COMPETITIVE INTELLIGENCE QUALITY ASSURANCE MODEL: A PROPERTY SECTOR CASE

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Abstract

Competitive intelligence (CI) improves the quality of products and services, decision-making, and quality of life (Ram & Zhang, 2021). However, decision-makers are not satisfied with the quality of CI (Kordestani et al., 2021). Enterprises lack clarity and fail to ensure the quality of CI (Alshammakh & Azmin, 2021). Studies that previously attempted to resolve CI quality problems were limited in scope and focused too much on the quality of information rather than the overall CI quality. The purpose of this study is to test and validate an empirical CI quality assurance model, which will aid in the quality assurance of CI. The research was quantitative in nature and employed a questionnaire to collect data. The study randomly sampled 385 property practitioner firms from a population of 5226. Descriptive statistics and regression analysis were used to describe and assess the reliability and validity of the CI quality assurance model. The research identified six factors that influence the quality assurance of CI, namely, decision-makers, process and structure, organisational awareness and culture, and feedback, planning and direction, information collection, sorting, capturing, and storage, information analysis, and organisational culture, feedback, and CI dissemination. The research also confirmed that the model is valid and reliable.

Keywords: Competitive Intelligence, Quality Assurance, Property Sector, Competitive Advantage, Decision-Making

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1. INTRODUCTION

Competitive intelligence (CI) monitors competitors to deliver both actionable and meaningful intelligence to organizations (Ranjan & Foropon, 2021; Maune & Themalil, 2022). Several studies have reported on the awareness and practice of CI in South Africa (Ranjan & Foropon, 2021; Asri & Mohsin, 2020). These studies indicate that CI is practised by both small and large firms (Asri & Mohsin, 2020). While it is reported that the ICT industry dominates CI practice in South Africa, other sectors are catching up (Maune, 2021). The South African real estate industry is aware of and practices CI (Maune, 2019). The real estate industry of South Africa is a major contributor to wealth and job creation (The Property Practitioners Regulatory Authority [PPRA], 2020, 2021). Moreover, the industry contributes highly to skills development, reduction of inequality, and eradication of poverty (PPRA, 2019, 2020). Economically, it contributes one hundred nighty-one billion rands (R191B) to the gross domestic product (GDP) of South Africa. Moreover, it contributes forty-six billion rands (R46B) to the fiscus (Kilian, 2016). It is a very competitive industry, and firms are constantly looking for a competitive advantage, hence the CI practice (Moropane et al., 2023).

CI helps in making quality decisions, improving product or service quality, and enhancing the overall quality of life (Hanif et al., 2022). Moreover, CI helps improve the quality of employees' skills. The quality of CI should be improved for firms to realise these benefits (Alshammakh & Azmin, 2021). Quality CI provides a competitive advantage to firms (de las Heras-Rosas & Herrera, 2021). According to Priporas (2019) and Rahma and Mekimah (2023), quality CI improves the performance of strategic planning and marketing of the business. Moreover, it helps businesses to produce products that meet the current demands of the market (Rahma & Mekimah, 2023; Uzoma & Hamilton, 2022).

CI must be of quality, or there is no point in having it (Hanif et al., 2022). Practitioners and decision-makers are not satisfied with the quality of CI (Dou & Fournie, 2021). Firms struggle to find quality sources of information and are overly focused on the quality of information rather than the quality of CI (Kordestani et al., 2021). Firms are uncertain about the quality assurance of CI (du Toit, 2013). This situation presented an opportunity to research CI quality practices. In light of this, Nenzhelele (2015) developed a conceptual CI quality assurance model to assist firms in producing quality CI. However, the model was not empirically tested for validity and reliability. Hence, this study aimed to empirically test the conceptual CI quality assurance model in the South African property sector. This study aimed to answer the following questions:

RQ1. How valid and reliable is the CI quality assurance model?

The study was quantitative in nature and used a web-based questionnaire to collect data from South African property practitioner firms randomly sampled. The study found that the CI quality assurance is valid, reliable, and acceptable for use. This study is in line with the quality assurance theory by Biehl (1991), which concludes that putting quality first is the lowest cost-cutting approach. Thus, avoiding quality concerns in production is cheaper than solving quality-related problems after releasing products and services. Decisions made from quality CI would save firms money in fixing problems related to poor decision-making (Alrashedi, 2023).

This paper is structured as follows. Section 2 discusses the review of relevant literature. Section 3 describes the research methodology followed in the study. Section 4 analyses the qualitative and quantitative data and discusses the findings. Section 5 makes conclusions and recommendations of the study.

2. LITERATURE REVIEW

The hallmark of quality decision-making that yields competitive advantage is quality CI (Alrashedi, 2023; Rouhi et al., 2023). Quality decision-making saves firms costs of fixing problems associated with poor quality decision-making. Poor quality decision-making may be associated with damage to firms' reputations. Repairing a damaged reputation is very costly. Hence, Biehl (1991) concluded that putting quality first is the lowest cost-cutting approach. Biehl (1991) recommends that quality concerns be avoided in production instead of fixing them after the release of products or services, which is usually very costly. Hence, Lin et al. (2023) recommend high-quality CI to achieve quality decision-making, products, and services. Quality products and services have a positive influence on business performance (Uzoma & Hamilton, 2022). Quality CI improve service delivery (Rouhani et al., 2023). Hence, firms should be concerned about the quality of CI.

