

The Potential Impact of Sociotechnical Changes on the Quantity Surveying Profession

Geels (2005, 2004) describes a sociotechnical system as the link between a social system and a technical system that are intended to fulfill a societal function. The social system usually consists of user practices, regulation, and culture, while the technical system usually comprises technology, infrastructure, supply networks, and the like. Therefore, the construction sector's sociotechnical system exists to meet the infrastructural needs of society.

The delivery of infrastructure in South Africa is generally executed through traditional procurement methods. In this traditional method, there is a separation between the design and the construction teams. The design team usually comprises the client and the professionals. Quantity surveyors form part of the professionals contained within the design team. Once the design is complete and the budget approved, quantity surveyors prepare tender documents comprising, amongst others, bills of quantities. The contractor who wins the tender, as well as their sub-contractors and suppliers, forms the construction team (Mathonsi and Thwala 2012; Walker and Lloyd-Walker 2012; Winch 2000).

The traditional procurement method is arguably biased toward South African quantity surveyors. As private enterprise professionals, quantity surveyors in South Africa can work independently and not under other professionals or with a contractor in a subordinate position, as would be the case in a turnkey procurement method. This means they have greater autonomy in terms of their work and the fees they charge (Forsyth and Danisiewicz 1985).

Even though this autonomy is legislated, current sociotechnical changes are challenging this position. For instance, the litigious nature of the traditional procurement method is placing pressure on the construction sector to adopt other non-traditional procurement systems, such as integrated, management-oriented, and collaborative procurement systems (Mathonsi and Thwala 2012). This is often because of the common misunderstandings and miscommunications that emerge between the design and construction teams (Ashworth, Hogg, and Higgs 2013). There is, therefore, the likelihood of wider adoption in the future of non-traditional procurement methods in South Africa.

For quantity surveyors in the construction sector, non-traditional procurement methods have the potential to reduce their workload, social status, and, subsequently, the fees they can charge. For example, by using a single, collaborative team, Heathrow Express was able to halve the number of quantity surveyors working at its airport rail link (Winch 2000). Therefore, if non-traditional procurement methods are widely adopted, there is a potential risk of loss of work and income for the South African quantity surveyor. Furthermore, the changes in the arrangement of the sociotechnical system presents another potential threat to the quantity surveying profession—technology.

Although there are other technologies and systems with the potential to have a negative impact on the quantity surveying profession, this paper looks only at BIM. It should be noted that there is no universal definition for BIM (Dakhil 2017; Doan et al. 2019). The National Building Standards (NBS 2011, 10), however, defines BIM as a "rich information model, consisting of potentially multiple data sources, elements of which can be shared across all stakeholders and be maintained across the life of the building from inception to recycle." There are assertions that BIM can perform traditional tasks of the quantity surveying profession faster and more efficiently than human counterparts (Kulasekara, Suranga Jayasena, and Ranadewa 2013).

Traditional quantity surveying tasks, including taking measurements, cost estimation, cost planning, cost control, bills of quantities preparation, material procurement, value management, and life-cycle costing, can apparently be efficiently and speedily executed using BIM. Current systems and technologies used to carry out these professional quantity-surveying tasks are laborious and error-prone. This is largely due to the measuring that is done using 2D drawings and because data sharing does not emanate from a single data source. The collation of data from different data sources and designers often results in errors that lead to cost overruns and

extended construction periods. BIM is thus regarded as a potential solution to these challenges (Cunningham 2014; Kulasekara, Suranga Jayasena, and Ranadewa 2013; Olatunji, Sher, and Gu 2010; Smith 2014; Wong, Salleh, and Rahim 2014; Wu et al. 2014).

Although the adoption of BIM in South Africa is still in its infancy (Chimhundu 2016), wider adoption internationally means its potential for growth in South Africa is great. With BIM absorbing traditional quantity surveying tasks, is there a positive future for the quantity surveying profession? Should the arrangement of the construction sector change, and what role will the quantity surveyor play? In an attempt to answer these questions, twenty-three experts were interviewed to determine their perspectives on the future of the quantity surveying profession.

Methodology

A qualitative approach was adopted for the study as it provides "new, richer, understandings and interpretations of social worlds and contexts" (Saunders, Lewis, and Thornhill 2016, 140). Data was collected through face-to-face semi-structured interviews with twenty-three experts. The *Cambridge Dictionary* (n.d.) defines an expert as "a person with a high level of knowledge or skill relating to a particular subject or activity." The level of knowledge required for the study was rooted within the construction sector or associated sectors, such as engineering and the property sector.

