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DEVELOPING A MODEL OF THE RELATIONSHIP BETWEEN ORGANIZATIONAL CULTURE, DIGITAL TECHNOLOGIES, AND JOB PERFORMANCE FOR A SOUTH AFRICAN ENERGY UTILITY

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Abstract

This article aims to develop a model of the relationship between organizational culture (OC), the use of digital technologies (DTs), and employee job performance (EJP) for use by South African energy utility. A quantitative research design was adopted, and a closed-ended questionnaire was employed to collect data from the South African energy utility. A partial least squares structural equation modeling (PLS-SEM) was utilized to analyze the data. The findings revealed a nexus between OC, the use of DTs, and EJP. OC was found to be a chief predictor of the effective use of DTs and EJP. Moreover, the use of DTs was found to significantly impact EJP. Further, the use of DTs complementarily mediated the relationship between OC and EJP. The research presents a unique nexus model, which underlines the importance of OC, the use of DTs, and EJP for the South African energy utility to realize the benefits of digital transformation initiatives.

Keywords

Digital Technologies, Employee Job Performance, Energy Utility, Organizational Culture

1. Introduction

The South African Electricity Supply Industry (ESI) is undergoing significant structural reforms, which include pursuing digitalization (Eskom, 2024). This digitalization is fundamental in the era of the digital economy as part of the broader concept of digital transformation (Cheng and Cui, 2024; Hoessler and Carbon, 2024). DTs play an enabler role in digital transformation (Hoessler and Carbon, 2024); hence, there is heightened interest in adopting and using emerging disruptive DTs (Sarlab *et al.*, 2024). Some of the foundational DTs that are being adopted and used by various industries, including ESI, are the Internet of Things (IoT), Big Data (BD), Cloud Computing (CC), and Artificial Intelligence (AI; Agrawal *et al.*, 2022; Ahamed *et al.*, 2022).

Moreover, the leading electricity provider focuses on human capital, where the organization is engraining a high-performance culture (Eskom, 2024). Significantly, the current deep-rooted transformation within the organization fits within the broader context of digital transformation programs (Cheng and Cui, 2024; Feng *et al.*, 2024). Digital transformation is not only associated with DTs but with the radical transformation of all aspects of the organization for value creation (Osorio-Gomez *et al.*, 2024; Verhoef *et al.*, 2021) and the establishment of novel business models (Datti and Kuppusamy, 2023; Savić, 2020).

The organizational aspects affected include operations, processes, strategy, structure, and organizational behaviors (Serna Gómez *et al.*, 2021; Steyn and Schmikl, 2013). This implies that an integrative approach is required for digital transformation schemes to succeed (Barrutia and Echebarria, 2021; Osorio-Gomez *et al.*, 2024). However, high failure rates of these schemes have been reported (Oludapo *et al.*, 2024; Sanchez-Segura *et al.*, 2024).

OC has been pinpointed as the foremost cause of high failure rates (Trushkina *et al.*, 2020; Zumstein *et al.*, 2022). OC affects all aspects of organizational life (Ciampi *et al.*, 2020; Dahlbom *et al.*, 2020). OC shapes how employees perform their tasks, think, and feel (Ciampi *et al.*, 2020; Dahlbom *et al.*, 2020). This infers that OC also affects the use of DTs, as DTs are essential for various purposes of an organization's operations and, ultimately, for organizations to achieve their strategic objectives and goals. Empirical research (Cardoso *et al*., 2023; Gatica-Neira *et al*., 2024) has underlined the significant impact of OC on DTs.

Additionally, as part of digital transformation initiatives, human capital guarantees success (Oludapo *et al*., 2024; Sivaraman, 2020). The adoption and use of DTs must intentionally focus on employees (Oludapo *et al*., 2024; Sivaraman, 2020). DTs and associated processes are contingent on employees for these DTs to be beneficial (Sharma, 2015). There must be harmony between DTs and employees, specifically their attitudes and behaviors, to warrant success (Çini *et al*., 2023; Sivaraman, 2020). Moreover, a conducive OC is key to shaping employee attitudes and behaviors (Sinding and Waldstrom, 2014). This suggests that DTs must be combined with a conducive OC and a deliberate focus on employees.

