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Higher education institutional innovation: An analysis of challenges to e-academic advising during emergency remote teaching

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Background: The sudden shift by higher education institutions (HEIs) to emergency remote teaching (ERT), driven by the coronavirus disease 2019 (COVID-19) pandemic, pushed academic advisors of HEIs to suddenly shift towards e-academic advising to continue with the provision of academic advisory support services. However, few studies have concentrated on e-academic advising innovation challenges in the context of developing countries.

Objectives: Therefore, the objective of this study was to examine students' challenges in the innovative e-academic advising during ERT in a HEI in South Africa.

Method: The study employed an online survey method and a stratified random sampling technique to select 240 first-year university undergraduate students from six faculties for the study. Structural equation modelling (SEM) with post hoc analysis, Bonferroni correlation, factor analysis with promax rotation and the Kaiser–Meyer–Olkin measure of sampling adequacy were employed in analysing the collected data.

Results: The findings revealed significantly correlated institutional, technological and personal challenges to e-academic advising. Despite e-academic advising challenges being experienced differently across faculties, findings revealed that students experienced personal challenges more than institutional and technological challenges.

Conclusion: Personal challenges are the most important factors for consideration when innovating to e-academic advising. The study concludes that the management of the HEI studied could improve the success of its innovation of integrating e-academic advising solutions to its academic affairs by considering a holistic approach that recognises the multifaceted challenges identified.

Contribution: The study contributes to the discussion on student success in online learning environments. Once the challenges are identified, measures can be put in place to address them.

Keywords: e-academic advising; innovation; first-year students; challenges; higher education institution; emergency remote teaching.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic resulted in the closure of academic institutions and the sudden shift to emergency remote teaching (ERT) by migrating courses and academic support services to virtual platforms (Murphy 2020). Resultantly, almost 91% of the global student body shifted to online education in the year 2020 (Abumalloh et al. 2021). The emergent shift was in a bid to maintain physical distancing, as well as continuing with the academic calendars. Higher education institutions (HEIs) struggled to augment their information communication technologies (ICTs) to keep on supporting students and restrict disturbances to their academic calendars (Fried & McDaniel 2020). One of the areas affected by the emergent shift was student academic advising, as it is part of the overall teaching and learning process (Campbell & Nutt 2008; Chan et al. 2019). Academic advising involves interaction between assigned academic advisors and students to provide students with guidance and advice (Iatrellis, Kameas & Fitsilis 2017), affording students opportunities to explore and acclimatise to the higher education institutional policies, procedures, services, resources, their academic goals, professional goals and personal goals (Chan et al. 2019). However, during the COVID-19 pandemic, the responsibility of academic advisors suddenly shifted to include supporting and easing of students' pressure, worries, nervousness and critical circumstances electronically after the COVID-19 pandemic (Flaherty 2020).

While studying during the pandemic was full of challenges, academic advising needed to be highly supportive (Advising Programs Office 2018), especially to first-year undergraduate students who had just joined the unfamiliar higher education environment. Academic advising enables early identification of students' challenges and subsequent direction of students to appropriate supporting resources and shaping students' worldviews in post-secondary education contexts (Liu & Ammigan 2022). The rigorous and perplexing nature of academic curriculum in HEIs can bring some level of stress in first-year undergraduate students (Barker et al. 2018) who have just migrated from secondary education systems, as online learning systems are new to such students, thus negatively affecting students' performance. Students' academic performance can be affected by the sudden change in education environment that they encounter when entering an institution of higher education (Pargett 2011). As an example, remote learning characterised by flexible self-directed learning can be challenging for undergraduate students from secondary education, as they are used to fixed learning schedules at schools. As a result, first-year students fail to cope with the new demands in higher education, resulting in high dropout rates, high failure rates and low success and graduation rates.

Although technological advancements in academic advising have been conventionally attentive to students' academic process and success (Gutiérrez et al. 2020; Loucif, Gassoumi & Negreiros 2020), face-to-face contact advising has been argued as more productive than remote advising (Kalamkarian & Karp 2015; Steele 2016). The coming of the COVID-19 pandemic and the rapid redesign of academic advising strategies to leverage technologies has drastically changed the practices and implementation of student support services (Amador & Amador 2014). In addition, the unremitting technological transformation has forced institutions to advance innovative operational models that align to this transformation successfully (Tshabalala & Marnewick 2021). As it may be a stimulating development for first-year undergraduate students to become accustomed to the new digitally enhanced learning environments (Gray, Chang & Kennedy 2010), important considerations on e-academic advising readiness provide a clear picture that academic institutions need more support and understanding of strategies to effectively provide e-academic advising services. Despite the potential of technological innovations in augmenting teaching and learning practices being naturally appealing (Davis 2011), it can be undeniably argued that the process of e-academic advising was characterised by challenges during the ERT periods, resulting from the lack of preparedness for pandemics. Literature (Al-Emran, Mezhuyev & Kamaludin 2018) reports that while technological innovation and acceptance research in education contexts has become prominent, and the importance of meaningful integration of technologies in teaching and learning contexts having been accentuated (Scherer, Siddiq & Tondeur 2019), the prospects of challenges in using these innovations cannot be ignored. Such challenges have a direct impact on the excellence of academic advising and services afforded to students by academic institutions. Consequently, the quality of e-academic advising provided by institutions goes on to affect students' retention and study completion rates.