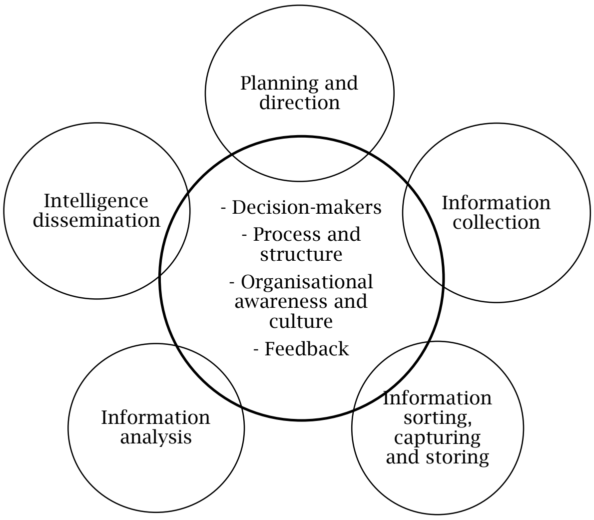
2.1. Definition of competitive intelligence

There are several definitions of CI in the literature (Pizzo et al., 2017). Scholars are concerned that so many definitions may confuse the practice and field of CI (Uzoma & Hamilton, 2022). Moreover, it may create many boundaries for the practice of CI (Isichei et al., 2023). It has been found that some of these definitions differ solely on the use of synonyms and swapping of terms (Lin et al., 2023). It is recommended that CI practitioners and scholars agree on a common and universal definition of CI (Madureira et al., 2021a). This may enable CI professionals to focus on the production of actionable intelligence without confusion (Madureira et al., 2021b). Moreover, this will differentiate CI from industrial espionage, and it has been claimed that there is a thin line between these two (Houa & Wang, 2020). Realising the problem of endless definitions, Pellissier and Nenzhelele (2013a) analysed fifty CI definitions to establish commonalities and differences to propose a comprehensive and universally acceptable definition. Pellissier and Nenzhelele (2013b) define CI as "a process or practice that produces and disseminates actionable intelligence by planning, ethically and legally collecting, processing, and analysing information from and about the internal and external or competitive environment to help decision-makers in decision-making and to provide a competitive advantage to the enterprise" (p. 5). This definition will be used for the purpose of this study.

2.2. Competitive intelligence process

Competitive intelligence is a process, product, and practice. Process-oriented CI helps build new capabilities and enhances formalisation (Maune, 2021). Moreover, process-oriented CI enhances the quality of actionable intelligence (Wu et al., 2023). Subsequently, process-oriented CI helps with quality decision-making, products, and services (Lin et al., 2023). Moreover, it grants firms a competitive advantage over rivals (Rahma & Mekimah, 2023). CI process has been portrayed as a circle to indicate that it is continuous and that the end product of one phase is the input of the next phase (Salguero et al., 2017). There are influential factors that play a role during the CI process (Bartes, 2014). Figure 1 shows the CI process. The CI process is made up of the following steps (Pellissier & Nenzhelele, 2013b): planning and direction; information collection; information sorting, capturing, and storing; information analysis; intelligence dissemination; and influential factors, namely, decision-makers, process and structure, organisational awareness and culture, and feedback. According to Pellissier and Nenzhelele (2013b), these steps and their influential factors are interlinked, and the outcome of one step influences the next step. Figure 1 indicates the steps of the CI process.

Figure 1. Competitive intelligence process



Source: Pellissier and Nenzhelele (2013b).

2.3. South African property sector competitive intelligence practice

The South African property sector contributes R5.8 trillion to the South African economy (Property Sector Charter Council [PSCC], 2018). The country relies on the sector to correct the economic imbalance caused by the apartheid regime (PPRA, 2022, 2023). It does so by providing shelter to those who previously did not have it and creating opportunities for wealth creation and storage (PPRA, 2021, 2022). The sector has over 5000 registered property practitioner firms and thousands of qualified, competent, knowledgeable, and skilled property practitioners. These firms and practitioners serve and protect the interests of the public (PPRA, 2018, 2019).

Due to the increase in firms and property practitioners, competition is very high in the South African property sector. In order to survive and gain a competitive advantage in this sector, firms have to implement tools that provide them with an edge over rivals. CI is one of the tools firms use to gain a competitive advantage over competitors (Pizzo et al., 2017; Orozco-Silva & Más-Basnuevo, 2017). South African property practitioner firms are aware of and practice CI to survive and gain a competitive advantage over rivals (Nenzhelele, 2016).

2.4. Competitive intelligence quality assurance

Quality assurance is defined by Dunckley and Elta (2011) as a process of monitoring and assessing a product, service, or process to ensure that it is of sufficient quality. The purpose of quality assurance is to ensure that each phase in a process is fulfilling its objectives and that the whole process is of quality. To ensure this happens, there must be quality checks, validation and verification, and communication of the results (Eriksson & Motte, 2013).

It is quality CI that offers a competitive advantage, helps in making quality decisions, improves the quality of products or services, and enhances the overall quality of life (Ram & Zhang, 2021). Quality CI produces quality strategic plans, ensures management continues to invest in CI, and holds decision-makers accountable (Al Dabbas & Alkshali, 2021). Therefore, quality should be the ultimate goal of CI practice (Kettunen, 2021). While firms have acknowledged the need to improve CI quality, they are clueless about quality assurance (du Toit, 2013; Jin & Ju, 2014; Köseoglu et al., 2021). Since the phases of CI are interconnected, all the phases must be quality-assured (Gaspareniene et al., 2013, Yılmaz & Özgener, 2022). Nenzhelele (2016) conceptualised the CI quality assurance model that is depicted in Figure 2. According to this conceptual model, all steps of the CI process should be quality-assured to ensure that actionable intelligence is of high quality. Thus, there are quality checklists or questions that should be answered to verify that CI is of high quality. Nenzhelele (2015) recommends that the following questions be asked during each CI process step:

Planning and direction: Has the firm appointed CI professionals? Do CI professionals have formal training in CI? Do CI professionals have work experience in CI? Are key intelligence topics (KITs) clearly defined and unambiguous? Are KITs discussed in a formal meeting between CI professionals and decision-makers? Are changes in KITs communicated to CI professionals by decision-makers immediately when they happen? Are KITs prioritised?

Information collection: Are information sources quality checked and evaluated? Is information quality checked and evaluated? Is information collected legally and ethically?