While the preceding discussion underlined the foundational roles of DTs, OC, and employees in the success of digital transformation initiatives, empirical research deficiently investigated the associations of DTs, OC, and employees. The impact of OC on DTs has been empirically researched; however, the interest has largely been on operational culture (Bag *et al*., 2021; Javaid *et al*., 2021; Seo and Myeong, 2020). The leading OC frameworks and theories, such as the competing values framework (CVF) and the Denison model, have been scantly used. Therefore, this study intends to use the Denison model.

Also, the relationship between DTs and employees, specifically their task performance in this study, has been meagerly investigated as part of the nexus. Different aspects of organizational performance have been investigated (Aguilar-Rodríguez *et al*., 2021; Asaah *et al*., 2020; Bag *et al*., 2021; Nayak *et al*., 2019); however, EJP is overlooked. Thus, this study focuses on EJP to establish the nexus. Moreover, while some foundational DTs have been combined, most reviewed studies predominantly focused on a specific technology, such as analytics and IoT. Therefore, this study aims to comprehend the relationship between the foundational DTs, Denison OC, and EJP and develop a nexus model for use by the South African energy utility. The remainder of this article covers a literature review, hypotheses and conceptual model development, research methodology, results, discussions, and conclusion.

2. Literature review

2.1 Organizational culture

OC is foundational for effectiveness and success (Schein and Schein, 2017; Sri *et al*., 2019). Therefore, a conducive OC is mandatory. While OC is crucial, various models, such as the Denison model and CVF, assess OC in organizations (Tulcanaza-Prieto *et al*., 2021; Vargas-Halabi and Yagüe-Perales, 2024). These models are predominant, as they have been successfully and widely used in different industries and contexts. This study adopted the Denison model, which comprises four cultural traits: consistency, adaptability, involvement, and mission (Denison *et al*., 2014). The Denison model is well-validated and can be used in any organization type and size, as all four cultural traits must co-exist (Vargas-Halabi and Yagüe-Perales, 2024).

Consistency is concerned with the organization's faculty to effectively coordinate its tasks and guarantee consensus among its employees (Denison *et al*., 2014). Involvement trait "concerns the personal engagement of individuals within the organization and reflects a focus on the internal dynamics of the organization and on flexibility" (Denison *et al*., 2014). Adaptability trait underlines the organization's faculty to adapt based on the perennial changing external environment and customers' requirements (Denison *et al*., 2014). Mission trait "refers to the degree to which an organization is clear on why it exists and where it is headed" (Gillespie *et al*., 2008).

2.2 Digital technologies

DTs, such as IoT, BD, CC, and AI, are some of the key leading digital technologies in the digital era (Bouwmans *et al*., 2024; Trenerry *et al*., 2021). Data-driven approaches are enabled through the combined use of these foundational DTs (El Hilali *et al*., 2021; Javaid *et al*., 2021), as they fuse the physical and cyber worlds for just-in-time and educated decision-making (Datti and Kuppusamy, 2023; Javaid *et al*., 2021). These DTs are associated with data capturing, data exchange, storage, information management, and effectiveness (Javaid *et al*., 2021; Seo and Myeong, 2020). When DTs are amalgamated, they improve effectiveness and create value for various stakeholders (Al-Edenat, 2023; Benahmed and Hansal, 2022). The optimal use of the foundational DTs requires consideration of technical factors, such as shared IT infrastructure (Al-Khatib, 2022; Sonia and Malika, 2021), network security and privacy (Kushwah and Ranga, 2022; Khan and Kaidi, 2023).