Purposive sampling was used to select the participants. The criteria used for selection was first, at least ten years of field expertise, and second, experience working in the South African construction sector. Before sending email invitations out to potential participants, ethical clearance was obtained from the Ethics Committee of the University of the Witwatersrand. Only twenty-two agreed to participate. Participant 5 recommended the twenty-third participant.

Twenty-three participants were deemed as a sufficient sample for the purpose of the study, as the minimum sample size for a semi-structured interview is between five to twenty-five and between twelve to thirty for a non-heterogeneous population (Saunders, Lewis, and Thornhill 2016). Table 1 provides the demographic profiles of the participants. The group of experts consists of eleven practicing quantity surveyors, two semi-retired quantity surveyors, two civil engineers, five architects, one researcher, one construction project manager, and one property and facilities manager.

Semi-structured interviews were preferred over other types of interviewees because they provide both structure and flexibility (Kumar 2014). In a semi-structured interview, participants are able to respond to questions according to their opinion (Bryman and Bell 2014; Kumar 2014; Saunders, Lewis, and Thornhill 2016).

Table 1: Demographic Profiles of Participants

Participants	*Current Profession*	*Experience in Current Economic Sector*	*Experience in Previous Economic Sector*	*Total Experience*
1	Semi-retired QS	6 months	QS—42 years	42 years
2	1.Civil Engineer 2.FM	1. 47 years 2. 40 years	Not applicable	47 years
3	QS in Engineering	32 years	Not applicable	32 years
4	Architect	29 years	Contractor—4 years	29 years
5	Architect	25 years	Not applicable	25 years
6	QS	26 years	Not applicable	26 years
7	1. CPM 2. Property Development 3. Civil Engineer	1. 18 years 2. 12 years 3. 18 years	Banker—2 years	18 years
8	QS	15 years	QS in government—6 years	15 years
9	QS	30 years	Not applicable	30 years
10	Architect	32 years	Not applicable	32 years
11	QS	22 years	QS in engineering—9 months	22 years
12	1.QS 2.CPM	1. 22 years 2. 19 years	Not applicable	22 years
13	QS—Socioeconomic Development	5 years	QS in engineering—14 years	19 years

Participants	*Current Profession*	*Experience in Current Economic Sector*	*Experience in Previous Economic Sector*	*Total Experience*
14	QS	27 years	1. Property Manager—3 years 2. Banker—7 years	30 years
15	1. QS 2. Academic	1. 15 years 2. 6 years	QS in construction company—2 years	15 years
16	1. QS 2. Academic	1. 40 years 2. 8 years	Construction—5 years	40 years
17	Property Developer	3 years	Property and facilities manager—20 years	23 years
18	Semi-retired QS	13 years	QS in construction—31 years	44 years
19	1. Architect 2. Property Developer	1.23 years 2. 1 year	Program and project management for government—16 months	23 years
20	FM	5 years	CPM—9 years	24 years
21	QS	22 years	Financial services—5 years	22 years
22	Architect	31 years	CPM—15 years	31 years
23	Researcher	12 years	Academic—3 years Architect—12 years	27 years

Note: QS = quantity surveyor; CPM = construction project manager; FM = property and facilities manager

Thematic analysis is a qualitative data analysis method that analyses data according to common themes and patterns (Saunders, Lewis, and Thornhill 2009). The choice to use thematic analysis over other types of qualitative data analysis methods, such as narrative analysis and discourse analysis, was because of its relevance in understanding "factors underpinning, human attitudes and actions" (Saunders, Lewis, and Thornhill 2016, 579).

All interviews were recorded with the express permission of the participants. Before data was analyzed, interview recordings were transcribed with the aid of the software Transcribe. Transcribe software automatically transcribes the audio recording, although not completely accurately. Therefore, the auto-transcribed interviews had to be edited. This involved listening to the audio-recorded interviews while scrutinizing the transcription from Transcribe to ensure that they were a true reflection of the interviews, simultaneously correcting any errors in the transcription. By going through the transcriptions once more and editing them, some form of validity and reliability of the data was achieved. In the next section, the findings of the paper are presented.