Several studies have been conducted on academic advising, but they have mainly concentrated on students' satisfaction (Anderson, Motto & Burdeaux 2014; Lynch 2004; Teasley & Buchanan 2013). Despite the COVID-19 pandemic resulting in the increased demand for infusion of technology into students' academic affairs such as academic advising, few studies have examined the challenges from a student's perspective. The interplay of students, technologies and academic advising is of vital importance to comprehend how students were limited when using electronic platforms for academic advising. As a result, the purpose of this study is to explore the prominent challenges that hindered students in e-academic advising during ERT. Comprehension of the challenges is important for understanding how to develop and sustain relationships with students to decrease the number of students at risk as well as increase students' retention and success. Therefore, this study concentrates on the following question: what were the students' challenges to e-academic advising during ERT?

Theoretical foundation and hypothesis generation

A system of innovation is built upon by a combination of elements, for instance, institutions, individuals and other actors that interrelate in the production, diffusion and application of knowledge (Edquist 2010; Fischer 2001). Innovation is a complex undertaking comprising diffusion and conversion of technological conception into new processes (Samara, Georgiadis & Bakouros 2012). Innovation involves a mix of the creation of the innovation itself and the shift in the competence by concerned agents who are to use such an innovation (Lundvall 2007); it does not occur in isolation but within a complex, interactive connection of nodes (i.e. institutions, individuals, and technology) (COFISA 2010). Thus, the study looks at challenges of e-academic advising as a technological innovation in the context of ERT, from an institutional, individual (students) and technological perspective. As institutions have a great significance in influencing innovation, this study investigates e-academic advising innovation using an adapted institutional analysis (IA) framework from Dorward and Omamo (2005) and Mudombi and Muchie (2014). The main advantage of an institutional approach is its ability to explore the presence and course of an innovation that is greatly influenced by the context in which the stakeholders involved function (Coriat & Weinstein 2002). In addition, the framework is intentionally abstract, allowing for application in different contexts that involve roles and influences of institutions (Dorward & Omamo 2005). The framework was adapted for application in this study by borrowing the material conditions and relating them as resource conditions. Furthermore, community attributes were considered but excluded by the rules. Finally, the study adapted the action

situations and related them as institutional arrangements. Resultantly, the study considered resource conditions, community attributes and institutional arrangement as vital constructs in relation to the use of e-academic advising innovations.

Resource conditions and technology innovation

Resource conditions refer to the availability and sufficiency of the means needed to support an innovation, which determines the likelihood that such an innovation will succeed (Niosi 2002). As argued by Hall, Mytelka and Oyeyinka (2006), institutions play a pivotal role in determining the significant processes of innovation by investing in them. Resource conditions embrace technological factors that pertain to issues around the technological innovation used and its related technologies. Aspects of the technological factor include the social capital (Branscomb 2001), such as e-academic advising ICT resource availability, complexity, access and affordability. The user's financial cost of using a technological innovation, in the form of required devices, plays a central role in determining its relevance in the context in which the innovation is advanced. In addition, the level of complexity in using the innovation has the potential to limit its advancement. Therefore, the study suggests that:

> Hypothesis 1: Technological factors significantly posed challenges to e-academic advising.

Community attributes and technology innovation

Community attributes form part of the societal elements and characteristics that influence diffusion and use of innovations (Edquist 2006). The main features of innovativeness are the abilities of the concerned actors to utilise technological innovations that provide economic benefits (Carlsson et al. 2002). Under community attributes are personal factors that include anticipated advantage and cost, knowledge and skill with technology. Anticipated benefits drive interest for using an innovation, for example, ability to facilitate better students' performance, in addition to the associated costs (time and effort) required to use the technological innovation. Furthermore, individuals' perceptions, self-efficacy and confidence in using the innovation may determine their willingness to engage with the innovation. Therefore, the study hypothesises that:

> Hypothesis 2: Students' personal factors significantly posed challenges to e-academic advising.

