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Towards the innovative university: What is the role of organisational culture and knowledge sharing?

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Orientation: Continuous innovation and knowledge sharing have become the linchpin of contemporary organisations, especially universities. Universities thus need to create a conducive organisational culture to enable innovation and knowledge sharing.

Research purpose: This study aimed to contribute empirically to an understanding of how an innovative university can be realised in a developing country context.

Motivation for the study: As innovation and knowledge sharing remain a challenge for most southern African universities, this article provides a theoretical and empirical understanding of the positive influence of organisational culture on these variables.

Research approach/design and method: The study followed a survey design. A structured questionnaire was administered to a sample of 277 university staff members. A total of 195 questionnaires were collected for data analysis, yielding a response rate of 70.39%. Data were interpreted using descriptive statistics and partial least squares structural equation modelling to analyse the relationship between the variables.

Main findings: The results indicated that the university under investigation had a dominant rational or clan culture orientation. A significant relationship was found between organisational culture and innovation and organisational culture and knowledge sharing.

Practical/managerial implications: The study proposes that innovation and knowledge sharing can best be realised within an adhocracy culture. Strategic priorities were proposed to the management of the university to enhance the pervasiveness of these variables.

Contribution/value-add: The study provides empirical evidence of the positive effect of organisational culture on innovation and knowledge sharing, confirming that organisational culture is a predictor of both innovation and knowledge sharing.

Keywords: organisational culture; innovation; knowledge sharing; universities; developing country context.

Introduction

The world of work, work itself and the composition of the workforce are being reshaped by sweeping global changes. These changes can be attributed mostly to globalisation and the emergence of the numerous technologies associated with the Fourth Industrial Revolution (notably artificial intelligence, robotics, automated systems, etc.), thus creating the so-called 'new world of work'. According to Buchanan, Kelley and Hatch (2016), workforce diversity, the increased usage of digital technologies, the accelerated rate of business innovation and flexible working arrangements characterise the new world of work.

The new world of work is enabled by the Internet and various forms of information and communications technology (ICTs) (Buchanan et al., 2016). This has a profound impact on the operations and design of organisations, leading to the dismantling of structural hierarchies and the adoption of more agile team-based organisational structures. Given this wave of digitalisation, which is rapidly altering economies around the world, innovation and knowledge sharing are now more important than ever before (Cirera & Maloney, 2017).

Despite the potential benefits of innovation, developing countries are less innovative than developed countries (Cirera & Maloney, 2017). Most research on innovation has been conducted through the developed country lens and has been perceived largely as a 'first world' activity. Not only are developing countries less innovative than developed countries, Cirera and Maloney (2017) have also observed that the literature on innovation is very limited in developing countries

compared to developed countries (Büschgens, Bausch, & Balkin, 2013; Fullwood, Rowley, & Delbridge, 2013; Hogan & Coote, 2014; Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2016). This also applies to innovation within the context of universities in developing countries.

One way of enhancing innovation is by means of a conducive organisational culture as this can assist contemporary organisations to build collaborative and innovative cultures to enable them to adapt to a fast-changing external environment (McDowell, Agarwall, Miller, Okamoto, & Page, 2016). This especially applies to universities, which are expected to be innovative, especially when it comes to teaching practices, research endeavours and stakeholder engagements. Apart from training and developing graduates for the new world of work, innovative universities are more likely to contribute to solving societal problems through cutting-edge research. Knowledge sharing is inextricably linked to innovation, and both concepts were investigated in this study.

Purpose

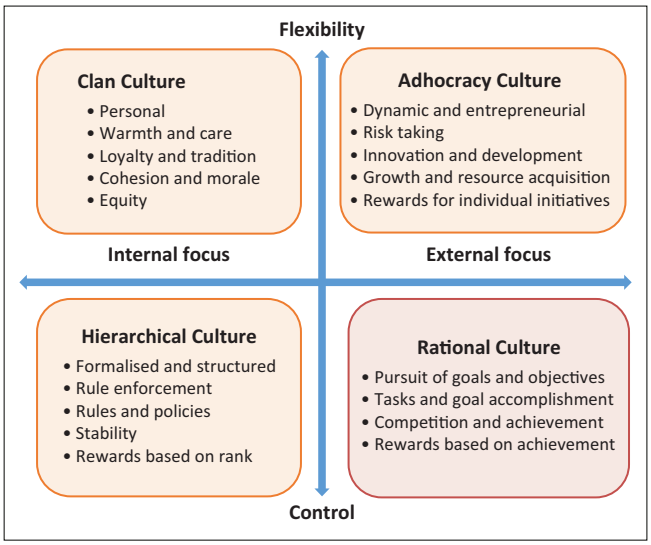
Universities need to be highly innovative in the new world of work. This implies a conducive organisational environment where individuals are encouraged to share ideas and interact in a meaningful way. The purpose of this study was thus to report on the impact of organisational culture on innovation and knowledge sharing within a university in the context of a developing country.

Literature review

Organisational culture

The concept of 'culture' has an elongated history linked to Anthropology, Sociology and Social Psychology. These disciplines focus, in general, on the development and functioning of humans and human societies. In human societies, the interaction amongst individuals usually leads to the development of unique behavioural patterns – commonly referred to as 'human culture'. Human culture enables individuals to fit in as members of a particular society (Bailey & Peoples, 2002). It spells out the behaviour that is expected from individuals in order to belong to and be accepted as members of a particular society. The sanctioning of acceptable behaviour also applies to organisations, and individuals must conform to the demands and expectations of organisations – referred to as 'organisational culture'.