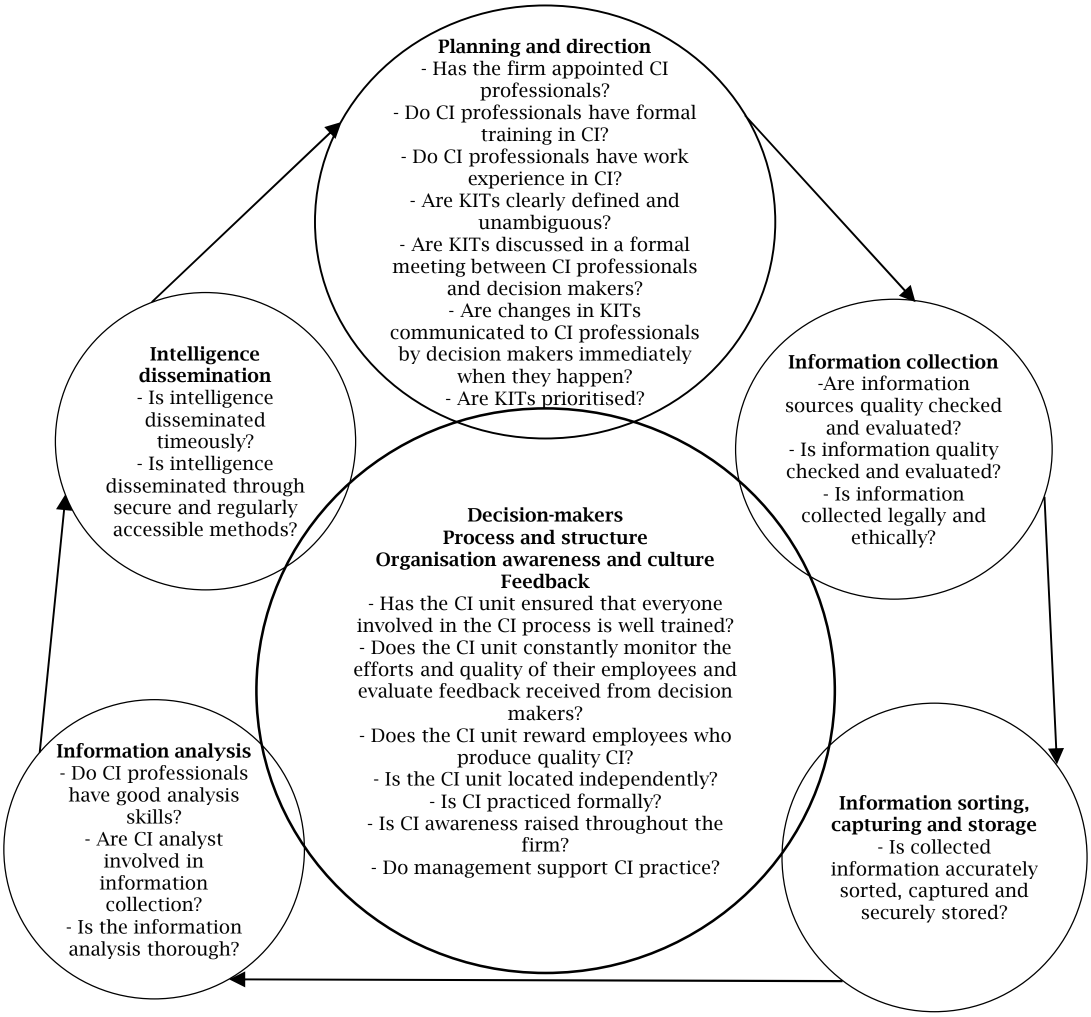
Information sorting, capturing and storage: Is collected information accurately sorted, captured, and securely stored?

Information analysis: Do CI professionals have good analysis skills? Are CI analysts involved in information collection? Is the information analysis thorough?

Intelligence dissemination: Is intelligence disseminated timeously? Is intelligence disseminated through secure and regularly accessible methods?

Decision-makers, process and structure, organisation awareness and culture, feedback: Has the CI unit ensured that everyone involved in the CI process is well trained? Does the CI unit constantly monitor the efforts and quality of their employees and evaluate feedback received from decision-makers? Does the CI unit reward employees who produce quality CI? Is the CI unit located independently? Is CI practised formally? Is CI awareness raised throughout the firm? Does management support CI practice?

Figure 2. Competitive intelligence quality assurance conceptual model



Source: Nenzhelele (2015).

3. RESEARCH METHODOLOGY

While there are three research methods to choose from, namely, qualitative, quantitative, and mixed, this study was quantitative in nature (Saunders et al., 2019). Quantitative research generates factual and reliable data that can be generalised to a larger population (Saunders et al., 2019). However, according to Saunders et al. (2019), qualitative research data cannot be generalised to the larger population due to the nature of the smaller sample. The mixed method combines both qualitative and quantitative. South African property sector firms were the population for this research. Population is defined as the total group or set of individuals, events, or objects with specific characteristics the research is interested in (Thomas, 2023). According to the PPRA (2015, 2016), there are 5,226 registered property practitioner firms in South Africa. Although there are two types of sampling, namely, probability and non-probability, probability sampling was used for the purpose of this research. Probability sampling gives every subject an equal opportunity to be selected, whereas non-probability sampling does not give the subjects an equal opportunity to be selected (McCombes, 2019). According to Cordoni (2011), a sample of about 360 is suitable for a population of approximately 5,000 in order to achieve a 95% degree of confidence with a minimum detectable prevalence of 0.8%. Hence, this study randomly sampled 360 property practitioners' firms from 5,226. A web-based questionnaire developed from a literature review was used to collect data from South African property practitioner firms. The questionnaire used closed-ended questions. These included a 5-point Likert scale to establish the level of agreement with CI quality assurance variables and their elements. The study achieved 103 responses, yielding a response rate of 29%. Data cleaning led to 71 usable responses. Data was collected over a period of two weeks. All the property practitioner firms participated in this study voluntarily and gave their informed consent. Thus, they could withdraw at any given point. The collected data was exported from an online survey into a Microsoft Excel spreadsheet and further exported into Statistical Package for the Social Sciences (SPSS) for analysis. Data was analysed with the help of a statistician. Exploratory factor analysis (EFA) and Cronbach's alpha were used to test the data for validity and reliability, respectively. Mean and standard deviation were used to describe the data. Regression was used in this study to analyse the validity and reliability of the CI quality assurance model.

