

Digital Transformation in Quantity Surveying: Implications for Employability and Professional Ethics

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ABSTRACT

Digital transformation is reshaping the quantity surveying (QS) discipline, with significant implications for employability and ethical responsibility. This study empirically examines the perceived impact of digital technologies on professional relevance, skill requirements and ethical considerations among quantity surveyors in South Africa. An explanatory mixed-method design was adopted, utilising a semi-structured survey administered to practising professionals. Quantitative data were analysed using descriptive and inferential statistical techniques, while qualitative responses were subjected to thematic analysis. The findings suggest that digital competence is increasingly central to employability, with respondents strongly affirming the importance of ICT skills for sustaining professional relevance. Continuous upskilling has become a necessary condition for participation in the evolving digital construction environment. In addition, ethical considerations are prominent, particularly in relation to data security, confidentiality, intellectual property and accountability within digitally integrated workflows. Notably, no statistically significant differences were observed across demographic groups, suggesting that the effects of digital transformation are uniformly experienced across the profession. By connecting digital transformation to employability and ethical behaviour in a South African setting, the study provides empirical insight on an underexplored issue. It concludes that digital technologies are augmenting rather than displacing the QS role, necessitating a reconfiguration of professional competencies that integrates digital proficiency with ethical judgement and continuous learning.

Keywords: Digital transformation, Quantity Surveying, Employability, Ethics, Information and communication technology.

INTRODUCTION

The global construction industry is undergoing rapid digital transformation. Digital technology such as information and communication technology (ICT), Building Information Modelling (BIM) and Artificial Intelligence (AI) have changed the way projects are planned, designed and completed. Advances in digital technology have significantly influenced and broadened the range of skills and competencies required in the Quantity Surveying profession and have changed the way work is completed. The Quantity Surveying (QS) profession has evolved over the years, moving away from the traditional role of measurement, cost estimation and financial control,

towards a more technologically driven role. Industry professionals need to adapt their competencies in this reshaped construction industry to remain relevant. However, introducing digital technologies has brought about new employment and ethical challenges and considerations for the profession. These include issues with employability, job security, data security, intellectual property, digital accountability and technological inequality. Although the drive towards digital technology presents opportunities such as increased efficiency, automation and collaboration, it also requires the quantity surveyor to upskill.

This study therefore aims to investigate how digital technology is changing employability, professional ethics and work practices. The study specifically examines QS professionals' perceptions of the impact of digital technology adoption on professional relevance, skill requirements and ethical responsibilities.

DIGITAL TRANSFORMATION AND THE EVOLVING QUANTITY SURVEYING PROFESSION

The adoption of digital technologies in the construction industry has been erratic, inconsistent and partial, often lagging other industries despite increasing the level of competitiveness between local professionals and organisations (Vermaak & Crafford, 2023; Nxamalo & Du Toit, 2025; Aleke, Okigbo & Danjuma, 2025). This slow and uneven adoption of digital technologies in construction has been widely attributed to the fragmented nature of the industry, where projects involve multiple independent stakeholders and organisations with varying levels of technological capability (Succar, 2009). Although, the building environment has benefited from the significant advances in digital technology through increased efficiency, collaboration, data integration and automation, the role of the QS was dramatically altered (Aleke et al., 2025), with the increasing need for professionals to integrate digital technologies into their everyday practise. Digital technologies such as Building Information Modelling (BIM) enable the integration of project information across different project participants, improving coordination and information management throughout the lifecycle of construction projects (Eastman et al., 2011).

The drive to increase the Quantity Surveyor's understanding of new and growing digital technologies such as BIM and adopt a lifelong learning mindset to remain relevant, becomes increasingly important. The dawn of digital technology necessitates a shift in the profession from measurement-based functions to higher-value analytical and strategic tasks by automating repetitive tasks like measurement and cost estimation through digitization (Aleke et al., 2025). For example, BIM-based quantity take-off systems allow quantities to be automatically generated from digital models, significantly reducing the time traditionally required for manual measurement processes (Eastman et al., 2011).