Cameron and Quinn (2006) noted that, from the early 1980s, the concept of 'organisational culture' began receiving serious attention from prominent scholars such as Peters and Waterman (1982) and Schein (2004). Through the diverse bodies of organisational culture research, many definitions have been proposed, perpetuating the state of definitional ambiguity of the concept (Jahoda, 2012). For the purposes of this study, Schein's (2004) definition is used, namely, that organisational culture is the distinctive, basic underlying shared assumptions, espoused values, symbols, artefacts and attitudes that collectively describe an organisation.



Source: Parker, R., & Bradley, L. (2000). Organisational culture in the public sector: Evidence from six organisations. *The International Journal of Public Sector Management, 13*(2), 125–141. https://doi.org/10.1108/09513550010338773

FIGURE 1: Competing values framework.

Previous research has confirmed that a conducive organisational culture enhances innovation (see Büschgens et al., 2013; Glisson, 2015), specifically inter-functional cooperation (Fernández Sastre & Vera, 2017), flexibility and risk-taking (Naranjo-Valencia et al., 2016) and participative decision-making (Isaksen & Isaksen, 2010). A conducive organisational culture also impacts positively knowledge sharing (Rega, Abu Mansor, Ramayah, & Norhalimah, 2014). Specific variables that have an effect on knowledge sharing include trust (Chen, Lin, & Yen, 2014), attitudes and actions of managers (Fullwood et al., 2013), opportunities for interaction (Sandhu, Jain, & Ahmad, 2011) and a shared vision (Lynch, 2015; Rega et al., 2014).

The Competing Values Framework (CVF) was adopted to investigate organisational culture in the university context. The CVF is a robust measure of organisational culture and served as the theoretical framework for this study. It has been utilised as a framework for mapping organisations' culture profiles and conducting comparative analysis in more than 10 000 organisations globally (Cameron & Quinn, 2006). The culture profiles are the clan or group culture, the adhocracy or developmental culture, the hierarchical culture and the rational or market culture. Each quadrant is characterised by certain objectives or processes (Kokt & Van der Merwe, 2009) as summarised in Figure 1.

Innovation

According to Cirera and Maloney (2017), innovation is the introduction of new products, technologies, business processes and ideas in the market, as well as the invention of new ideas. Innovation is associated with novelty in production, marketing and services, and continuous innovation can entail enhanced managerial practices, organisational processes and business models.

The growing body of research on innovation spans across many disciplines, such as Sociology, Psychology, Business Administration and Public Management (Damanpour & Aravind, 2012). Many researchers agree that innovation has a positive impact on competitive advantage (see Crossan & Apaydin, 2010; Naranjo-Valencia, Jimenez-Jimenez, & Sanz-Valle, 2010; Petrakis, Kostis, & Valsamis, 2015). The growing body of literature also suggests that innovation enhances firm performance (see Camisón & Villar-López, 2014; Gunday, Ulusoy, Kilic, & Alpkan, 2011; Silva, Styles, & Lages, 2017).

Knowledge sharing

According to Razmerita, Kirchner and Nielsen (2016), knowledge sharing is the process by which employees mutually exchange their tacit and explicit knowledge in order to create new knowledge. Similar to organisational culture and innovation, knowledge sharing has become a widely researched topic. This can be ascribed to the emergence of the knowledge economy. Previous research has suggested that knowledge sharing enhances organisational variables, such as competitive advantage (see Li, Roberts, Yan & Tan, 2014; Navimipour & Charband, 2016), innovation (see Colombo, Laursen, Magnusson, & Lamastra, 2011; Kamaşak & Bulutlar, 2010; Obeidat & Tarhini, 2016) and job satisfaction (see Kianto, Vanhala, & Heilmann, 2016).

Data and methods

Research approach and design

This study adheres to the ontological position of objectivism which asserts that social phenomena and their meanings exist independently from social actors. This means that there is a distant, neutral and non-interactive relationship between the researcher and the objects under investigation. Also, the epistemological position of positivism was taken in this study, as is evident in the use of quantifiable observations that require statistical analysis (Saunders, Lewis, & Thornhill, 2016). The study followed a quantitative research approach, which is consistent with similar studies on the topic (Büschgens et al., 2013; Fullwood et al., 2013; Hogan & Coote, 2013).

The research design was a survey, and data were collected from a single southern African university. Both academic and administrative staff members were included, and structured questionnaires were administered via SurveyMonkey. In the instruction section of the questionnaire, the anonymity and confidentiality of respondents were guaranteed.

Measures

The data were gathered using a structured questionnaire. The reliability of the measurement model was determined using indicator reliability, convergent reliability, internal consistency reliability and discriminant validity. The reliability coefficients were found to be acceptable, as explained in detail in the results section of this article.

Participants

The study population included all the staff members of a southern African university, that is, 956 individuals. This included both academic (340) and administrative (616) staff members. Stratified random sampling was used to select individuals from the different sections and levels of the university. The Human Resource Department of the university provided information on the organisational structure to enable stratified sampling. According to Israel (1992), for any population between 900 and 1000, a sample of 277 is sufficient (at a confidence level of 95%). Hence, the sample size was 277, of which 195 individuals completed the survey, representing a response rate of 70.39%.