4. RESULTS

This section discusses and analyses the results of this research highlighting data validity and reliability, descriptive statistics, and empirical CI quality assurance model.

4.1. Data validity and reliability

Exploratory factor analysis was used in this study to test the validity of collected data. EFA produces a smaller number of combinations of original factors that may fulfil the objective of the study (Garson, 2009). This study achieved 103 responses and is therefore suitable for analysis according to Hair et al. (1998), who state that a minimum sample of 60 respondents is suitable for analysis in the quantitative study.

To establish commonality between variables, the Kaiser-Meyer-Olkin (KMO) index was used. KMO index value ranges from 0 to 1, with 0.50 or more regarded as suitable for further analysis. The Bartlett's test of sphericity is used to test significance. The study makes a significant contribution if the $p \leq 0.05$. The variables of this study have a KMO index value of 0.891 with a $p \leq 0.05$ and thus warrant further analysis. Table 1 shows the KMO index and Bartlett's test of sphericity of the variables.

Table 1. KMO index and Bartlett's test of sphericity the variables

Kaiser-Meyer-Olkin measure of sampling adequacy		0.891
Bartlett's test of sphericity	Approx. Chi-square	2216.484
	df	378
	p-value	0.000

Principal component analysis (PCA) is used in this study to extract factors that influence CI quality assurance. Three criteria are used in this study to extract valid factors, namely Kaiser's criteria (eigenvalue > 1 rule), the scree test, and the rotation method. These are the most commonly used criteria for the extraction of valid factors (Williams et al., 2010). Table 2 indicates six strong factors with an Eigenvalue greater than one. These factors qualify for extraction according to the eigenvalue > 1 rule (Linacre, 2005). The eigenvalue of the six extracted factors ranges between 16.793 and 1.102. The percentage of variance accounted for these factors ranges between 59.976 and 2.792. The six extracted factors for further analysis in this study account for 81.95% of the total variance.

Table 2. Total variance explained

Component	*Initial eigenvalues*			*Extraction sums of squared loadings*			*Rotation sums of squared loadings*		
	Total	*% of variance*	*Cumulative %*	*Total*	*% of variance*	*Cumulative %*	*Total*	*% of variance*	*Cumulative %*
1	16.793	59.976	59.976	16.793	59.976	59.976	6.870	24.537	24.537
2	1.775	6.338	66.313	1.775	6.338	66.313	5.508	19.670	44.207
3	1.489	5.317	71.630	1.489	5.317	71.630	3.086	11.023	55.230
4	1.118	3.993	75.623	1.118	3.993	75.623	2.832	10.116	65.346
5	1.109	3.531	79.154	0.989	3.531	79.154	2.596	9.270	74.616
6	1.102	2.792	81.946	0.782	2.792	81.946	2.052	7.330	81.946
7	0.631	2.253	84.199						
8	0.574	2.049	86.249						
9	0.505	1.802	88.051						
10	0.442	1.577	89.628						
11	0.389	1.389	91.017						
12	0.342	1.222	92.239						
13	0.317	1.132	93.371						
14	0.279	0.997	94.368						
15	0.252	0.900	95.269						
16	0.224	0.798	96.067						
17	0.211	0.753	96.820						
18	0.181	0.648	97.467						
19	0.126	0.450	97.917						
20	0.103	0.367	98.284						
21	0.096	0.342	98.626						
22	0.088	0.313	98.940						
23	0.071	0.253	99.193						
24	0.069	0.248	99.441						
25	0.052	0.187	99.628						
26	0.047	0.167	99.795						
27	0.034	0.123	99.918						
28	0.023	0.082	100.000						

Note: Extraction method: PCA.

Following Costello and Osborne's (2005) advice of using multiple criteria to extract valid factors, the orthogonal varimax rotational method opposed to oblique rotation was used in this study as it is the most commonly used and it produces few factors with large loadings and many factors with few loadings. Also, orthogonal varimax rotation assumes that the variables are not correlated, whereas oblique rotation assumes that the variables are correlated (Costello & Osborne, 2005).

This study aimed to retain factors with more variable loading. The rule of thumb is to retain factors that load at a minimum of 0.3 and eliminate those factors that load below 0.3 (Tabachnick & Fidell, 2007). Costello and Osborne (2005) conclude that factors with fewer than three items loading are weak and unstable. To ensure that only the factors that are stronger, stable, and yield the most interpretable results are retained, this study considered factors with an eigenvalue ≥ 1 and have a minimum of three items loading at 0.4. Consequently, only five factors were extracted and retained for further analysis in this study. Table 3 indicates the items loading per factor.

Table 3. Items loading per factor

CI quality assurance variable items		*Component*					
		1	*2*	*3*	*4*	*5*	*6*
Q2	The extent of quality assurance.			0.825			
Q3_1	Our firm appoints CI professionals.	0.814					
Q3_2	Our CI professionals have formal training in CI.	0.845					
Q3_3	Our CI professionals have work experience in CI.	0.824					
Q3_4	KIT are clearly defined and unambiguous.	0.649					
Q3_5	KIT are discussed in a formal meeting between CI professionals and decision-makers.	0.741					
Q3_6	Changes in KIT are communicated to CI professionals by decision-makers immediately when they happen.	0.745					
Q3_7	KIT are prioritised.	0.787					
Q3_8	Our information sources are quality-checked and evaluated.					0.638	
Q3_9	Information quality is checked and evaluated.					0.617	
Q3_10	Information is collected legally and ethically.					0.846	
Q3_11	Collected information is accurately sorted, captured and securely stored.			0.729			
Q3_12	Our information analysis is thorough.						0.712
Q3_13	Our CI analysts are involved in information collection.						0.734
Q3_14	Our CI professionals have good analysis skills.						0.725
Q3_15	Intelligence is disseminated to decision-makers timeously.				0.662		
Q3_16	Intelligence is disseminated through secure and regularly accessible methods.				0.617		
Q3_17	Our CI unit ensures that everyone involved in the CI process is well-trained.		0.775				
Q3_18	Our CI unit constantly monitors the efforts and quality of its employees and evaluates feedback received from decision-makers.		0.708				
Q3_19	Our CI unit rewards employees who produce quality CI.		0.746				
Q3_20	Our CI unit is located independently.		0.762				
Q3_21	We practice CI formally.		0.707				
Q3_22	We raise CI awareness throughout the firm.		0.646				
Q3_23	Our management supports CI practice.		0.707				
Q3_24	We receive constant feedback throughout the CI process.				0.646		
Q3_25	CI received is considered for continuous improvement.				0.791		
Q3_26	Our firm is structured to facilitate CI practice.				0.652		
Q3_27	Our business processes enable CI practice.				0.776		