It is evident that digital technology has changed the role of the Quantity Surveyor, requiring the professionals to adapt and broaden their skill set to be relevant and useful. Aleke et al. (2025) address a shift in skill sets, requiring

quantity surveyors to become proficient in digital technology, data analysis and digital workflows. Vermaak & Crafford (2023) contends that digital transformation is not only driven by digital competencies, but also requires adaptability, innovation and organizational leadership. Succar (2009) further emphasises that the successful implementation of BIM requires professionals to develop new competencies related to digital collaboration, information management and integrated project delivery. The need for Quantity surveyors to integrate new competencies and adapt to the ever changing digital environment has become non-negotiable. New ethical and professional challenges and responsibilities have also been brought about by the adoption of digital technologies. Concerns about data security, intellectual property, digital accountability, and unequal access to digital technologies arise from the growing reliance on digital systems. Aleke et al. (2025) point out that the increasing use of digital systems in building projects has sparked concerns about data security, intellectual property, and the ethical application of technology in the workplace. The use of shared digital information models also introduces complex issues regarding data ownership, responsibility for digital outputs and the management of confidential project information (Eastman et al., 2011).

Concerns about employability and job security in professional roles have been brought up by automation and digitalization in addition to ethical issues. While some academics contend that digital technologies might automate some of the traditional tasks carried out by quantity surveyors, others contend that digital transformation is more likely to enhance professional capabilities by facilitating better analysis, increased teamwork, and effective decision-making processes. Nadim and Goulding (2010) suggested that the automation capabilities associated with BIM may reduce the need for traditional measurement activities performed by quantity surveyors. However, other studies argue that professionals who possess BIM competencies may improve their employability by offering higher-value services related to digital project management and integrated cost control (Arayici et al., 2011). Despite the growing body of knowledge examining digital transformation within the construction industry, limited empirical research has explored the effect of digital technology on employability and professional ethics relating to data security, confidentiality, digital inequality, ownership of intellectual property and professional accountability, especially in a South context. Much of the existing literature has focused primarily on technological adoption and organisational barriers to BIM implementation rather than the broader professional implications of digital transformation within the quantity surveying profession (Succar, 2009; Eastman et al., 2011).

The study, therefore, addresses the following research questions: (i) How do quantity surveyors perceive the impact of digital technology on professional employability? (ii) How important are digital skills for maintaining professional relevance within the industry? (iii) What ethical concerns arise for the increase in adoption of digital technologies? (iv) Do perceptions regarding digital technologies differ across demographic groups such as age, gender and professional experience.

METHODOLOGY

This study adopted an explanatory mixed-method research approach by means of a survey instrument. Data collection was conducted using a semi-structured survey questionnaire with closed and open ended questions. Closed ended questions was measured by means of Likert scale type responses and open ended questions to allow respondents to comprehensive provide insights. A non-probable sampling approach was adopted, specifically convenience sampling to professionals accessible to the researcher. The survey was distributed by means of email and other electronic devices to professionals. The target population for this study consisted of quantity surveying professionals working within the South African construction industry. The participants were limited to the Gauteng province, which represents the largest construction markets in South Africa. Following data screening and removal of incomplete responses, 49 valid responses were retained for analysis. The final sample therefore consisted of 49 practising quantity surveyors, representing a range of age groups and levels of professional experience. Although the sample size is small, it is comparable to other survey-based studies carried out in the built environment and offers sufficient data for thematic interpretation and exploratory statistical analysis. Inferential results should be interpreted as exploratory and indicative rather than fully generalizable due to the small sample size ($n = 49$). Comparable studies like Obubiyi et al. (2019), Windapo et al. (2023), and Otasowie et al. (2023) all used samples of roughly 50 to 100 respondents, and the results were consistent and statistically significant, supporting this study's sample size. Google forms were used to capture the respondent responses and Excel and SPSS version 30 were used to analyse the data. Data analyses included descriptive statistics to summarise the respondents overall patterns in perceptions. Inferential statistics were measured using non-parametric statistical tests to examine the differences between demographic groups. Both the Kruskal-Wallis H test and Pairwise Mann-Whitney U Test was used to evaluate whether the distribution of responses varied significantly across groups.

Qualitative data analysis was done by means of thematic analysis to identify patterns and recurring themes. Qualitative insights were used to provide additional contextual background for quantitative research results to illustrate the ethical challenges associated with digital transformation in the construction industry. Ethical clearance for the study was obtained by the researcher from the University of the Free State and all respondents remained anonymous and data coded in line with the Protection of Personal Information Act 4 of 2013.

RESULTS

This section aims to establish what the respondent perceptions of ICT, Employability and ethical principles with the Quantity Surveying industry is. In addition, it is aimed to establish how results vary across demographic groups. Lastly, themes identified from qualitative insights are summarized and compared with quantitative insights. The result section is organised into four sections: (1) respondent demographics, (2) descriptive statistics describing

perceptions of ICT, employability and ethical principles and (3) differences across age, gender and experience groups and (4) integration of quantitative and qualitative results.