Measuring instrument

The structured questionnaire comprised a demographics section (which included gender, qualifications and position of participants within the university), an organisational culture section based on the CVF by Cameron and Quinn (2006), an innovation section based on Dobni (2008) and a knowledge sharing section based on Jolaee, Md Nor, Khani and Md Yussoff (2014).

Research procedure and ethical consideration

A self-administered questionnaire was employed and administered electronically via the SurveyMonkey platform. After obtaining permission from the university to conduct the study, respondents were approached to participate in the study. The cover letter of the questionnaire confirmed that all responses would be kept anonymous and that responses would only be used for research purposes.

Statistical analysis

In line with current trends in research on organisational culture (see Kamaşak & Bulutlar, 2010; Kokt & Ramarumo, 2015; Valmohammadi & Roshanzamir, 2015) and innovation and knowledge sharing (see Jolaee et al., 2014; Naranjo-Valencia et al., 2016), partial least squares structural equation modelling (PLS-SEM) was applied to validate the relationship amongst the three constructs (organisational culture, innovation and knowledge sharing). It was also used to measure the reliability and validity of the measurement items.

Ethical consideration

This article followed all ethical standards for a research without direct contact with human or animal subjects.

Results

The following section delineates the results of the study. It includes a brief demographic profile of the respondents and the construction of the structural equation model (SEM). The demographic composition of the respondents was as follows: 53% men and 47% women. The majority of respondents

(63%) had a master's degree, 12% had a doctoral degree, 18% had a bachelor's degree and 7% had a national certificate or diploma. The majority of respondents were appointed on a junior lecturer level (46%), 25% were on a senior lecturer level, 5% were on a professoriate level and 24% were appointed as administrative staff.

Assessing the outer model

As all data variables significantly deviated from a normal distribution, the use of PLS-SEM was validated. The statistical package SmartPLS version 3.0 was used to conduct the PLS-SEM analysis. Partial least squares structural equation modelling is a second-generation multivariate technique that is capable of carrying out a simultaneous assessment of the model of measurement (the relationships shared between constructs and their corresponding indicators) and the structural model, along with the objective of reducing the error variance (Abdi et al., 2018). Partial least squares structural equation modelling is also suitable when the goal of the study is to predict key target constructs and the research is exploratory in nature (Hair, Hult, Ringle, & Sarstedt, 2017).

Another reason that PLS-SEM was used in the study was the relatively low minimum sample size required to conduct the analysis. The minimum sample size for PLS-SEM should be equal to the larger of the following: (1) 10 times the largest number of formative indicators used to measure one construct or (2) 10 times the largest number of structural paths directed at a particular construct in the structural model. The minimum required sample size for the PLS-SEM analysis was therefore 20. Clearly, the sample size in the study (n = 195) far exceeded the minimum requirement. The research model for the study is presented in Figure 2.

The hypotheses for the research model were as follows:

H1: Organisational culture will positively influence innovation.

H2: Organisational culture will positively influence knowledge sharing.

H3: Knowledge sharing will positively influence innovation.

Reliability and validity

To assess the reliability and validity of the measurement model, indicator reliability, convergent reliability, internal consistency reliability and discriminant validity were assessed. This is explained next.

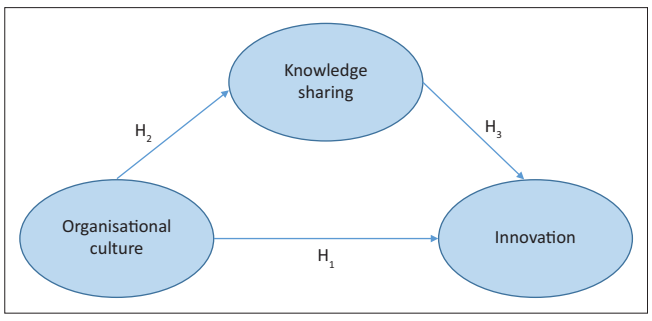


FIGURE 2: The research model.

For *indicator reliability*, the reflective indicator loadings of >0.5 show that the item is a good measurement of a latent construct (Hulland, 1999). However, according to Hair et al. (2017), the indicator's outer loadings should be higher than 0.70. Indicators with outer loadings between 0.40 and 0.70 should be considered for removal only if the deletion would lead to an increase in composite reliability (CR) and an average variance extracted (AVE) above the suggested threshold value. Based on guidelines provided by Hulland (1999), all items that had loadings of < 0.5 were removed from the measuring model, namely, CUL-AC-05, CUL-HC-03, IN-ECE-01, IN-ECE-02, IN-OC-03, IN-OL-05, IN-OL-04 (refer to Table 1).

Hair et al. (2017) further advised that items with loadings below 0.7 and above 0.5 should be removed from the measurement model, but only if the removal would lead to an increase in CR and an AVE above the suggested threshold value. Therefore, the following items were also removed from the measuring model – CUL-CC-01, CUL-CC-03, CUL-CC-04 and IN-OC-05, in order to increase the AVE of the related latent variables above the threshold value of 0.5. All indicator loadings were above the 0.5 thresholds (Table 1), as prescribed by Hulland (1999). Furthermore, all indicator loadings exceeded the 0.7 thresholds, as prescribed by Hair et al. (2017), except the following four items, which had loadings greater than 0.65 but smaller than 0.7: CUL-CC-07, CUL-HC-02, CUL-RC-01 and CUL-RC-04.