Institutional arrangements and technology innovation

Institutional arrangements denote the different components of the institutional make-up that impact innovativeness (Hollingsworth 2000). As argued by Lundvall (2007), the fundamental of the innovation system is entrenched in the broader set of institutions. As such, institutions contribute significantly to shaping the important progression in innovation (Hall et al. 2006). However, institutions may possess conducive or inhibiting influence on innovation (Gronning 2008). Innovation happens if the capacity to innovate exists in an institution. Innovation capacity denotes readiness and accessibility of resources, collective structures, systems and processes (Bayarçelik, Taşel & Apak 2014). It becomes of vital importance for institutions to satisfy a certain level of innovation capacity to advance technological innovation. For example, it is crucial to have satisfactory finance and budgets as essential conditions for advancing technological innovations. According to Xie et al. (2013), financial resources play a significant role in determining the level of technological innovations. Institutional factors nurturing innovation include the dispersal of competent personnel to advance the innovation, information to guide decision making on such innovations, networks, and access to funding to acquire related technologies needed for the innovation (Oldenboom & Kleinknecht 1994). The presence or the absence of the capacity to innovate is assumed to translate to opportunities or challenges for students who seek for e-academic advising. Therefore, the study hypothesises that:

> Hypothesis 3: Institutional factors significantly posed challenges to e-academic advising.

Method

Research method is an important component of research; the relevant research method derives accurate results and therefore achieves the objective of the study (Henson, Stewart & Bedford 2020). Based on the positivist research paradigm (Andrade 2019), the quantitative study used an online survey questionnaire to collect data from a stratified sample drawn from six strata (faculties). Subsequently, the random technique was applied to select 40 participants across each faculty. Thus, a sample comprising 240 first-year undergraduate students was recruited and used for the study. From the online survey sent, a total of 202 responses were received, with 191 completed responses, representing a completion rate of 95%. This number of responses is deemed adequate as argued by Hair et al. (2010); for structural equation modelling (SEM), 150 responses are an acceptable parameter for measuring less than seven constructs. Accordingly, through the methodology of SEM with post hoc analysis, Bonferroni correlation, confirmatory factor analysis (CFA) with promax rotation, exploratory factor analysis (EFA) and the Kaiser–Meyer–Olkin measure of sampling adequacy were employed in analysing the collected data by using the Statistical Package for the Social Sciences (SPSS) (IBM Corporation, Armonk, New York, United States) version 25.

The structured online survey questionnaire was originally informed by the adapted research framework during development and comprised two sections. Section A had eight demographic items collecting data on students' gender, age, faculty, experience in using ICTs in formal learning environments, frequency of use of ICTs for academic advising and respondents' ICT. In addition, the questionnaire comprised Section B, which covered 20 five-

point Likert scale–based question items (from strongly disagree [1], to strongly agree [5]), collecting data on resource conditions, community attributes and institutional arrangements to estimate their influence on the use of e-academic advising. The scales were tested for validity and reliability. The questions were evaluated for validity to determine whether they were suitable for measuring the desired study issues and whether the statements were clear through expert opinion. Informed by the advice from experts, the scale was adjusted. Thereafter, the relationships between factors and factor loads were determined through confirmatory and exploratory analyses. The data attained from the factor analysis demonstrated the factor loads of between 0.571 and 0.809.

Table 1 shows that 48.7% of the study participants were male, while 51.3% were female students. In addition, 47.52% indicated that they completed 51% – 75% of their assessments in real time and that ICTs were very important (57.43%) in the execution of their academic activities. A significant 92.7% have been using ICT in a formal learning environment for less than 8 years, $p < 0.001$.

TABLE 1: Respondents' demographics.

Characteristics	Percentage
Gender	
Male	48.7
Female	51.3
Age	
17–18	28.8
19–20	43.5
21–22	20.4
23–25	6.3
More than 25 years	1.0
Average daily online presence	
0–<2	0.5
2–<4	7.9
4–<6	28.8
6-<8	48.2
3–<8	12.6
8–<12	2.1
Respondent faculty	
Arts and design	21.5
Management sciences	24.6
Accounting and informatics	18.8
Applied sciences	16.2
Health sciences	8.9
Engineering and built environment	9.9
Experience in ICT use	
< 3 years	51.3
3–8 years	41.4
8–12 years	6.3
12–15 years	1.0
Alignment between your ICT skills and the skills needed for e-academic activities:	
Not at all aligned	14.7
2	37.7
3	27.2
4	16.2
Very well aligned	4.2

ICT, information communication technologies; h, hour.

Data analysis and results

Collected data were analysed using SPSS version 25 through SEM, and various latent constructs were subjected to CFA and EFA analysis (Hair et al. 2017). Factor analysis with promax rotation was applied to these 20 items measuring academic e-advising challenges. Items 3 ('Because of the high data costs, I was unable to book adequate slots to get academic advice') and 15 ('The huge time gap between the pre-advising and advising was a limiting factor') were dropped because they did not load strongly enough onto any factor, while items 12 ('Open engagements were limited due to virtual communication') and 13 ('Long waiting queues discouraged me from seeking academic advice') were dropped because they cross-loaded onto multiple factors. Institutional, personal and technological factors were extracted which account for 50.97% of the variance in the data. A Kaiser–Meyer–Olkin measure of sampling adequacy (KMO) of 0.939 and a significant Bartlett's test indicate that the data were adequate for successful and reliable extraction. Rotation converged in five iterations. The factor loadings and factor correlations are shown in Table 2 and Table 3, respectively.