Demographic Information

Following data screening and the elimination of incomplete responses, 49 valid respondents were included in the final analysis. The respondents' demographic details are compiled in Table 1. Respondents older than 56 accounted for 10.2% of the sample, with the majority (63.3%) being between the ages of 25 and 45. In terms of gender distribution, 67.3% of respondents were men, 24.5% were women, and 8.2% would rather not reveal their gender. Respondents with 0–6 years of experience accounted for the largest group (34.7%), closely followed by professional with 6–10 years of experience (32.7%). 32.6% of the sample consisted of respondents with more than ten years of work experience.

Table 1: Respondent profile.

Variable	Category	n
%		
Age		
12.2	Under 25 years	6
34.7	25–35 years	17
28.6	36–45 years	14
14.3	46–55 years	7
10.2	56 years and older	5
Gender		
67.3	Male	33
24.5	Female	12
8.2	Prefer to not disclose	4
Experience		
34.7	0–6 years	17
32.7	6–10 years	16
16.3	11–15 years	8
16.3	More than 15 years	8

Perceptions of ICT, Employability and Ethical Principles

The perceptions of respondents on the influence of ICT on employability, the importance of ICT skills, the importance of ethical principles in technology adoption and the need for continuous ICT upskilling are presented in Table 2. 63.3% of respondents agreed that ICT somewhat influences their ability to maintain employment, while 12.2% strongly agreed. A combined total of 75.5% acknowledge the fact that ICT influences their ability to maintain employment, suggesting that it is widely perceived as important to maintain

employment in the industry. The importance of ICT skills on employability was also perceived to be increasingly important for long term professional relevance with 44.9% of respondents indicating that it is very important, while 34.7% indicated that it is somewhat important. Combined, 79.6% of participants recognized that ICT skills are important for sustaining employment in the profession. On the aspect of the importance of ethical principles in digital technology adoption, 61.2% of respondents agreed and 22.4% strongly agreed. Combined a high percentage (83.7%) of study participants perceived ethical principles as an important aspect of digital technology adoption. Lastly, a significant portion (77.6%) of respondents indicated that they had to learn new ICT skills to remain relevant in the Quantity Surveying profession. This clearly suggests that the profession is widely perceiving ICT skills as increasingly important to remain relevant and competitive in the profession.

Table 2: Perceptions of employability and ethics in relation to ICT adoption.

Variable	Response distribution (%)	Mean	SD	Rank
ICT impact on ability to maintain employment	2.0 (Def. not) / 6.1 (Not) / 16.3 (Neutral) / 63.3 (Somewhat) / 12.2 (Strongly)	3.78	0.82	4
Importance of ICT skills for long-term employability	20.4 (Neutral) / 34.7 (Somewhat) / 44.9 (Very)	4.24	0.73	2
Ethical principles important in technology adoption	16.3 (Neutral) / 61.2 (Agree) / 22.4 (Strongly agree)	4.06	0.68	3
Had to learn new ICT skills to remain relevant	22.4 (No) / 77.6 (Yes)	–	–	1*

Differences in Perceptions across Demographic Groups

To determine if ICT and ethical considerations differed between demographic groups, non-parametric statistical tests were conducted. Kruskal-Wallis H test was conducted for comparisons between more than 2 groups (age and experience categories), while Pairwise Mann-Whitney U tests were conducted for two group comparisons (gender, collapsed age and experience categories). Table 3 summarises the results of the non-parametric statistical tests.

Table 3: Summary of non-parametric test examining demographic differences in ICT employability and ethics perceptions.

Dependent variable	Grouping variable	Test	Statistic	df	p-value
Employability perception	Age (5 groups)	Kruskal–Wallis H	2.366	4	0.669
Employability perception	Experience (4 groups)	Kruskal–Wallis H	4.582	3	0.205
Employability perception	Gender (Male vs Female)	Mann–Whitney U	178.5	–	0.568
Employability perception	Age grouped (≤ 40 vs >40)	Mann–Whitney U	204.0	–	0.553

(Continued)

Table 3: Continued.