Note: Extraction method: PCA. Rotation method: Varimax with Kaiser normalization. Rotation converged in 10 iterations.

The Cronbach's coefficient alpha is used to test the internal consistency because it is the most common and widely used method (DeVellis, 2006). The following three criteria for judging Cronbach's alpha results proposed by DeVellis (2006) are used in this study: reliability is considered good when the Cronbach's alpha is above 0.8; reliability is considered acceptable when the Cronbach's alpha is between 0.6 and 0.8; and reliability is considered unacceptable when the Cronbach's alpha is below 0.6.

The reliability of CI quality assurance factors is indicated in Table 4. The planning and direction factor consists of seven items. The Cronbach's alpha of planning and direction is 0.938. Thus, the reliability of planning and direction factors is good. The information collection factor consists of two items. The third item "information is collected legally and ethically" was removed as it was found unreliable. The Cronbach's alpha of the information collection factor is 0.931. Thus, the reliability of the information collection factor is good. The decision-maker's process and structure organisation awareness and culture feedback factor consist of seven items. The Cronbach's alpha of this factor is 0.930. Thus, its reliability is good. The information analysis factor consists of three items. The Cronbach's alpha of this factor is 0.874. Thus, its reliability is good. The organisational culture, feedback, and CI dissemination factor combines items from the decision makers' process and structure organisation awareness and culture feedback factor and CI dissemination. It consists of six items. The Cronbach's alpha of this factor is 0.949. Thus, its reliability is good.

Table 4. Cronbach's alpha of competitive intelligence quality assurance factors

Factor	*Cronbach's alpha*	*Number of items*
Planning and direction	0.938	7
Information collection	0.931	2
Decision makers, process and structure organisation awareness and culture feedback	0.930	7
Information analysis	0.874	3
Organisational culture, feedback and CI dissemination	0.949	6

4.2. Descriptive statistics of competitive intelligence quality assurance factors

Table 5 indicates the descriptive statistics of valid and reliable CI quality assurance factors.

The standard deviation and mean of planning and direction factors are 1.233 and 3.37, respectively. The standard deviation indicates that there was less spread of responses to the items. The mean indicates that the majority of the respondents agree that planning and direction have an influence on CI quality assurance.

The standard deviation and mean of the information collection factor are 1.110 and 3.86, respectively. The standard deviation indicates that there was less spread of responses to the items. The mean indicates that the majority of the respondents agree that information collection has an influence on CI quality assurance.

The standard deviation and mean of decision-makers, process and structure, organisation awareness and culture, and feedback (*DPOF*) factor are 1.135 and 3.49, respectively. The standard deviation indicates that there was less spread of responses to the items. The mean indicates that the majority of the respondents agree that the *DPOF* factor has an influence on CI quality assurance.

The standard deviation and mean of the information analysis factor are 1.139 and 3.54, respectively. The standard deviation indicates that there was less spread of responses to the items. The mean indicates that the majority of the respondents agree that the information analysis factor has an influence on CI quality assurance.

The standard deviation and mean of organisational culture, feedback, and CI dissemination factor are 1.011 and 3.62, respectively. The standard deviation indicates that there was less spread of responses to the items. The mean indicates that the majority of the respondents agree that organisational culture, feedback, and CI dissemination have an influence on CI quality assurance.

Table 5. Descriptive statistics of competitive intelligence quality assurance factors

Factor	*Mean*	*Std. dev.*	*N*
Planning and direction	3.37	1.233	71
Information collection	3.86	1.110	71
Decision makers, process and structure, organisation awareness and culture, and feedback	3.49	1.135	71
Information analysis	3.54	1.139	71
Organisational culture, feedback and CI dissemination	3.62	1.011	71

4.3. Empirical competitive intelligence quality assurance model

This section provides an analysis of the different regression models that influence the CI quality assurance model.

The R^2 of these relationships was 0.885, indicating that 89% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.874, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.885–0.874) change in the relationships. The Durbin-Watson of the proposed model was 2.038, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the constant variable *DPOF* was -0.121, indicating a negative contribution to the model. Its p-value was 0.533, indicating a 46.7% level of confidence. Thus, its t-value of -0.627 is not significant. The b-value for the predictor information collection (*IC*) was -0.005, indicating a negative contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.930, indicating a 7% level of confidence. Thus, its t-value of -0.088 is not significant. The b-value for the predictor information sorting, capturing and storage (*ISCS*) was 0.079, indicating a positive contribution to the model. Thus, an increase in *ISCS* will lead to an increase in the dependent variable. Its p-value was 0.088, indicating a 91% level of confidence. Thus, its t-value of -0.978 is not significant. The b-value for the predictor organisational culture, feedback, and CI dissemination (*OFC*) was 0.070, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to a decrease in the dependent variable. Its p-value was 0.369, indicating a 63% level of confidence. Thus, its t-value of 0.905 is not significant. The b-value for the predictor information analysis (*IA*) was 0.201, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to a decrease in the dependent variable. Its p-value was 0.038, indicating a 96% level of confidence. Thus, its t-value of 2.124 is significant. The b-value for the predictor planning and direction (*PD*) was 0.235, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to a decrease in the dependent variable. Its p-value was 0.001, indicating a 100% level of confidence. Thus, its t-value of 3.391 is significant. Table 6 indicates the coefficients for the relationship between decision-makers, process and structure, organisation awareness and culture, and feedback and predictors variables.