Convergent reliability is the extent to which a measure correlates positively with alternative measures of the same construct (Hair et al., 2017). Convergent reliability was assessed using the AVE, which, according to Bagozzi and Yi (1988) and Fornell and Larcker (1981), should be greater than 0.5. The AVE of all items in the measurement model of first-order constructs was above the 0.5 thresholds (Table 1), indicating convergent reliability of the first-order latent variables. Also, the AVE of all items in the measurement model of second-order constructs was above the 0.5 thresholds, except for organisational culture, which was 0.322 (Table 2). Because the measurement of organisational culture consisted of four competing culture quadrants (clan, adhocracy, hierarchical and rational), it can be expected that these four organisational culture measures will not have the same high positive correlation as the innovation and knowledge sharing constructs used in the study.

Internal consistency reliability can be assessed using CR and Cronbach's alpha (α). According to Gefen, Straub and Boudreau (2000), CR should be greater than 0.7 in order to indicate an adequate internal consistency reliability. Hair et al. (2017) emphasised that, in exploratory research, a lower bound of 0.60 to 0.70 is considered acceptable values for α.

TABLE 1: Measurement model: First-order latent variables.

Latent variables	Items	Loadings	AVE	CR	α
CUL-AC	CUL-AC-01	0.722	0.661	0.907	0.870
	CUL-AC-02	0.839	-	-	-
	CUL-AC-03	0.788	-	-	-
	CUL-AC-04	0.858	-	-	-
	CUL-AC-06	0.849	-	-	-
CUL-GC	CUL-CC-02	0.706	0.551	0.859	0.793
	CUL-CC-05	0.722	-	-	-
	CUL-CC-06	0.768	-	-	-
	CUL-CC-07	0.653	-	-	-
	CUL-CC-08	0.847	-	-	-
CUL-HC	CUL-HC-01	0.793	0.506	0.802	0.676
	CUL-HC-02	0.681	-	-	-
	CUL-HC-04	0.756	-	-	-
	CUL-HC-05	0.599	-	-	-
CUL-RC	CUL-RC-01	0.680	0.540	0.824	0.714
	CUL-RC-02	0.779	-	-	-
	CUL-RC-03	0.812	-	-	-
	CUL-RC-04	0.658	-	-	-
IN-ECE	IN-ECE-03	0.901	0.826	0.905	0.790
	IN-ECE-04	0.917	-	-	-
IN-IC	IN-IC-01	0.869	0.778	0.946	0.929
	IN-IC-02	0.922	-	-	-
	IN-IC-03	0.874	-	-	-
	IN-IC-04	0.891	-	-	-
	IN-IC-05	0.853	-	-	-
IN-IP	IN-IP-01	0.912	0.833	0.952	0.933
	IN-IP-02	0.947	-	-	-
	IN-IP-03	0.918	-	-	-
	IN-IP-04	0.872	-	-	-
IN-OC	IN-OC-01	0.830	0.711	0.881	0.796
	IN-OC-02	0.879	-	-	-
	IN-OC-04	0.820	-	-	-
IN-OL	IN-OL-01	0.914	0.855	0.947	0.915
	IN-OL-02	0.954	-	-	-
	IN-OL-03	0.906	-	-	-
KS-AT	KS-AT-01	0.966	0.951	0.983	0.974
	KS-AT-02	0.982	-	-	-
	KS-AT-03	0.976	-	-	-
KS-IN	KS-IN-01	0.949	0.854	0.921	0.834
	KS-IN-02	0.899	-	-	-
KS-OS	KS-OS-01	0.691	0.605	0.820	0.668
	KS-OS-02	0.880	-	-	-
	KS-OS-03	0.751	-	-	-
KS-SE	KS-SE-01	0.945	0.911	0.976	0.967
	KS-SE-02	0.967	-	-	-
	KS-SE-03	0.958	-	-	-
	KS-SE-04	0.947	-	-	-
KS-SN	KS-SN-01	0.951	0.911	0.954	0.903
	KS-SN-02	0.958	-	-	-

AVE, average variance extracted; CR, composite reliability; CUL, organisational culture; AC, adhocracy culture; CC, clan culture; HC, hierarchical culture; RC, rational culture; IN, innovation; ECE, employee creativity and empowerment; IC, implementation context; IP, innovation propensity; OC, organisational constituency; OL, organisational learning; KS, knowledge sharing; AT, attitude to knowledge sharing; IN, intention to share knowledge; OS, organisational support; SE, self-efficacy; SN, subjective norm.

The CR of all items was above 0.7 and the α of all items above 0.6 (Tables 1 and 2), indicating internal consistency reliability.

Discriminant validity is the extent to which a construct is truly distinct from other constructs by empirical standards. The most reliable method to assess discriminant validity is the heterotrait-monotrait ratio (HTMT) of the correlations. Hair et al. (2017) explained HTMT as follows:

> HTMT is the mean of all correlations of indicators across constructs measuring different constructs (i.e. the heterotrait-heteromethod correlations) relative to the (geometric) mean of the average correlations of indicators measuring the same construct (i.e. the monotrait-heteromethod correlations) and can be used for discriminant validity assessment. (p. 115)

The HTMT ratio should not exceed 0.9 (Hair et al., 2017). No HTMT ratio exceeded 0.9 (Table 3) in the present study, indicating that the measurement model exhibits discriminant validity.