2.3 Employee job performance

Employees are a cornerstone of an organization to guarantee sustainable success and competitive advantage. This demands an intentional focus on EJP (Irsyadi, 2023; Sudha *et al*., 2023). It, therefore, becomes crucial that EJP is continually monitored and that specific intervention strategies are implemented. The team's performance and, ultimately, organizational effectiveness are affected by EJP (Kundi *et al*., 2021; Setianto and Andreas, 2023). This underlines EJP's centrality. EJP is "the total expected value to the organisation of the discrete behavioural episodes that an individual carries out over a standard period" (Sudha *et al*., 2023, citing Motowidlo and Kell, 2013). EJP has two predominant components: contextual and task performance (Ding and Liu, 2022; Sudha *et al*., 2023). This study focuses on task performance, which "is the effectiveness with which job incumbents perform activities that contribute to an organization's technical core either directly by implementing a part of its technological process or indirectly by providing it with needed materials or services" (Uraon and Gupta, 2021). Core competencies and skills are necessary for employees to complete their core duties per the job description (Ding and Liu, 2022).

3. Research hypotheses

3.1 The relationship between OC and DTs

The empirical research has resolved that OC affects DTs in organizations (Asaah *et al*., 2020; Martínez-Caro *et al*., 2020; Nayak *et al*., 2019). However, these studies have not focused on the effect of the Denison model on the combined foundation DTs. Moreover, these studies were not focused on the South African energy utility. Therefore, the hypothesis for this study is that:

H1: The OC positively impacts the use of DTs.

3.2 The relationship between OC and EJP

OC has been found to influence EJP (Aggarwal, 2024; Fridan and Maamari, 2024; Li and Tresirichod, 2024; Pham *et al*., 2024). While empirical research found a relationship between OC and EJP, no study has examined the impact of Denison OC on EJP within the South African energy utility. The hypothesis for this study is, therefore, that:

H2: The OC positively impacts EJP.

3.3 The relationship between the use of DTs and EJP

Some studies, such as Alshammary and Hilmi (2024), Liu *et al*. (2024), Paola *et al*. (2024), Tapia-Andino and Barcellos-Paula (2023), and Uzkurt *et al*. (2024), have found that DTs correlate with EJP. Though the relationship between DTs and EJP has been established, the aggregated application of foundational DTs has not been empirically investigated, especially within the South African energy utility. Thus, this study's hypothesis is that:

H3: The use of DTs positively impacts EJP.

3.4 The mediation role of the use of DTs

Some researchers, such as Daryanto *et al*. (2017) and Martínez-Caro *et al*. (2020), have empirically established the mediation role of DTs in the relationship between OC and performance. These results suggest that using DTs arbitrates OC's actual influence on performance. Any changes in OC impact the performance through the use of DTs. This implies that appropriate DTs must be implemented; however, their effective use relies on OC. However, it is necessary to investigate how the foundational DTs mediate the relationship between the Denison OC and EJP within the South African energy utility. Thus, this study's hypothesis is that:

H4: The use of DTs mediates the relationship between OC and EJP.
Figure 1 is the conceptual model of the relationship between OC, the use of DTs, and EJP.