Table 6. Coefficients for the relationship between *DPOF* and predictors variables

Model		*Unstandardized coefficients*		*Standardized coefficients*	*t-value*	*p-value*	*95.0% confidence interval for B*		*Collinearity statistics*	
		B	*Std. error*	*Beta*			*Lower bound*	*Upper bound*	*Tolerance*	*VIF*
1	Constant	-0.121	0.194		-0.627	0.533	-0.509	0.266		
	IC	-0.005	0.057	-0.006	-0.088	0.930	-0.119	0.109	0.444	2.254
	ISCS	0.079	0.064	0.088	1.248	0.217	-0.048	0.207	0.366	2.735
	ID	0.070	0.077	0.061	0.905	0.369	-0.085	0.225	0.400	2.499
	IA	0.201	0.095	0.213	2.124	0.038	0.012	0.390	0.178	5.611
	PD	0.235	0.069	0.260	3.391	0.001	0.097	0.374	0.306	3.269

Note: Dependent variable: DPOF. VIF — Variance inflation factor.

The R^2 of these relationships was 0.930, indicating that 93% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.927, suggesting that the addition or reduction of predictor variables will lead to a 0.3% (0.930–0.927) change in the relationships. The Durbin-Watson of the proposed model was 2.026, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the dependent variable *DPOF* was 0.258 indicating a positive contribution to the model. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 4.720 is significant. The b-value for the predictor *PD* was 0.248, indicating a positive contribution to the model. Thus, an increase in the dependent variable leads to an increase in *PD*. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 4.520 is significant. The b-value for the predictor *IA* was 0.265, indicating a positive contribution to the model. Thus, an increase in the dependent variable leads to an increase in *IA*. Its p-value was 0.001, indicating a 100% level of confidence. Thus, its t-value of 3.596 is significant. The b-value for the predictor *OFC* was 0.554, indicating a positive contribution to the model. Thus, an increase in the dependent variable leads to an increase in *OFC*. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 7.599 is significant. The b-value for the predictor *ISCS* was -0.055, indicating a negative contribution to the model. Thus, an increase in the dependent variable leads to a decrease in *ISCS*. Its p-value was 0.330, indicating a 67% level of confidence. Thus, its t-value of -0.978 is not significant. The b-value for the predictor *IC* was -0.007, indicating a negative contribution to the model. Thus, an increase in the dependent variable leads to a decrease in *ISCS*. Its p-value was 0.883, indicating a 12% level of confidence. Thus, its t-value of -0.147 is not significant. Table 7 indicates the coefficients for the relationship between *DPOF* and constant predictors.

Table 7. Coefficients for the relationship between *DPOF* and constant predictors

Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Correlations			Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Zero-order	Partial	Part	Tolerance	VIF
1	Constant	0.258	0.058		4.720	0.000	0.109	0.402					
	PD	0.248	0.055	0.267	4.520	0.000	0.139	0.357	0.897	0.417	0.121	0.206	4.846
	IA	0.265	0.074	0.273	3.596	0.001	0.119	0.411	0.924	0.343	0.096	0.125	8.020
	OFC	0.554	0.073	0.510	7.599	0.000	0.410	0.699	0.940	0.611	0.204	0.159	6.270
	ISCS	-0.055	0.056	-0.046	-0.978	0.330	-0.165	0.056	0.757	-0.099	-0.026	0.320	3.120
	IC	-0.007	0.047	-0.007	-0.147	0.883	-0.100	0.086	0.788	-0.015	-0.004	0.303	3.300

Note: Dependent variable: DPOF. VIF — Variance inflation factor.

The R^2 of these relationships was 0.464, indicating that 46% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.456, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.464–0.456) change in the relationships. The Durbin-Watson of the proposed model was 2.286, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the constant variable information collection was 1.543, indicating a positive contribution to the model. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 4.916 is significant. The b-value for the predictor planning and direction was 0.688, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 7.727 is significant. Table 8 indicates the coefficients for the relationship between *IC* and *PD*.

Table 8. Coefficients for the relationship between *IC* and *PD*

Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	Constant	1.543	0.314		4.916	0.000	0.917	2.170		
	PD	0.688	0.089	0.681	7.727	0.000	0.510	0.865	1.000	1.000

Note: Dependent variable: IC. VIF — Variance inflation factor.

The R^2 of this relationship was 0.523, indicating that 52% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.516, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.523–0.516) change in the relationships. The Durbin-Watson of the proposed model was 2.057, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the constant variable *OFC* was 1.512, indicating a positive contribution to the model. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 6.062 is significant. The b-value for the predictor *IA* was 0.590, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 8.704 is significant. Table 9 indicates the coefficients for the relationship between *IA* and *OFC*.

Table 9. Coefficients for the relationship between *IA* and *OFC*

Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	Constant	1.512	0.249		6.062	0.000	1.014	2.009		
	IA	0.590	0.068	0.723	8.704	0.000	0.454	0.725	1.000	1.000

Note: Dependent variable: OFC. VIF — Variance inflation factor.

The R^2 of this relationship was 0.349, indicating that 35% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.340, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.349–0.340) change in the relationships. The Durbin-Watson of the proposed model was 2.426, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the constant variable *PD* was 0.655, indicating a positive contribution to the model. Its p-value was 0.156, indicating an 84% level of confidence. Thus, its t-value of 1.433 is not significant. The b-value for the predictor *OFC* was 0.754, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 6.087 is significant. Table 10 indicates the coefficients for the relationship between *OFC* and *PD*.