Dependent variable	Grouping variable	Test	Statistic	df	p-value
Employability perception	Experience grouped (≤ 10 vs > 10 years)	Mann–Whitney U	256.0	–	0.747
Ethical principles perception	Age (5 groups)	Kruskal–Wallis H	0.387	4	0.984
Ethical principles perception	Experience (4 groups)	Kruskal–Wallis H	1.023	3	0.796
Ethical principles perception	Gender (Male vs Female)	Mann–Whitney U	183.0	–	0.661
Ethical principles perception	Experience grouped (≤ 10 vs > 10 years)	Mann–Whitney U	235.0	–	0.523

Note: Kruskal–Wallis tests were applied for comparisons involving more than two groups, while Mann–Whitney U tests were used for two-group comparisons. Significance was evaluated at $\alpha = 0.05$.

To determine if ICT's impact on employment differed across age groups, a Kruskal–Wallis H test was conducted. The results interestingly indicated no statistically significant differences between the five age categories. Similarly, to determine if any differences exist between the perceptions of respondents on employability across the experience groups, another Kruskal–Wallis H test was done. The results also indicated no statistically significant differences across the experience groups. Furthermore, several Pairwise Mann–Whitney U tests were conducted to assess employability perceptions across collapsed experience groups (≤ 10 vs > 10 years) and collapsed age groups (≤ 40 vs > 40). Both revealed no statistically significant differences between the collapsed groups. Ethical perceptions across age, experience and gender groups were also examined using Kruskal–Wallis H tests and Pairwise Mann–Whitney U tests, all of which revealed no statistically significant results. Overall, the inferential statistical analysis indicates that perceptions regarding ICT employability impacts and ethical considerations are broadly shared across demographic groups within the profession.

Integration of Quantitative and Qualitative results

To find recurrent themes about ethical issues and the professional implications of adopting digital technology, thematic analysis was used to explore qualitative responses. A combined summary of the quantitative and qualitative results is shown in Table 4. The qualitative responses revealed several important themes. Professional accountability for digital outputs and data security and confidentiality were the most frequently identified themes. Respondents emphasized the need for strong data security measures and voiced concerns on the possible misuse of private project information. Respondents noted that when multiple stakeholders contribute to the digital environment, there is uncertainty regarding the ownership of BIM models. This was another frequently mentioned theme pertaining to intellectual property and ownership of digital models. Concerns about digital inequality were also raised by respondents, who pointed out that professionals or smaller businesses with

less access to sophisticated digital tools might be at a disadvantage in an industry that is becoming increasingly reliant on technology. Respondents highlighted the significance of ongoing professional development, ethical use of digital tools, and retaining professional judgment when interpreting automated outputs in relation to evolving professional responsibilities. By highlighting the wider professional obligations connected to ICT adoption, these qualitative findings supplement the quantitative results and offer a deeper understanding of the ethical implications of digital transformation.

Table 4: Summary of quantitative and qualitative findings.

Theme	Quantitative finding	Qualitative finding	Integrated interpretation
ICT and employability	75.5% of respondents indicated that ICT somewhat or strongly impacts their ability to maintain employment	Respondents noted that digital technologies are changing how work is performed and that professionals must remain technologically current to stay relevant	ICT is perceived as influencing employability by shifting the basis of professional relevance toward digital capability
Importance of digital skills	79.6% regarded ICT skills as somewhat or very important for long-term employability	Respondents emphasised lifelong learning, digital upskilling and adaptation to changing technologies	Digital skills are increasingly viewed as essential for maintaining competitiveness in the quantity surveying profession
Continuous upskilling	77.6% reported that they had to learn new ICT skills to remain relevant	Respondents referred to the need for ongoing training and adapting to new digital workflows	Digital transformation is not only changing tools, but also requiring continuous professional development
Ethical principles in technology adoption	83.7% agreed or strongly agreed that ethical principles are important in technology adoption	Respondents raised concerns about data security, confidentiality, intellectual property and accountability for digital outputs	Ethical concerns are an important dimension of digital transformation and are recognised alongside the functional benefits of technology
Digital accountability	No significant demographic differences were found in perceptions of ethics	Qualitative responses highlighted responsibility for digital outputs and the need for professional judgement when using automated systems	Ethical responsibilities appear to be broadly recognised across the profession rather than confined to specific demographic groups
Profession-wide impact of digital transformation	No statistically significant differences were found across age, experience or gender groups for employability or ethics perceptions	Respondents across groups expressed similar concerns about relevance, skills and ethics	Digital transformation appears to be experienced as a profession-wide issue rather than a subgroup-specific issue