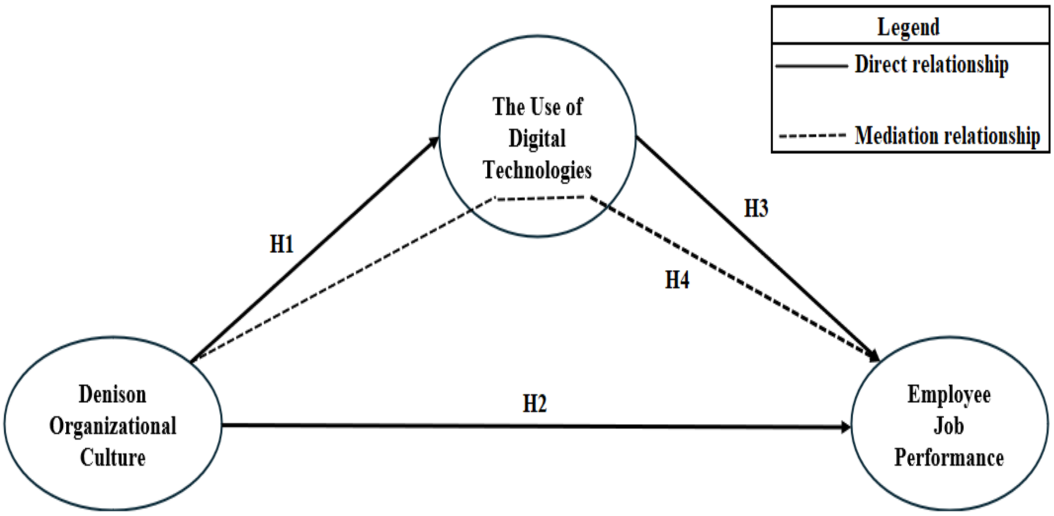

Figure 1. A conceptual model of the relationship between the use of DTs, OC, and EJP

4. Research methodology

A quantitative research design was adopted to achieve the study's objectives. The study was cross-sectional, and a questionnaire was used to collect the data. The questions were closed-ended. Microsoft (MS) Forms were used to collect data from the energy utility. The constructs' statements were primarily adapted from instruments from the literature. Most of these instruments have been previously empirically validated. Few statements were developed from existing literature to ensure content validity. All the statements were discussed and reviewed by the researchers to eliminate any errors. The items were structured on a five-point Likert scale: strongly disagree, disagree, undecided, agree, strongly agree.

The data was collected from the energy utility, comprising three operating divisions and corporate functions, with over 40 thousand employees. The interest was to generalize the findings to this population of employees. Therefore, diverse representation was necessary. This study focused on employees who used DTs from professionals (such as engineers), management, and senior management. It was impossible to collect data from the whole target population (Creswell and Creswell, 2023). Therefore, a representative sample from the target population was required (Creswell and Creswell, 2023). This was key to ensuring the findings were generalizable (Creswell & Creswell, 2023).

Probability cluster sampling helped collect a representative sample from the target population. The minimum sample size was calculated using the G*Power software based on power analysis (Memon *et al*., 2020), and the result was 68 minimum sample size. The researcher emailed the questionnaire's link (MS Forms) to individuals from all divisions; however, some departments were asked to distribute the link to their employees. Data collection occurred from mid-June 2023 until the end of August 2023. Table I shows frequency distribution results from the different energy utility divisions.

Division	**Frequency**	**Percentage**
Division 1	43	38.7%
Division 2	15	13.5%
Division 3	41	36.9%
Division 4	12	10.8%
Total	**111**	**100%**

Table I. Results of the frequency distribution of the energy utility divisions

5. Results

5.1 Measurement model assessment

Data analysis was performed using PLS-SEM, and the SmartPLS 4 software package was used. The analysis followed two main steps: measurement model study and structural model study (Hair *et al*., 2022). Measurement model assessment employed convergent validity, internal consistency reliability, and discriminant validity (Hair *et al*., 2022). When indicator outer loadings are 0.5 and above, they are acceptable; however, when they are 0.4 and below, they are removed (Ab Hamid *et al*., 2017; Hair *et al*., 2022). In this study, one indicator (IME1) was below 0.4. The AVE must be 0.5 and above (Hair *et al*., 2022). After removing five indicators (DCS3, IME3, IME4, IME5, IME6) on DTs, the AVE was above the threshold, as indicated in Table II.

The reliability was assessed using internal consistency reliability (Hair *et al*., 2022). Internal consistency reliability was tested using Cronbach's alpha, composite reliability (ρ_A), and composite reliability (ρ_c; Hair *et al*., 2022). The threshold value should be above 0.6 for a construct to be deemed reliable (Hair *et al*., 2022). The actual reliability is between Cronbach's alpha and composite reliability (ρc), which is the composite reliability (ρ_A; Hair *et al*., 2022). As shown in Table II, all the results met the threshold. The discriminant validity was assessed using the heterotrait Monotrait (HTMT) ratio (Ab Hamid *et al*., 2017; Hair *et al*., 2022). The threshold of 0.9 was employed (Altinay *et al*., 2023; Lacap and Alfonso, 2022), and as indicated in Table II, HTMT was acceptable.