Table 10. Coefficients for the relationship between *OFC* and *PD*

Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	Constant	0.655	0.457		1.433	0.156	-0.257	1.567		
	OFC	0.754	0.124	0.591	6.087	0.000	0.507	1.001	1.000	1.000

Note: Dependent variable: PD. VIF — Variance inflation factor.

The R^2 of this relationship was 0.338, indicating that 34% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.328, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.338–0.328) change in the relationships. The Durbin-Watson of the proposed model was 1.803, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable, and acceptable.

The b-value for the constant variable *ISCS* was 0.655, indicating a positive contribution to the model. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 4.343 is significant. The b-value for the predictor *IC* was 0.575, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 5.930 is significant. Table 11 indicates the coefficients for the relationship between *IC* and *ISCS*.

Table 11. Coefficients for the relationship between *IC* and *ISCS*

Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	Constant	1.684	0.388		4.343	0.000	0.911	2.458		
	IC	0.575	0.097	0.581	5.930	0.000	0.381	0.768	1.000	1.000

Note: Dependent variable: ISCS. VIF — Variance inflation factor.

The R^2 of this relationship was 0.613, indicating that 61% of the variation of the dependent variable is explained by the independent variables. The R^2 of this model represent a large practical effect size (Osteen & Bright, 2010). The adjusted R^2 of these relationships was 0.606, suggesting that the addition or reduction of predictor variables will lead to a 1% (0.613–0.606) change in the relationships. The Durbin-Watson of the proposed model was 2.174, which is closer to 2, indicating that the assumption of independent errors is acceptable. The statistical summary of these relationships indicates that the model fits the collected data. Thus, the model is valid, reliable and acceptable.

The b-value for the constant variable *IA* was 0.595, indicating a positive contribution to the model. Its p-value was 0.045, indicating a 95% level of confidence. Thus, its t-value of 2.041 is significant. The b-value for the predictor *ISCS* was 0.755, indicating a positive contribution to the model. Thus, an increase in this predictor variable will lead to an increase in the dependent variable. Its p-value was 0.000, indicating a 100% level of confidence. Thus, its t-value of 10.463 is significant. Table 12 indicates the coefficients for the relationship between *ISCS* and *IA*.

Table 12. Coefficients for the relationship between *ISCS* and *IA*

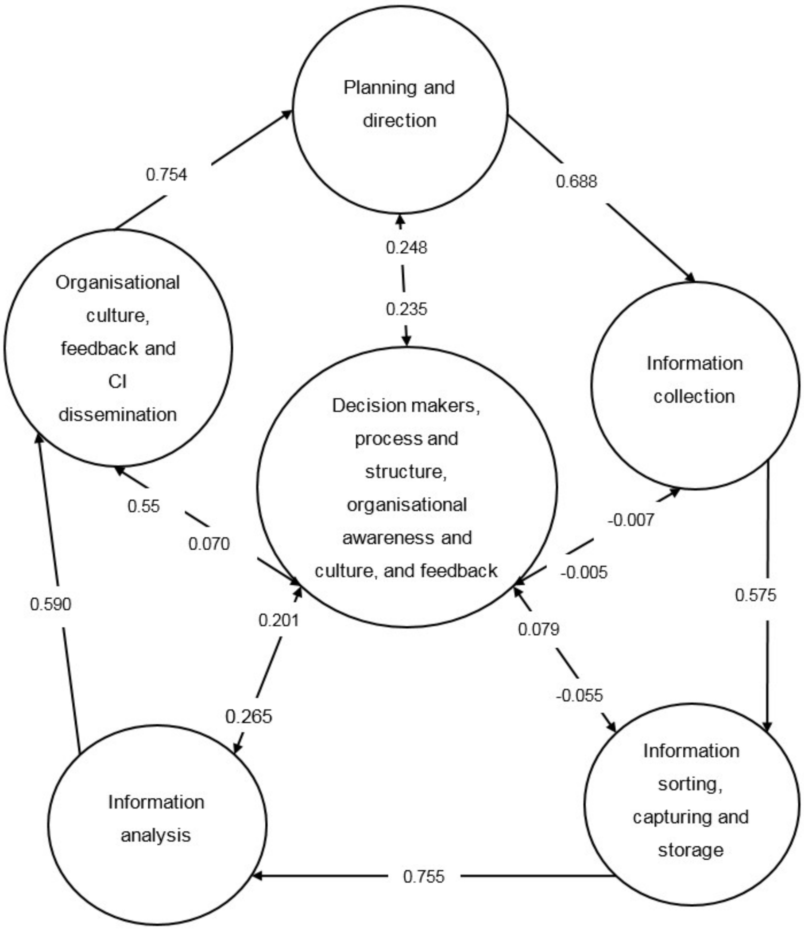
Model		Unstandardized coefficients		Standardized coefficients	t-value	p-value	95.0% confidence interval for B		Collinearity statistics	
		B	Std. error	Beta			Lower bound	Upper bound	Tolerance	VIF
1	Constant	0.595	0.291		2.041	0.045	0.013	1.176		
	ISCS	0.755	0.072	0.783	10.463	0.000	0.611	0.899	1.000	1.000

Note: Dependent variable: IA. VIF — Variance inflation factor.

4.4. Discussion

The results discussed above can be summarised by the CI quality assurance model depicted in Figure 3. The model indicates that quality assurance of *PD* positively influences *IC*. *IC* has a positive influence on *ISCS*. *ISCS* have a positive influence on *IA*. *IA* has a positive influence on *OFC*. *OFC* have a positive influence on *PD*. The CI quality assurance model indicates that *DPOF* positively influences *PD, IA,* and *OFC* whereas it negatively influences *IC* and *ISCS*. The CI quality assurance model also indicates that *DPOF* is positively influenced by *PD, IA, OFC*, and *ISCS* whereas it is negatively influenced by *IC*.

Figure 3. The empirical competitive intelligence quality assurance model



Source: Author's production from statistical tables.