TABLE 2: Measurement model: Second-order latent variables.

Latent variables	Items	Loadings	AVE	CR	α
Organisational culture	CUL-CC	0.832	0.322	0.916	0.904
	CUL-AC	0.781	-	-	-
	CUL-HC	0.725	-	-	-
	CUL-RC	0.846	-	-	-
Innovation	IN-IC	0.888	0.507	0.953	0.964
	IN-ECE	0.676	-	-	-
	IN-OC	0.861	-	-	-
	IN-OL	0.917	-	-	-
	IN-IP	0.919	-	-	-
Knowledge sharing	KS-SN	0.846	0.606	0.954	0.945
	KS-SE	0.917	-	-	-
	KS-OS	0.669	-	-	-
	KS-AT	0.893	-	-	-
	KS-IN	0.788	-	-	-

AVE, average variance extracted; CR, composite reliability; CUL, organisational culture; CC, clan culture; AC, adhocracy culture; HC, hierarchical culture; RC, rational culture; IN, innovation; IC, implementation context; ECE, employee creativity and empowerment; OC, organisational constituency; OL, organisational learning; IP, innovation propensity; KS, knowledge sharing; SN, subjective norms; SE, self-efficacy; OS, organisational support; AT, attitude to knowledge sharing; IN, intention to share knowledge.

Assessing the inner model

The following procedure was followed in constructing the model.

Step 1: Assessing structural model for collinearity issues

Multicollinearity occurs when two or more independent variables in a regression model are correlated and provide redundant information about the dependent variable. High multicollinearity can increase the standard error of estimates of the β's (decreased reliability) and lead to confusing and misleading results (Poole & O'Farrell, 1971). The statistics in the current study indicated that the multicollinearity of all variables used in the structural model was well within the acceptable range, with all the tolerance values above 0.2 (Field, 2009). This means that no high correlation of one independent variable with a combination of the other independent variables occurred in the model.

Step 2: Assessing the significance and relevance of the structural model relationships

The direct effects of all the hypothesised relationships were evaluated by means of bootstrapping analysis. Bootstrapping is a resampling technique that draws a large number of

TABLE 3: Heterotrait-monotrait ratio ratios.

Variable	CUL-DC	CUL-GC	CUL-HC	CUL-RC	IN-ECE	IN-IC	IN-IP	IN-OC	IN-OL	KS-AT	KS-IN	KS-OS	KS-SE
CUL-DC	-	-	-	-	-	-	-	-	-	-	-	-	-
CUL-GC	0.586	-	-	-	-	-	-	-	-	-	-	-	-
CUL-HC	0.368	0.763	-	-	-	-	-	-	-	-	-	-	-
CUL-RC	0.749	0.777	0.82	-	-	-	-	-	-	-	-	-	-
IN-ECE	0.686	0.527	0.236	0.812	-	-	-	-	-	-	-	-	-
IN-IC	0.713	0.349	0.177	0.484	0.581	-	-	-	-	-	-	-	-
IN-IP	0.881	0.444	0.322	0.651	0.64	0.822	-	-	-	-	-	-	-
IN-OC	0.797	0.602	0.37	0.686	0.795	0.781	0.855	-	-	-	-	-	-
IN-OL	0.874	0.502	0.333	0.651	0.668	0.809	0.874	0.899	-	-	-	-	-
KS-AT	0.404	0.293	0.306	0.284	0.025	0.193	0.255	0.214	0.298	-	-	-	-
KS-IN	0.195	0.21	0.248	0.262	0.096	0.154	0.153	0.15	0.178	0.831	-	-	-
KS-OS	0.834	0.441	0.342	0.747	0.613	0.77	0.832	0.769	0.858	0.7	0.572	-	-
KS-SE	0.377	0.243	0.302	0.313	0.028	0.214	0.313	0.146	0.272	0.729	0.639	0.607	-
KS-SN	0.314	0.289	0.374	0.251	0.065	0.249	0.303	0.188	0.276	0.663	0.644	0.547	0.895

CUL, organisational culture; AC, adhocracy culture; CC, clan culture; HC, hierarchical culture; RC, rational culture; ECE, employee creativity and empowerment; IC, implementation context; IP, innovation propensity; OC, organisational constituency; OL, organisational learning; AT, attitude to knowledge sharing; IN, intention to share knowledge; OS, organisational support; SE, self-efficacy; SN, subjective norms.

TABLE 4: Path model results of structural equation modelling model.

Hypothesis	Relationship	Std Beta	Std Error	t-value	p-value	Decision	95%CI LL	95%CI UL
H1	Organisation Culture -> Innovation	0.67	0.077	8.624	< 0.001	Supported	0.532	0.781
H2	Organisation Culture -> Knowledge Sharing	0.444	0.068	6.493	< 0.001	Supported	0.331	0.556
H3	Knowledge Sharing -> Innovation	0.058	0.063	0.961	0.336	Not supported	-0.044	0.162

subsamples from the original data (with replacement) and estimates models for each subsample. It is used to determine standard errors of coefficients to assess their statistical significance without relying on distributional assumptions (Hair et al., 2017). The standardised β- and t-values were calculated by the bootstrapping procedure with a resample of 5000. The results of the bootstrapping procedure are shown in Table 4.

Table 4 shows that a positive statistically significant relationship was found between culture and innovation ($\beta = 0.67$, $p < 0.001$). Therefore, H1 of the study is supported.