Findings

This section discusses the three themes that were analyzed. To determine the perspectives of experts on the future of the quantity surveying profession, these three questions were posed to participants: (1) Will the quantity surveying profession exist in future? (2) Which quantity surveying tasks will not exist in future? (3) Will the quantity surveying profession retain its professional status?

Theme 1: The Future of the Quantity Surveying Profession in South Africa

Given literature's claims and predictions about the future of the quantity surveying profession (Luksha et al. 2015), it was important to test this claim by asking experts within the South African construction sector their perspective on the possible future of the profession. In spite of the current sociotechnical changes in the construction sector, twenty-two of the twenty-three participants believe the quantity surveying profession will still exist in future.

With the exception of Participants 12, 3, 19, and 8, the costing skill of quantity surveyors was cited as the main reason the quantity surveying profession will exist in future, as the following quotes exhibit: "Because the service [of providing cost] still has to be provided" (Participant 9); "There's always got to be somebody that works out what is going to cost, and does it make sense?" (Participant 1); and "The quantity surveyor is the person who is there (a) to develop the cost for the contractor or the supplier and (b) to then manage and be able to report on that cost and be able to manage the cost against it" (Participant 2).

Others, like Participants 3, 8, and 19, believe that the profession will exist albeit in a different form. Participant 3 stated, "So yes, it will exist. It will be different," while Participant 8 said:

> Yeah, whether it will be called quantity surveyors?…so I think that's a question, the quantity surveyors need [to answer] given all these challenges and the way the world has changed and the niche that they need to establish…[whether] they still want to remain rigid or redefine quantity surveyors within the changing landscape, improved technology, and environment.

The structure of the current sociotechnical system was also cited as one of the main reasons for the survival of the profession: "All professions are structured and tailored to provide specific services. Architects are trained for certain services. Unless curriculums change to incorporate quantity surveyors as part of architecture…[and] then get one package, then you will eliminate one of them" (Participant 12).

Only Participant 10 does not believe that the quantity surveyor profession will exist in the future:

> You know quantity surveying never existed…when we started in our profession…there was no quantity surveyor, there were estimators…They didn't deal with the actual cost of the project. But then construction accountants, or cost controllers of the project, were brought in and they were called quantity surveyors.

The findings from the foregoing feedback does not seem to support the literature that states that the role of the quantity surveyor will cease to exist in the future (Luksha et al. 2015). It seems that, in spite of technology's capabilities, there will always be a need for a human to verify the numbers, as Participant 17 stated, "Yes, there will be robotics, but I still need a quantity surveyor."

Theme 2: Quantity Surveying Tasks That Are Most at Risk of Extinction

Kulasekara, Suranga Jayasena, and Ranadewa (2013) identified the following traditional quantity surveying tasks as at risk of extinction: quantities take-off, bills of quantities preparation, cost estimation, cost planning, cost reporting, cost control, material procurement, payment application, value management, and life-cycle costing. The participants were asked which of the traditional quantity surveying tasks, as identified by Kulasekara, Suranga Jayasena, and Ranadewa (2013), that they believe will not exist in future. Table 2 shows the traditional quantity surveying tasks that participants say are most at risk of extinction or automation.

Table 2: Traditional Quantity Surveying Tasks Most at Risk of Extinction or Automation

	Traditional Quantity Surveying Tasks	*Risk of Extinction or Automation*
a	Quantities take-off	Mostly at risk
b	Bills of quantities preparation	Mostly at risk
c	Cost estimation	Moderately at risk
d	Cost planning	Moderately at risk
e	Cost reporting	Moderately at risk
f	Cost control	Moderately at risk
g	Material procurement	Not sure
h	Payment application	Moderately at risk
i	Value management	Not at risk
j	Life-cycle costing	Not at risk

The majority of participants identified quantities take-off or the measurement and preparation of bills of quantities as the two traditional tasks most at risk of extinction or being lost to automation. Participants 20, 19, 9, 2, 8, 5, and 16 believe quantities take-off and the preparation of bills of quantities will be completely automated, and Participants 15, 23, and 13 believe the time quantity surveyors spend carrying out these tasks will be reduced because of automation.

Three participants are of the view that all the tasks will still exist; however, they will be offered differently. For instance, Participant 22 thinks bills of quantities will be "more digital, more interactive," and Participant 21 says, "I don't think any of these stages [tasks] are going to evaporate…these are going to be better managed in future."