5. CONCLUSION

Quality CI produces quality decision-making, strategic planning, strategic marketing, products, and services (Lin et al., 2023). Additionally, quality CI provides firms with improved performance, productivity, and competitive advantage (Uzoma & Hamilton, 2022). In the competitive real estate industry of South Africa, firms need a competitive advantage to survive and excel (PPRA, 2021, 2022). Moreover, the real estate industry needs quality CI to produce quality services, namely, sales and purchases (Nenzhelele, 2024). However, there have been concerns about the quality of CI; hence, this study was initiated (Alshammakh & Azmin, 2021). This study aimed to validate the CI quality assurance model conceptually developed by Nenzhelele (2016). The findings indicate that this study is valid and reliable through exploratory factor analysis and Cronbach's alpha, which are acceptable. The descriptive statistics indicate that these property practitioner firms agree that the identified variables influence CI quality assurance. The study concludes that this CI quality assurance model is valid, reliable, acceptable, and usable.

It is recommended that South African real estate firms use this CI quality assurance empirical model to produce quality CI. This model adds to the existing knowledge in CI. Moreover, it may be considered by CI policymakers in compiling and amending policies. Additionally, the government may also consider investing money into helping implement this model. However, the research's response rate is low and affects the generalisation of the results. Thus, this study may be repeated in the future to attract a good response rate. Furthermore, this study was quantitative in nature and future studies may follow a mixed-method approach. Moreover, the information sorting, capturing, and storage had only one question which negatively affected its validity and reliability. Future studies may explore more elements in relation to the information, capturing, and storage variable. This study was limited to the South African real estate sector and may not be generalised to other countries. Future studies may be conducted in other countries to validate the CI quality assurance model. Moreover, further research may be conducted in other sectors of the economy. Methodologically, this study has added to quantitative research in CI. Theoretically, the study has contributed to testing and validating a conceptual CI quality assurance model. Practically, property practitioner firms may use this CI quality assurance model to enhance the quality of CI.

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APPENDIX. QUESTIONNAIRE

This survey is completely anonymous and the information obtained will be kept confidential. It will take you at most 10 minutes to complete this questionnaire.

Competitive Intelligence refers to the collection of information from the internal and external environment (including your competitors) for the purpose of decision-making and gaining competitive advantage. For example, you check the prices of other businesses in order to set competitive prices. This can be done formally or informally.

Thank you for participating in our survey. Your feedback is important.

1. Do you consent to participate in this research project?

☐ Yes
☐ No

2. To what extent does your property practitioners' firm quality assure competitive intelligence?

☐ Very little extent
☐ Little extent
☐ Some extent
☐ Great extent
☐ Very great extent

3. Indicate your level of agreement or disagreement with each factor that influences competitive intelligence quality assurance (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Strongly agree).

Item	*1*	*2*	*3*	*4*	*5*
Our firm has appointed competitive intelligence professionals.					
Our competitive intelligence professionals have formal training in competitive intelligence.					
Our competitive intelligence professionals have work experience in competitive intelligence.					
Key intelligence topics (KITs) are clearly defined and unambiguous.					
KITs are discussed in a formal meeting between competitive intelligence professionals and decision-makers.					
Changes in KITs are communicated to competitive intelligence professionals by decision-makers immediately when they happen.					
KITs are prioritised.					
Our information sources are quality-checked and evaluated.					
Information quality is checked and evaluated.					
Information is collected legally and ethically.					
Collected information is accurately sorted, captured and securely stored.					
Our information analysis is thorough.					
Our competitive intelligence analysts are involved in information collection.					
Our competitive intelligence professionals have good analysis skills.					
Intelligence is disseminated to decision-makers timeously.					
Intelligence is disseminated through secure and regularly accessible methods.					
Our competitive intelligence unit ensures that everyone involved in the competitive intelligence process is well-trained.					
Our competitive intelligence unit constantly monitors the efforts and quality of its employees and evaluates feedback received from decision-makers.					
Our competitive intelligence unit rewards employees who produce quality competitive intelligence.					
Our competitive intelligence unit is located independently.					
We practice competitive intelligence formally.					
We raise competitive intelligence awareness throughout the firm.					
Our management supports competitive intelligence practices.					
We receive constant feedback throughout the competitive intelligence process.					
Competitive intelligence received is considered for continuous improvement.					
Our firm is structured to facilitate competitive intelligence practice.					
Our business processes enable competitive intelligence practice.					

4. What is the focus area of your property practitioners' firm?

☐ Rentals, sales, management, development and debt collection
☐ Rentals, sales, management and debt collection
☐ Rentals, sales, management
☐ Rentals and sales
☐ Management and debt collection
☐ Rentals and debt collection
☐ Other (please specify): ____________________

5. How many employees does your property practitioners' firm have?

☐ 1 to 5
☐ 6 to 10
☐ 11 to 20
☐ 21 to 50
☐ 50 to 200
☐ 201 or more

6. In which South African province does your property practitioners' firm operate from?

- [ ] Eastern Cape
- [ ] Free State
- [ ] Gauteng
- [ ] KwaZulu Natal
- [ ] Limpopo
- [ ] Mpumalanga
- [ ] Northern Cape
- [ ] North West
- [ ] Western Cape

7. How many years has your property practitioners' firm been operating?

- [ ] Less than 1 year
- [ ] 1 to 2 years
- [ ] 3 to 5 years
- [ ] 6 to 10 years
- [ ] 11 or more years

8. What is your property practitioners' firm's total annual turnover (sales)?

- [ ] Less than R1m
- [ ] R1m to R5m
- [ ] R6m to R10m
- [ ] R21m to R30m
- [ ] R31m to R50m
- [ ] R51m to R64m
- [ ] More than R64m

9. Indicate the position you hold in your property practitioners' firm:

- [ ] Business owner
- [ ] Managing director
- [ ] Portfolio manager
- [ ] General manager
- [ ] Sales/marketing manager
- [ ] Information/knowledge manager
- [ ] Competitive intelligence professional/practitioner
- [ ] Chief executive officer
- [ ] Chief information manager
- [ ] Other (please specify): ______________________________