Table 3 shows that these factors were tested for reliability using Cronbach's alpha. An alpha value > 0.7 indicates reliability. Construct validity (convergent and discriminant validity) is evident from the loading matrix. The factors are cleanly separated, indicating discriminant validity. On each factor there are at least three items with factor loadings > 0.4, demonstrating that convergent validity has been attained.

Table 4 shows factor correlation matrix. The results show that there is a strong correlation between the institutional, personal and technological factors.

Table 5 shows that there is a strong correlation between these three factors. Composite variables are formed by calculating the average of the agreement scores for all items included in a variable. Correlations between these composite variables demonstrate a strong correlation between each pair, $p < 0.001$ in each case.

There is a significant difference in the agreement that these challenges are experienced, F (2, 380) = 43.127, $p < 0.001$. Post hoc analysis on each pair using the Bonferroni correction shows that personal challenges are experienced more than institutional and technological challenges, $p < 0.001$ in each case, and technological challenges are experienced more than institutional challenges, $p < 0.001$, as represented in Figure 1.

Figure 2 shows that male students experience significantly more personal challenges than female students, t (148.462) = 2.648, $p = 0.009$. The difference in technological challenges between male students and female students is marginally significant, with male students experiencing these challenges more than female students, t (157.442) = 1.903, $p = 0.059$.

TABLE 2: Factor loadings.

Questionnaire item	Factor		
	Institutional	Personal	Technological
5.17 The online advisory sessions were sometimes reduced in time because of technical glitches or some other problem beyond my control	0.786	-	-
5.8 I felt that there could be potential security and privacy violation issues if I consult online	0.728	-	-
5.1 There is a lack of support from the institution for students in the form of, for example, the provision of laptops and data	0.632	-	-
5.18 There were instances of session time-out before we had completed the advice session	0.628	-	-
5.16 There were instances of inadequate and slow response times from academic advisors	0.571		
5.5 I had low self-motivation to seek academic advice	-	0.806	-
5.6 Pressure from main academic activities limited the time I had available for academic advising	-	0.692	-
5.11 The communication channels used limited my contact with advisors	-	0.605	-
5.4 Network connectivity problems discouraged me from booking slots to get academic advice	-	0.611	-
5.20 Communicating through e-mails was discouraging	-	0.743	-
5.14 The lack of guidelines (initial orientation) on how to connect and schedule academic advising appointments was discouraging	-	0.719	-
5.9 I did not have adequate technology resources to connect and seek advice	-	-	0.809
5.10 I had technology affordability challenges	-	-	0.731
5.2 Because of my lack of sufficient ICT skills and knowledge, I found navigating academic advising platforms a challenge	-	-	0.575
5.7 I find e-academic advising to be less personal than face-to-face advising and therefore not as effective	-	-	0.780
5.19 I feel that having advice sessions online could result in violation of confidentiality	-	-	0.659

TABLE 3: Academic e-advising challenges.

Facator	Construct	Items included	Variance extracted	Cronbach's alpha
1	Institutional (INS)	1, 8, 16, 17, 18	44.29	0.830
2	Personal (PERS)	4, 5, 6, 11, 14, 20	4.22	0.829
3	Technological (TECH)	2, 7, 9, 10, 19	2.46	0.855

TABLE 4: Factor correlation matrix.

Factor	Institutional factors	Personal factors	Technological factors
Institutional	1.000	0.716	0.721
Personal	0.716	1.000	0.771
Technological	0.721	0.771	1.000

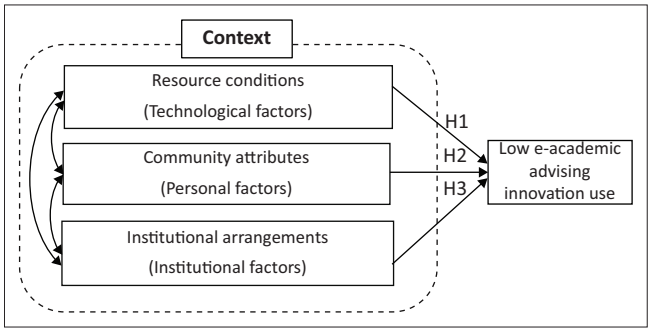
In addition, e-academic advising challenges were tested to determine if they differed significantly across faculty. Through analysis of mean values, findings demonstrated that these challenges are in every faculty. However, the lowest mean values were recorded in the faculty of arts and design, demonstrating fewer challenges. In addition, findings revealed significant differences in the extent to which institutional challenges are experienced by students across faculties, Welch (5, 74.003) = 3.508, $p = 0.007$. Games–Howell post hoc analysis shows that these challenges are experienced more in management sciences than in arts and design ($p = 0.031$); more in applied sciences than in arts and design ($p = 0.004$); and more in engineering and the built engineering than in arts and design ($p = 0.038$). However,

TABLE 5: Factor correlations.