Constructs	Indicators	Outer loadings	Cronbach's alpha	Composite reliability (ρa)	Composite reliability (ρc)	AVE	HTMT
	A1	0.800					
	A2	0.838					
	A3	0.748					
	C1	0.801					
	C2	0.816					
	C3	0.773					
Denison Organizational Culture	I1	0.776	0.947	0.953	0.953	0.631	0.8651 (EJP<->OC
	I2	0.724					
	I3	0.659					
	M1	0.872					
	M2	0.841					
	M3	0.861					
	SIIS1	0.790					
	SIIS2	0.649					
	SIIS3	0.855					
	SIIS4	0.826					
Use of Digital Technologies	DCS1	0.778	0.889	0.921	0.908	0.502	0.759 (Use of DTs <->OC)
	DCS2	0.609					
	DCS4	0.591					
	DCS5	0.491					
	IME2	0.768					
	IME3	0.641					
	EJP1	0.950					
	EJP2	0.945					
Employee Job Performance	EJP3	0.960	0.946	0.963	0.960	0.829	0.691 (EJP<->OC)
	EJP4	0.967					
	EJP5	0.704					

Table II. Results of convergent validity, internal consistency reliability, and discriminant validity

5.2 Structural model assessment

The structural model assessment commenced with the evaluation of collinearity using the variance inflation factor (VIF; Hair et al., 2022; Johnston et al., 2018). The conservative VIF threshold value of 5 (Hair et al., 2022) was adopted for this study. The results indicated that VIF for OC and DTs was 1.000. The VIF for OC and EJP was 2.196, and for DTs and EJP, it was also 2.196. Based on these results, hypothesis tests were performed using path coefficients and a probability (p) value of 0.05 (Hair et al., 2022). Table III shows the results of path coefficients and p values.

Constructs Relationships	Path Coefficients	t Values	ρ Values	95% Confidence Interval	Significance (ρ < 0.05)?
OC -> Use of DTs	0.738	14.134	0.000	[0.593, 0.817]	Yes
OC -> EJP	0.739	12.389	0.000	[0.614, 0.849]	Yes
Use of DTs -> EJP	0.141	2.086	0.037	[0.005, 0.271]	Yes

Table III. Results of the path coefficients and *p* values

The study then evaluated the model's explanatory power to determine whether the results fit the in-sample data, using the coefficient of determination (R-square) and *f*-square effect size (Hair et al., 2022). The R-square values of 0.75, 0.50, and 0.25 are substantial, moderate, and small, respectively (Hair et al., 2022; Shmueli et al., 2016). The R-square value for DTs was 0.545 (0.540 R-square adjusted), while for EJP, it was 0.719 (0.714 R-square adjusted). When *f*-square value is 0.02, 0.15 and 0.35 suggests small, medium, and large effect sizes, respectively (Hair et al., 2022). The f-square value for the relationship between OC and the use of DTs was 1.196. The f-square value for the relationship between OC and EJP was 0.886. The f-square value for the relationship between DTs and EJP was 0.032. Lastly, the mediation role of the use of DTs was evaluated. As depicted in Table 3, the influence of OC on EJP is 0.739. The indirect effect through DTs is 0.104, and the p-value is 0.046. Therefore, the total effect effect on EJP is 0.843.

6. Discussion

6.1 The relationship between OC and the use of DTs

The hypothesis that OC positively affects the use of DTs was supported. The path coefficient was 0.738, and the *p*-value was 0.000, which suggested a significant impact. The adjusted R-square value was 0.545, which suggested a moderate effect, and the *f*-square value was 1.196, indicating a large effect. Thus, OC has a significant and relevant impact on the use of DTs. Empirical research has indicated a substantial impact of OC on DTs (Asaah *et al*., 2020; Martínez-Caro *et al*., 2020; Nayak *et al*., 2019). This study is particularly pivotal as it adopted Denison OC and the foundational DTs within the South African energy utility. It is, therefore, key that the adoption and use of DTs are aligned with the conducive OC to guarantee success (Martínez-Caro *et al*., 2020). Based on Denison cultural traits, the utility must assess its culture through culture surveys. Emanating from the gaps identified, that is, if there were deficiencies from any of the four Denison cultural traits, it would be critical that the organization first correct the deficiencies.