Also, a positive statistically significant positive relationship was found between culture and knowledge sharing ($\beta = 0.44$, $p < 0.001$). Therefore, H2 of the study is supported.

However, no statistically significant relationship was found between knowledge sharing and innovation ($\beta = 0.058$, $p = 0.336$). Therefore, H3 of the study is not supported.

Step 3: Assessing the level of R^2

R-squared measures the proportion of variance in a latent endogenous variable that is explained by exogenous variables expressed as a percentage (Chinn, 1998). The R^2 value of innovation was 0.482. This implies that organisational culture explained 48.2% of the variance in the innovation variable. The following guidelines presented by Evans (1996) were used to interpret R^2: very weak (0% – 4%), moderate (16% – 36%), strong (36% – 64%) and very strong (64% – 100%).

From these guidelines, it can be concluded that organisational culture had a strong predictive power towards innovation. Furthermore, knowledge sharing had an R^2 value of 0.197, which means that organisational culture explained 19.7% of the variability of the knowledge sharing variable, indicating a moderate predictive power according to Evans (1996).

Step 4: Assessing the effect size (f^2)

The assessment of the effect size of a construct evaluates whether the omitted construct has a substantive impact on the endogenous construct, which is also known as the effect size of the exogenous latent variable in the model. The assessment of this effect size follows Cohen's (1988) guideline, namely, $0.02 < f^2 < 0.15$: weak effect; $0.15 < f^2 < 0.35$: moderate effect; and $f^2 > 0.35$: strong effect. The effect size of knowledge sharing on innovation and organisational culture on innovation was calculated. The findings showed that organisational culture had a large effect size (0.689), meaning that it plays a crucial role in predicting innovation, whereas the effect size of knowledge sharing on innovation was close to zero (0.012), meaning that it does not play a role in predicting innovation.

Step 5: Assessing the predictive relevance (Q^2)

The predictive relevance (Q^2) of exogenous constructs is obtained by using the blindfolding procedure where every nth data point in the endogenous construct's indicators is omitted to estimate the parameters with the remaining data points (Henseler, Ringle, & Sinkovics, 2009). The assessment of this effect size follows Cohen's (1988) guidelines – $0.02 < Q^2 < 0.15$: weak relevance; $0.15 < Q^2 < 0.35$: moderate relevance; $Q^2 > 0.35$: strong relevance. The findings showed that knowledge sharing did not have predictive relevance

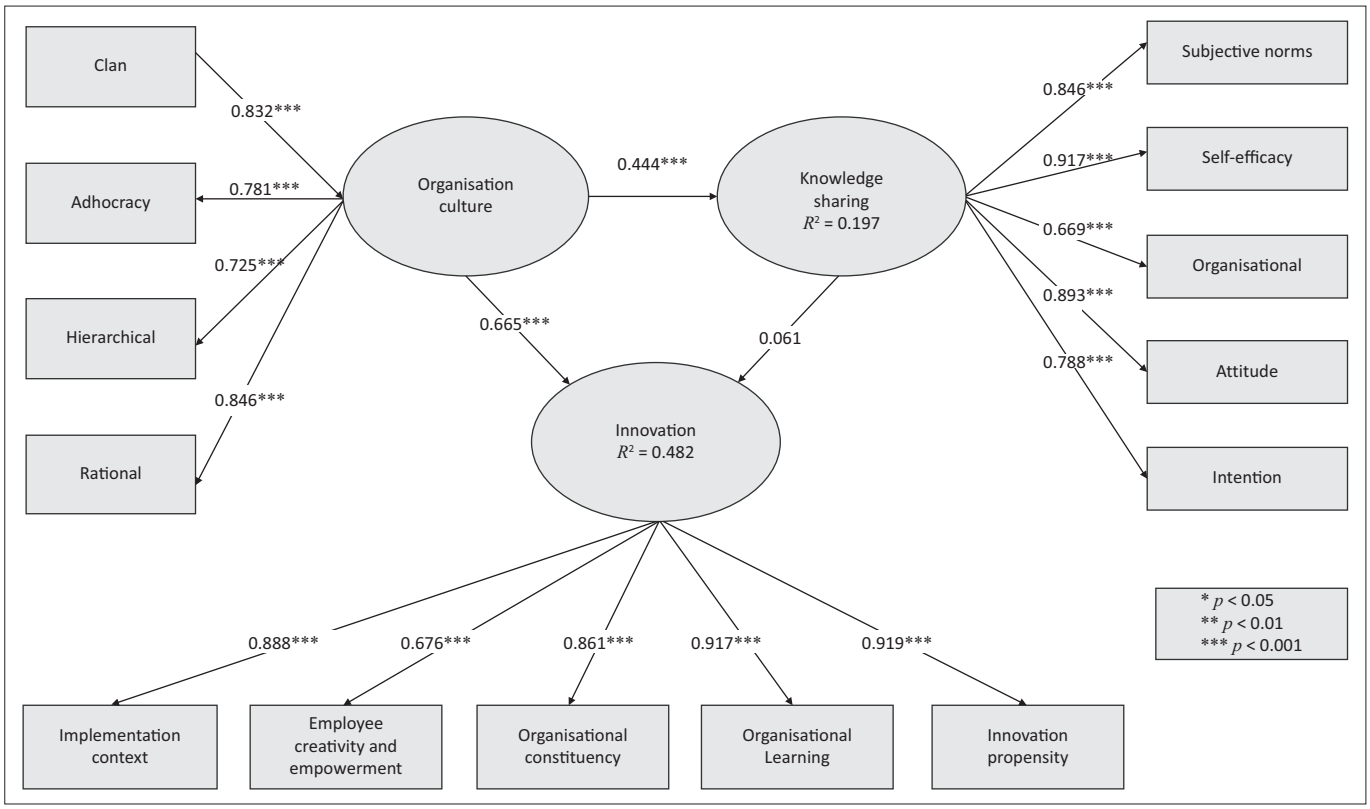


FIGURE 3: The structural equation model of organisational culture, knowledge sharing and innovation.