	Institutional	Personal	Technological
Institutional challenges			
Pearson correlation	1	**0.656****	**0.700****
Sig. (2-tailed)	-	0.000	0.000
N	191	191	191
Personal challenges			
Pearson correlation	**0.656****	1	**0.751****
Sig. (2-tailed)	0.000	-	0.000
N	191	191	191
Technological challenges			
Pearson correlation	**0.700****	**0.751****	1
Sig. (2-tailed)	0.000	0.000	-
N	191	191	191

**, Correlation is significant at the 0.01 level (2-tailed).

Bold values represent Pearson correlation as indicated. Correlation between two variables.



Source: Dorward, A. & Omamo, W., 2005, 'Chapter 3: A framework for analysing institutions', in J. Kirsten & N. Vink (eds.), *The economics of institutions: Theory and application to African agriculture*, pp. 62–90, University of Pretoria, Pretoria and Mudombi, S. & Muchie, M., 2014, 'An institutional perspective to challenges undermining innovation activities in Africa', *Innovation and Development* 4(2), 313–326. https://doi.org/10.1080/2157930X.2014.921272

FIGURE 1: An adapted institutional analysis framework.

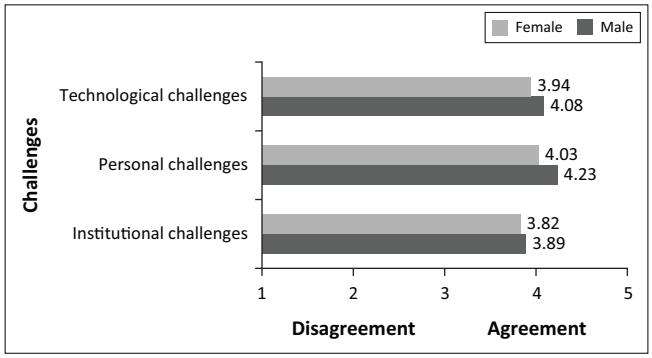


FIGURE 2: Challenges differences across demographics (gender).

results reveal a significant difference in the extent to which personal challenges are experienced by students across faculty, Welch (5, 72.768) = 4.445, $p = 0.001$. In addition, Games–Howell post hoc analysis shows that these challenges are experienced more in management sciences than in arts and design ($p = 0.002$); more in applied sciences than in arts and design ($p = 0.004$); more in health sciences than in arts and design ($p = 0.033$); and more in engineering and the built environment than in arts and design ($p = 0.003$). Furthermore, results reveal a significant difference in the extent to which technological challenges are experienced by students across faculty, Welch (5, 74.037) = 4.036, $p = 0.003$. Games–Howell post hoc analysis shows that these challenges are experienced more in management sciences than in arts and design ($p = 0.002$); in applied sciences than in arts and

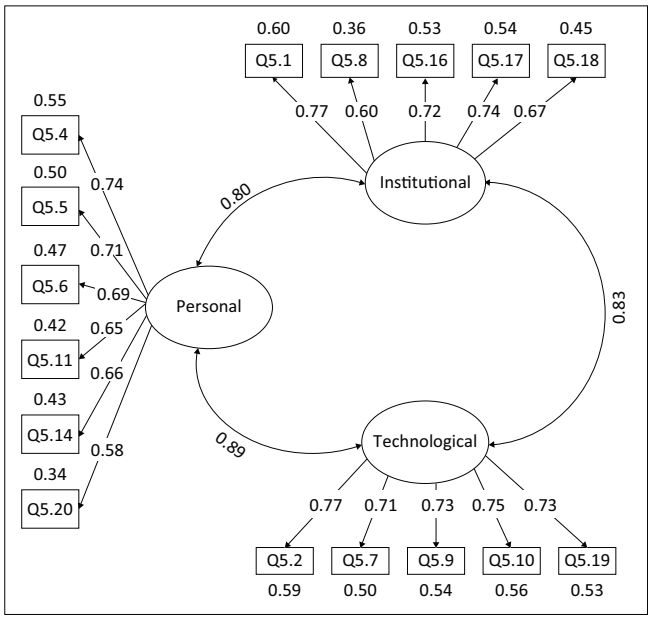
design (p = 0.007); in health sciences than in arts and design (p = 0.001); and in engineering and the built engineering than in arts and design (p = 0.008).

Furthermore, findings reveal that the better the alignment of students' ICT knowledge and skills, the less these challenges are experienced (institutional, personal and technological). However, the more critical ICT is perceived to be, the more technological challenges students experience. The study therefore suggests that the bring your own device (BYOD) practices (Mayayise 2021), in the context of students' e-academic advising, was problematic from a students' resource affordability perspective.