DISCUSSION

The study revealed several noteworthy findings, including large proportions of respondents indicating ICT impacts on their ability to maintain employment, the importance of ICT skills for long term employability and the fact that professionals widely had to learn new ICT skills to remain relevant in the Quantity Surveying profession in South Africa. These findings echo the fact that digital skills are increasingly viewed as a core component of the Quantity Surveying profession in South Africa. The growing significance of ICT and digital competencies in the field of quantity surveying is widely acknowledged in the literature (Arijeloye & Ramabodu, 2025; Mavasa & Terblance, 2023), but these studies primarily concentrate on organizational readiness, educational preparedness, and technological adoption. There is limited empirical data that accurately reflects practicing quantity surveyors' perspectives about how ICT affects their employability. As a result, rather than being directly tested, the relationship between ICT capability and employment sustainability has mostly been assumed. This study adds to the body of knowledge by presenting empirical data from working professionals showing that ICT is thought to have a major impact on employability and long-term career relevance in the South African quantity surveying industry. Importantly, the results do not indicate that ICT is replacing the Quantity Surveyor but rather changing their role. Digital technologies require the Quantity Surveyor to adapt their skill set, with a focus on augmentation rather than eliminating the professionals. The need for continuous digital upskilling is evident with a large majority of respondents reporting that new ICT skills were learned to remain professionally relevant and competitive in the industry. Quantity surveyors should adopt a mindset of lifelong learning to increasingly incorporate digital technologies, data literacy and digital project management skills to equip professionals for the evolving construction industry.

The results highlight the importance of ethical considerations when adopting digital technologies, with 83.7% of respondents indicating the belief that ethical considerations are important, suggesting strong recognition of ethical responsibility within the profession. Several key ethical concerns were further identified in the qualitative study pointing to data security, accountability, confidentiality, ownership of digital models and unequal access to digital technologies. The Quantity Surveyor may be required in future to assume greater responsibility for ensuring integrity of data, accountability and confidentiality of project information. Inferential statistics furthermore revealed that no statistically significant differences exist between age, experience or gender groups regarding employability impacts or ethical considerations. The findings suggest that digital transformation is not perceived as a generational or demographic issue and is a profession wide phenomenon affecting all Quantity Surveyors. Collectively the findings suggest that the profession is undergoing significant transformation and that digital technology is reshaping professional competencies and ethical responsibilities.

CONCLUSION

The findings of this study successfully achieved its objectives by identifying the impact of digital technology on employability, establishing the importance of maintaining digital skills for industry relevance and identifying ethical considerations with the increasing adoption of digital technologies. Furthermore, the objectives of how perceptions regarding digital technologies differ across demographic groups have been satisfied. The findings confirmed that digital technologies influences employability, that digital competencies are increasingly important for long term employment and professional relevance. The findings further confirm that many professionals have already acquired new digital technology skills to remain competitive with the profession. The study highlights the importance of ethical considerations associated with digital technology relating to, among others, data security, accountability and ownership of digital models. Perceptions of digital technologies and its implications are broadly shared across the profession, with no statistically significant differences across the demographic groups. The findings suggest that digital technologies are not replacing the Quantity Surveyor, but rather transforming the competencies required by the profession. The Quantity Surveyor will continue to evolve with the evolution of digital technology to combine traditional cost management skills with digital literacy, advanced analytical capabilities and ethical decision-making skills to remain relevant in the modern construction industry.

The study recommends that industry stakeholders, professional bodies and higher educational institutions prioritize continuous professional development in digital technologies. Professional bodies like the South Africa Council for Quantity Surveyors Profession (SACQSP) and voluntary associations such as the Association of Quantity Surveyors (ASAQS) initiate structured ICT training and upskilling. Educational institutions should place more emphasis on digital literacy, data management and emerging technologies to prepare graduates for the rapidly shifting digital construction industry. Industry stakeholders and SACQSP should develop and enforce clear ethical standards and guidelines relating to data security, confidentiality, intellectual property and accountability for digital outputs. Increased collaboration between industry stakeholders, academia and professional bodies should be encouraged to ensure a coordinated approach to digital technology.

Future research includes larger scale surveys across multiple regions of South Africa. More in-depth investigation into the relationship between adoption of digital technology and measurable professional outcomes such as productivity, project performance and career progression. Such research could contribute to a better understanding of how digital technology is advancing the profession and professional practice.

ACKNOWLEDGEMENT

The authors would like to acknowledge the University of the Free State for providing ethical clearance and institutional support for this study. Appreciation is extended to all the registered Quantity Surveyors who participated in the survey and contributed valuable insights into the research.

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