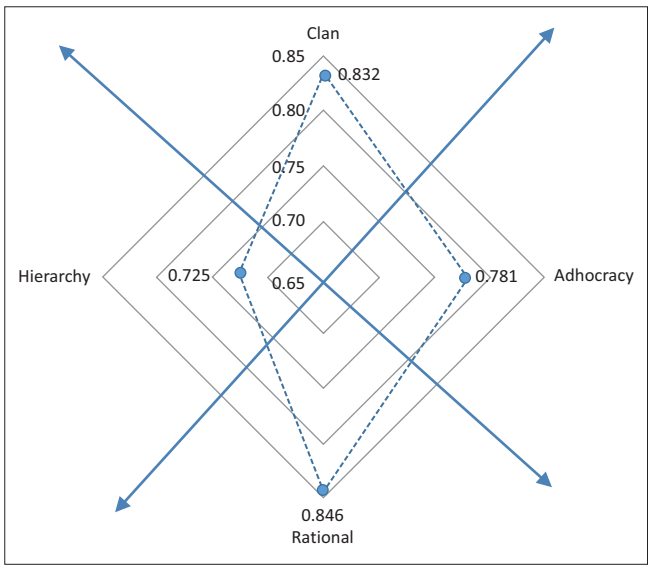


FIGURE 4: The organisational culture profile of the university.

(0.004), but that organisational culture portrayed a moderate level of relevance (0.214).

Figure 3 shows the structural equation model of organisational culture, knowledge sharing and innovation.

Culture profile of the university

By using the loadings of the SEM for the four organisational culture quadrants, the culture matrix of the organisation was constructed (Figure 3). Loadings reflect the degree to which each of the four culture dimensions is linked to the organisational culture (Valmohammadi & Roshanzamir, 2015). With the largest loading on rational culture (0.846), the organisational culture of the university can be best explained by this dimension (Figure 4). The second dominant culture is the clan culture (0.832) (Figure 4). The hierarchical culture received the lowest loading of 0.725 and the adhocracy culture received the second lowest (0.781) (Figure 4).

Discussion

Outline of the results

The main objective of this study was to ascertain the impact of organisational culture on innovation and knowledge sharing at a southern African university. The culture profile in Figure 4 shows that the university under investigation displayed a prominent rational culture with a secondary clan culture. This finding is consistent with Cameron and Quinn's (2006) assertion that most organisations display a dominant culture and that, in more than 80% of cases, more than one culture type can be distinguished in an organisation, as in the current study. This is because, in general, stakeholders in organisations hold competing values that could lead to different goals and objectives.

As indicated before, the rational culture is externally oriented with a control focus. This implies that the university is focused on accomplishments, productivity and profit or

impact. Employees are, thus, given clear goals and direction, and decisiveness is expected from managers and leaders. Because of its external focus, the university emphasises maximum output and competitive advantage through instilling order. Given their changing nature, contemporary universities are expected to be externally focused and in constant interaction with external stakeholders. This seems to explain the dominance of the rational culture in the university under study. Universities need to develop and train graduates for the new world of work, drive new knowledge creation through research and innovation and be involved in the communities they serve – actions that all require an external focus.

The clan culture, on the other hand, is more spontaneous, with an emphasis on commitment, morale and a concern for people. The clan culture is geared towards the development of human resources and focuses on discussion, participation and openness. Thus, this culture is concerned with the internal maintenance of the socio-technical system. Because of their collegial past, universities tend to place great emphasis on autonomy, long-term relationships, non-hierarchical structures, shared decision-making, informal relationships and mutual support (Lynch, 2015). These values are also reflected and supported by the clan culture, which can explain its being the second most dominant culture type in this university. Also, many African societies are collectivistic in nature, meaning that there is an emphasis on a tight social framework where individuals look after one another and decision-making is shared (Hofstede, 2011). This stands in contrast to individualistic societies, where people prefer to act as individuals rather than as members of a group.

These findings further show that organisational culture has a positive impact on innovation ($\beta = 0.665$, $p < 0.001$). Therefore, a one-unit change in organisational culture has a positive impact of 67% on the innovation variable (see Figure 3). This implies that university managers have to create a conducive organisational culture in order to advance the innovation agenda at their institution. A conducive organisational culture provides an environment in which mistakes are tolerated, creativity is encouraged, knowledge is shared extensively and risks can be taken. The findings correspond with those of Zhu (2015) who concluded that dimensions of organisational culture are significantly associated with the technology-enhanced innovation amongst Chinese universities.