The goodness-of-fit of the model, as depicted in Figure 3, was examined using the root mean square error of approximation (RMSEA), minimum discrepancy per degree of freedom (CMIN/DF), comparative fit index (CFI), normed fit index or Tucker–Lewis index (NFI or TLI) and incremental fit index (IFI). The indices were higher than the generally accepted levels, showing that the measurement model fit the data well. Therefore, the fit of this measurement model is acceptable as given above. In addition to testing the significance of the association between the technological factor, personal factor and institutional factor, this study investigated the influence of these factors on students' use of e-academic advising innovations.

Technological factors and e-academic advising innovations use

While investigating the challenges to use of e-academic advising innovations by university students. The results of the present study disclosed that the composite variable of the technological factor (TECH) has a strong and positive correlation with students' use of e-academic advising innovations. The results shed more light on the crucial role of ICT skills, ICT knowledge and access to ICT resources in shaping students' use of institutional innovations such as e-academic advising.



Minimum discrepancy per degree of freedom (CMIN/DF) = 1.450, p = 0.002; comparative fit index (CFI) = 0.967; incremental fit index (IFI) = 0.967; root mean square error of approximation (RMSEA) = 0.049.

FIGURE 3: The refined model.

Institutional factors and e-academic advising innovations use

Regarding the composite variable institutional factor (INS), results demonstrated a significantly positive correlation with students' use of e-academic advising innovations. This provides an indication of the dominant role of institutions on the use of technological innovations by its stakeholders. Universities can be the origins of the forces that act against innovation use by students, and these are in the form of a lack of technological resource support, privacy and security concerns in the innovations adopted, response mechanisms and time by institutional academic advisors.

Personal factors and e-academic advising innovations use

Furthermore, the composite variable of personal factors (PERS) revealed significantly positive correlation with the use of e-academic advising innovations. This is regarded as the students' level of motivation to use and their perceptions regarding the e-academic advising innovations.

Discussion

Findings reveal that personal challenges are experienced more than institutional and technological challenges by the students surveyed. The findings agree with findings by Ohei and Brink (2019), whose study suggested that despite digital tools being pedagogically effective in education systems, human factors, resources and institutional policies posed challenges and needed to be considered. Personal challenges were also reported in a study by Owusu-Fordjour, Koomson and Hanson (2020) on Ghanaian tertiary students who indicated a lack of preparedness for self-guided learning from home during the COVID-19 pandemic. The current study findings further resonate with Machaba and Bedada (2022), whose study found that institutional and personal factors posed challenges to the use of technology in the higher education environment during the COVID-19 pandemic. However, the study partially diverges from the findings by Machaba and Bedada (2022) in that the prominent barriers to the integration of technology into teaching and learning processes rather proved to be at the institutional level.

In addition, the findings reveal that male students experience significantly more personal challenges than female students on e-academic advising. This finding contradicts the literature (Poelmans, Truyen & Desle 2009), whose study demonstrated that internationally, male students demonstrated significant comprehension of ICTs and their applications in different contexts in comparison to their female counterparts. Furthermore, technological factors such as inadequate technological resources to connect and seek e-academic

advice, technology affordability challenges and insufficient skills to navigate e-academic advising platforms resonate with Pather and Booi (2020), whose study suggests that the digital divide in South Africa was a reality especially for students from rural areas and isolated rural towns. Technological device ownership, network connectivity and speed of internet access determined the level of students' engagement with online academic activities. The study found that students had privacy and confidentiality concerns regarding e-academic advising, negatively influencing their willingness to seek advising. This finding also converges with (Argüello 2020), who postulates that issues of confidentiality and security of online academic advising have the potential to pose challenges to virtual academic advising.

Furthermore, the findings demonstrate a strong correlation between these personal, institutional and technological challenges. However, the study findings reveal that the better the alignment of students' ICT knowledge and skills, the less these challenges are experienced (institutional, personal and technological), resonating with Feghali, Zbib and Hallal (2011), who suggested that effective academic advising is dependent on the knowledge of students requiring that advice. The study findings suggest that if the institution trains first-year undergraduate students on ICTs for academic advising, the lower the prevalence of such challenges. Training of students on ICTs for academic affairs addresses institutional challenges that affect e-academic advising by improving the preparedness and readiness of students for emergency contexts. This finding resonates with Argüello (2020) and Alex (2022), who support that virtual advising requires full understanding of how to effectively develop and implement it. Support is given by Wang and Patterson (2005), who reported that diffusion of technological innovations is a multifaceted and problematic journey that is additionally complicated in the higher education environment due to the innovative culture that it naturally inspires. As such, the institution's digital transformation needed to follow a more student-centric e-academic advising implementation strategy that takes the resource attainment (acquisition and availing of digital resources) into consideration, as postulated by Mhlungu, Chen and Alkema (2019).