Eight participants (18, 1, 11, 7, 3, 14, 12, and 21) believe that no tasks will be lost to technology, as they are core to the profession and its fundamentals. Participant 18 stated, "I mean that's the fundamentals…it doesn't matter whether the architect shows you a 3D or something else. You have got to measure it. Somewhere along the line. But there has to be those fundamentals in place." Only one participant (10) believes that all the tasks of the quantity surveyor will be automated. One participant (17) did not respond to this question.

The majority of participants regard value management and life-cycle costing as the future tasks of the quantity surveying profession: "life-cycle costing will be the future. Value management will be [the] future" (Participant 8). Two participants (20 and 19) are of the view that life-cycle costing will be automated, while Participant 13 believes that only 70 percent of quantity surveying tasks will be automated. One participant (12) stated that life-cycle costing will not exist, as it is not being practiced currently. Only Participants 20 and 10 are of the opinion that value management will also be automated.

The findings regarding the future tasks of the quantity surveying profession somewhat corroborate literature claims by Acemoglu and Autor (2011), in which tasks that require quantification can be automated easily. It seems that work that involves some analysis is likely to survive the technological encroachment, as Participant 19 stated, "Cost planning, that is what requires a bit of human analysis…[Cost reporting] also requires some analysis. I don't know if there are apps that are, that have been programmed to analyze." Therefore, according to the majority of participants, value management and life-cycle costing require significant human analysis.

According to Table 2, other traditional professional tasks are only moderately at risk. The reason for this is that the majority of the participants believe that although there will be some automation in these tasks, human analysis will be required. Material procurement was contentious, as many cited that professional quantity surveyors do not do it currently; hence, it is rated "not sure." Participant 12 stated that material and life cycle costing "don't feature much in the day-to-day quantity surveying work," and Participant 14 said, "material procurement…it is almost gone now."

The encroachment of technology on the quantity surveying profession may lead to the reduction of the number of quantity surveyors needed in projects, as technical skills of measuring and quantifying will be automated. For instance, Participant 7 says, "before technology, you need a lot of quantity surveyors to do this. You need a quantity surveyor on site…with the technology the number of the demand might reduce. The demand will reduce."

Theme 3: Professional Status of the Quantity Surveying Profession

The Quantity Surveying Act (No. 49 of 2000) protects the professional status of the South African quantity surveyor, and the Identification of Works (2011) document identifies work that is reserved for professional quantity surveyors (SACQSP 2011, 2000). This paper argues that with the automation of certain professional tasks and the diffusion of quantity surveyors' expert knowledge through technology, the legislative boundaries may become redundant. The question posed to the twenty-two participants who believed that the profession will still exist in future were thus asked if the profession will retain its professional status in future.

Fifteen of the participants who responded to this question were of the view that the quantity surveying profession will keep its professional status. Three participants (3, 13, and 19) believed that the profession will not keep its professional status, and two were unsure (1 and 5).

The need to preserve and regulate the profession were the main reasons given for quantity surveying maintaining its professional status: "[It will keep its professional status] because of regulation. It's important to have a regulation either self-regulated or forced

regulation" (Participant 16). Those who do not believe that the profession will lose status cite the encroachment of technology and other professions as the reason for the loss of its professional status: "Yeah, there is an attrition of professions" (Participant 19).

The responses for Theme 3 indicate that the professional status of quantity surveyors is not at risk, as regulation will preserve them. Regulation by a professional body is, therefore, crucial for preserving the professional status of the profession.

Conclusion

The aim of this paper was to test the claim that the quantity surveying profession will not exist in the future given the sociotechnical changes currently affecting the profession. Experts believe that the quantity surveying will still exist in the future, and it will retain its professional status. Current sociotechnical changes are, therefore, not a major threat to the profession nor to its status. Automation, however, is likely to cause a reduction in the number of quantity surveyors required in projects. This paper recommends futures studies, such as scenario planning, to show how the quantity surveying profession in South Africa might look in the future.

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ABOUT THE AUTHORS

Josephine Llale: PhD, Senior Lecturer, Department of Construction Economics, University of Pretoria, Pretoria, Gauteng, South Africa

David Root: Professor, School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

Paulin Wembe: PhD, Visiting Lecturer, School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

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