6.2 The relationship between OC and EJP

The hypothesis that OC has a positive effect on EJP was supported. The path coefficient was 0.739, and the *p*-value was 0.000, which suggested a significant impact. The adjusted R-square value was 0.739, which suggested a moderate effect, and the *f*-square value was 0,886, indicating a large effect. Thus, OC has a significant and relevant impact on EJP. Empirical studies showed a significant impact of culture on performance (Fridan and Maamari, 2024; Li and Tresirichod, 2024; Pham *et al*., 2024). This underlines the importance of aligning OC and HR practices (Narang and Singh, 2012; Uen *et al*., 2023) to positively shape employees' attitudes and behaviors (Sinding and Waldstrom, 2014). This would result in improved employee performance, which is key to organizational success (Hassan *et al*., 2023; Irsyadi, 2023).

6.3 The relationship between the use of DTs and EJP

The hypothesis that the use of DTs positively influences EJP was supported. The path coefficient was 0.141, and the *p*-value was 0.037, which suggested a significant impact. The adjusted R-square value was 0.719, which suggested a moderate effect, and the *f*-square value was 0.032, indicating a small effect. Thus, DTs have a significant and relevant impact on EJP. The empirical studies suggested a significant impact of the DTs on EJP (Alshammary and Hilmi, 2024; Schmitt, 2024). Therefore, DTs must be synchronized with employees to guarantee improved performance (Çini *et al*., 2023; Sivaraman, 2020). This further requires appropriate HR practices to positively shape employees' attitudes and behaviors (Sinding and Waldstrom, 2014).

6.4 The mediation role of the use of DTs

The hypothesis that using DTs mediates the relationship between OC and EJP was supported. The direct effect of OC on EJP was significant. Moreover, the indirect effect was significant. Therefore, DTs provided a complementary mediation (Hair *et al*., 2022) on the relationship between OC and EJP. Few empirical studies have found that DTs mediate the relationship between OC and performance (Daryanto *et al*., 2017; Martínez-Caro *et al*., 2020). However, this study is critical as it suggested the mediation role of foundational technologies and associated technical factors on the relationship between the Denison OC and EJP for the energy utility in South Africa. This implies that any change in OC directly impacts the use of DTs, subsequently impacting EJP. Therefore, OC, DTs, and EJP must be aligned to guarantee success.

7. Conclusion

The primary purpose of this study was to comprehend the relationship between the use of DTs, OC, and EJP and to develop a model for use by the energy utility in South Africa. This aim was achieved by evaluating the relationship between DTs, OC, and EJP use. A quantitative research design was adopted, and a close-ended questionnaire was used to collect data from the energy utility in South Africa. 111 valid responses were obtained from the energy utility. The PLS-SEM was employed to analyze the data. The SmartPLS 4 software package aided with the analysis. The results suggested a relationship between DTs, OC, and EJP. Hence, a nexus model was established between DTs, OC, and EJP.

Therefore, the organization must develop and implement appropriate strategies to warrant congruency between DTs, OC, and employees to increase the chances of success of digital transformation projects. While it is crucial for the organization to adopt appropriate emerging DTs, a conducive OC and employee focus are crucial. Thus, an integrative approach is mandatory when developing and implementing digital transformation initiatives. Human capital must be focal in these initiatives to obtain the associated benefits.

Although previous studies have suggested the relationship between DTs, OC, and EJP, this research established the nexus between DTs, OC, and EJP. Therefore, policymakers must adopt a holistic approach to digital transformation initiatives. The Denison OC is particularly crucial in shaping employees' attitudes and behaviors. It should be used to assess OC, and any gaps from the four Denison cultural traits must be addressed as part of digital transformation. Moreover, effective HR strategies and conducive OC are crucial in shaping employees' attitudes and behaviors. Though the developed nexus model is essential, it is only limited to the energy utility; hence, it must be tested on other similar organizations to determine its applicability.

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