Conclusion and recommendations

Through an IA framework, the study examined the challenges to e-academic advising in a South African HEI. Despite personal challenges having greatly negatively impacted first-year undergraduate students' e-academic advising, findings demonstrated a strong correlation among the personal, technological and institutional factors; therefore, the institution needs to advance e-academic advising by considering all the perspectives. In addition, the study demonstrated that personal, technological and institutional factors are strongly positively correlated to the use of e-academic advising innovations. The study concludes that the challenges to e-academic advising are multifaceted and heterogeneous; therefore, a holistic approach is needed to address the challenges (personal, technological and institutional) and promote the envisioned success of e-academic advising. The holistic approach can be advanced through a strategically established framework built on a vibrant and integrated vision and educational motivation. Institutional challenges such as the lack of ICT resources can be attributed to ever-increasing students' enrolments (DHET 2014), with unmatched increase in the provision of resources (Davids 2014).

Findings from this study may be of interest to the South African HEIs, the Southern Africa region and other parts of the world sharing comparable circumstances. The findings demonstrate what needs to be prioritised when unforeseen detrimental circumstances such as disasters and pandemics resurface. As such, e-advising models need to be developed and implemented down to various institutional stakeholders through relevant training and technological resource support. However, findings from the study may be generalised with the consideration that the study was conducted with a group of first-year students at one institution of higher learning, which may not be a true representative of the entire South African student populace. A longitudinal survey is recommended to a wider student population. In addition, it is recommended that the HEI collaborate with other local and international HEIs to grasp good practices for e-academic advising.

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Competing interests

The author declares that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Author's contribution

J.M. is the sole author of this research article.

Ethical considerations

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Data availability

The datasets generated during the current study are available from the corresponding author on reasonable request.

Disclaimer

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References

Abumalloh, R., Alghamdi, A., Azzam, N. & Abdulraheem, A., 2021, 'Management of academic advising in higher educational institutions during COVID-19 pandemic', *Management Science Letters* 11(5), 1659–1666. https://doi.org/10.5267/j.msl.2020.12.006

Advising Programs Office, 2018, *Undergraduate advising resources and support*, viewed 13 March 2022, from https://advising.college.harvard.edu/.

Al-Emran, M., Mezhuyev, V. & Kamaludin, A., 2018, 'Technology acceptance model in M-learning context: A systematic review', *Computers & Education* 125, 389–412. https://doi.org/10.1016/j.compedu.2018.06.008

Alex, J.K., 2022, 'Impact of the COVID-19 pandemic on the academic life of higher education students: A rural South African perspective from a global study', *South African Journal of Higher Education* 36(1), 20–40. https://doi.org/10.20853/36-1-4303

Amador, P. & Amador, J., 2014, 'Academic advising via Facebook: Examining student help seeking', *The Internet and Higher Education* 21, 9–16. https://doi.org/10.1016/j.iheduc.2013.10.003

Anderson, W., Motto, J.S. & Bourdeaux, R., 2014, 'Getting what they want: Aligning student expectations of advising with perceived advisor behaviors', *Mid-Western Educational Researcher* 26(1), 27–51.

Andrade, C., 2019, 'Describing research design', *Indian Journal of Psychological Medicine* 41(2), 201–202. https://doi.org/10.4103/IJPSYM.IJPSYM_66_19

Argüello, G., 2020, 'Virtual academic advising in challenging times', in L. Naumovska (ed.), *The impact of COVID19 on the international education system*, pp. 184–196, Proud Pen, London. https://doi.org/10.51432/978-1-8381524-0-6_14

Barker, E.T., Howard, A.L., Villemaire-Krajden, R. & Galambos, N.L., 2018, 'The rise and fall of depressive symptoms and academic stress in two samples of university students', *Journal of Youth and Adolescence* 47(6), 1252–1266. https://doi.org/10.1007/s10964-018-0822-9

Bayarçelik, E.B., Taşel, F. & Apak, S., 2014, 'A research on determining innovation factors for SMEs', *Procedia-Social and Behavioral Sciences* 150, 202–211. https://doi.org/10.1016/j.sbspro.2014.09.032

Branscomb, L.M., 2001, 'Technological innovation', *International Encyclopedia of the Social & Behavioral Sciences,* pp. 15498–15502, Pergamon.

Campbell, S.M. & Nutt, C.L., 2008, 'Academic advising in the new global century: Supporting student engagement and learning outcomes achievement', *Peer Review* 10(1), 4–7, viewed 20 March 2022, from https://www.ebsco.com/ (Editorial).

Carlsson, B., Jacobsson, S., Holmén, M. & Rickne A., 2002, 'Innovation systems: Analytical and methodological issues', *Research Policy* 31(2), 233–245. https://doi.org/10.1016/S0048-7333(01)00138-X

Chan, Z.C., Chan, H.Y., Chow, H.C.J., Choy, S.N., Ng, K.Y., Wong, K.Y et al., 2019, 'Academic advising in undergraduate education: A systematic review', *Nurse Education Today* 75, 58–74. https://doi.org/10.1016/j.nedt.2019.01.009

COFISA, 2010, *Enhancing innovation in South Africa: The COFISA experience*, Department of Science and Technology, Pretoria.