The findings of the current study indicate that organisational culture has a positive influence on knowledge sharing ($\beta = 0.444$, $p < 0.001$). This implies that a one-unit change in organisational culture can have a positive impact of 44% on the knowledge sharing variable (Figure 3). The implication for university managers is that they need to build knowledge sharing blocks, such as reward mechanisms for knowledge sharers, and create knowledge sharing infrastructure and a supportive organisational culture. A clan culture has a significant positive influence on knowledge sharing.

The study found a weak relationship between knowledge sharing and innovation ($\beta = 0.058$, $p = 0.336$). Thus, a one-unit change in knowledge sharing can result in a 5.8% change in innovation, which is not a statistically significant relationship. This means that university management would need to devise strategies to enhance knowledge sharing, for example, by creating a conducive organisational culture. In contrast, Al-Husseini and Elbeltagi (2018) found that knowledge sharing processes were positively related to product and process innovation in Iraqi higher education institutions. Also Alnesr and Ramzani (2019) found a positive relationship between knowledge sharing and innovation in Syrian public and private universities.

The current study argues that the weak knowledge sharing–innovation relationship at the university under investigation can be traced to the university's organisational culture profile. As established above, the dominant culture is the rational culture, whilst one of the weak cultures is the adhocracy culture. A rational culture is generally associated with competitive employee behaviours; hence, employees are more likely to pursue personal goals at the expense of organisational objectives. In a dominant rational culture organisation, knowledge is seen as a critical source of power and distinctiveness; given this, employees may be inhibited to voluntarily donate their knowledge to help colleagues (Cavaliere & Lombardi, 2015). When knowledge is not shared, social interaction is limited, organisational creativity is diminished and innovation is likely to be suppressed.

On the other hand, an adhocracy culture is associated with high levels of entrepreneurship and risk taking. This implies that the adhocracy culture is most likely to support social interaction, which can stimulate employees towards exchanging ideas and opinions (Cavaliere & Lombardi, 2015). However, as the adhocracy culture is weak at the university under investigation, knowledge sharing is limited, affecting innovative behaviours.

Practical implications

The findings of the study can be applied on a strategic level. University top management needs to initiate actions towards the development of a conducive organisational culture that enhances innovation and knowledge sharing. Innovation and knowledge sharing are critical in driving the industrialisation and modernisation agenda.

Limitations and recommendations

The empirical part of the study was conducted at only one university. It is, therefore, not possible to generalise the findings to other universities. The findings, however, provide some indication of the positive impact of organisational culture on innovation and knowledge sharing.

Based on the findings of the investigation and literature review, this study proposes strategic priorities for the university as follows:

Creating an adhocracy culture: As indicated before, the adhocracy culture enhances innovation and knowledge sharing (see Cavaliere & Lombardi, 2015; Naranjo-Valencia et al., 2016). Adhocracy culture is associated with risk taking and high levels of entrepreneurship and creativity, which are all critical in facilitating a highly innovative environment. It is, therefore, recommended that university management fosters this culture. Students, lecturers and non-academic staff members should be allowed to experiment with ideas to facilitate the process of innovation.

Creating innovation and knowledge-sharing goals: It is proposed that strategic innovation and knowledge-sharing goals should be developed and that all university efforts are aligned towards achieving them. Innovation and knowledge-sharing goals should be part of the mission of the university and be well articulated to university stakeholders to ensure maximum effect.

Innovation training and mentorship: Innovation training should help staff members and students undertake applied research, which can lead to innovative thinking. Furthermore, mentorship would enable the transfer of knowledge, especially from role models from the industry who have launched successful companies and products. These role models can engage individual students in start-up ideas and business plans.

Government support: Government is crucial in advancing the innovation agenda of universities; hence, universities have to solicit for government support. Government should provide policies that support innovation in universities, for example, by granting customs duty rebate on imported innovation equipment, rewarding researchers for innovative ideas and providing land for the development of innovation infrastructure such as science parks. Furthermore, government can also provide funding for cutting-edge research and platforms for knowledge sharing such as research symposiums.

Developing innovation infrastructure: Innovation infrastructure is necessary to facilitate the whole process of starting innovative research and commercialising it. University managers can set up meeting rooms, incubation hubs, science parks and technology transfer offices, all of which would facilitate innovation at the university and the transfer of the same to the industry. Moreover, the creation of innovation infrastructure would enhance knowledge sharing at the university.

Setting up an innovation fund: Funding is a crucial element in helping researchers' ideas become a reality. Funding is required not only to purchase equipment for innovation, but also to reward innovation champions on the campuses. These funds can come from government or private stakeholders.

Creating an innovation movement: This movement would comprise a group of people who can spearhead innovations at the university. It can take the form of communities of practice (research teams). The university has to take the lead in creating such teams. This movement can also perform the role of celebrating innovators – which is an important activity.

Conducting similar studies at other universities: This study was conducted at a single university. It is thus recommended that similar studies should be carried out in other universities.

Conclusion

This study presented statistical evidence of the positive relationship between organisational culture and innovation and between organisational culture and knowledge sharing. It also found that the culture profile of a university is essential in supporting innovation and knowledge sharing. The study concludes that the adhocracy culture, which is characterised by an environment of risk taking, flexibility, adaptation, supportive and capable leadership and a focus on continuous growth, best supports the development of an innovative university.

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Competing interests

The authors have declared that no competing interest exists.

Author's contributions

W.M. constructed the literature review and performed the data gathering, as well as the first draft of the article. D.K. assisted with the overall aim of the study and refining of the article, results and conclusions.

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Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

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