Coriat, B. & Weinstein, O., 2002, 'Organizations, firms and institutions in the generation of innovation', *Research Policy* 31(2), 273–290. https://doi.org/10.1016/S0048-7333(01)00141-X

Davids, M.N., 2014, 'Traditional tutorial system – Fit for purpose or past its sell-by date? University students' pedagogical experiences: Leading article', *South African Journal of Higher Education* 28(2), 338–354. https://doi.org/10.20853/28-2-352

Davis, F.D., 2011, *Foreword in technology acceptance in education: Research and issues*, Sense Publishers, Rotterdam.

DHET, 2014, *White paper for post-school education and training*, Department of Higher Education and Training, viewed 04 April 2022, from www.gov.za/documents/download. php?f=207591?.

Dorward, A. & Omamo, W., 2005, 'Chapter 3: A framework for analysing institutions', in J. Kirsten & N. Vink (eds.), *The economics of institutions: Theory and application to African agriculture*, pp. 62–90, University of Pretoria, Pretoria.

Edquist, C., 2006, 'Systems of innovation: Perspectives and challenges', in J. Fagerberg, D.C. Mowery, & R.R. Nelson (eds.), *The Oxford handbook of innovation*, pp. 181–208, Oxford University Press, Oxford.

Edquist, C., 2010, 'Systems of innovation perspectives and challenges', *African Journal of Science, Technology, Innovation and Development* 2(3), 14–45, viewed 30 March 2022, from https://hdl.handle.net/10520/EJC10560.

Feghali, T., Zbib, I. & Hallal, S., 2011, 'A web-based decision support tool for academic advising', *Journal of Educational Technology & Society* 14(1), 82–94, viewed 10 April 2022, from https://www.jstor.org/stable/10.2307/jeductechsoci.14.1.82.

Fischer, M.M., 2001, 'Innovation, knowledge creation and systems of innovation', *The Annals of Regional Science* 35(2), 199–216. https://doi.org/10.1007/s001680000034

Flaherty, C., 2020, 'The ABCs of advising are listen, respect, care', *Insider Higher Ed*, pp. 1–7. viewed 20 March 2022, from https://www.insidehighered.com/news/2020/12/14/study-abcs-advising-are-listen-respect-care

Fried, M. & McDaniel, C., 2020, *Accelerating advising technology implementation in response to* COVID-19, Ithaka S+R, New York. https://doi.org/10.18665/sr.314573

Gray, K., Chang, S. & Kennedy, G., 2010, 'Use of social web technologies by international and domestic undergraduate students: Implications for internationalising learning and teaching in Australian universities', *Technology, Pedagogy and Education* 19(1), 31–46. https://doi.org/10.1080/14759390903579208

Gronning, T., 2008, 'Institutions and innovation systems: The meanings and roles of the institution concept within systems of innovation approaches', in *DRUID conference on entrepreneurship and innovation–Organizations, institutions, systems and regions*, Copenhagen, June 17, pp. 17–20, CBS, Denmark

Gutiérrez, F., Seipp, K., Ochoa, X., Chiluiza, K., De Laet, T. & Verbert, K., 2020, 'LADA: A learning analytics dashboard for academic advising', *Computers in Human Behavior* 107, 105826. https://doi.org/10.1016/j.chb.2018.12.004

Hair, J.F., Black, W.C., Babin, B.J. & Anderson, R.E., 2010, *Multivariate data analysis*, 7th edn., Prentice Hall, Englewood Cliffs, NY.

Hair, J.F., Hult, G.T.M., Ringle, C.M. & Sarstedt, M., 2017, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 2nd edn., Sage, New York.

Hall, A., Mytelka, L. & Oyeyinka, B., 2006, *Concepts and guidelines for diagnostic assessments of agricultural innovation capacity*, UNU-MERIT working paper series #2006–2017, UNU-MERIT, Maastricht.

Henson, R., Stewart, G. & Bedford, L., 2020, 'Key challenges and some guidance on using strong quantitative methodology in education research', *Journal of Urban Mathematics Education* 13(2), 42–59. https://doi.org/10.21423/jume-v13i2a382

Hollingsworth, J.R., 2000, 'Doing institutional analysis: Implications for the study of innovations', *Review of International Political Economy* 7(4), 595–644. https://doi.org/10.1080/096922900750034563

Iatrellis, O., Kameas, A. & Fitsilis, P., 2017, 'Academic advising systems: A systematic literature review of empirical evidence', *Education Sciences* 7(4), 90. https://doi.org/10.3390/educsci7040090

Kalamkarian, H.S. & Karp, M.J.M., 2015, 'Student attitudes toward technology-mediated advising systems', *Online Learning* 21(2), 1–24. https://doi.org/10.24059/olj.v21i2.918

Liu, C. & Ammigan, R., 2022, 'Humanizing the academic advising experience with technology: An integrative review', in R. Ammigan, R.Y. Chan & K. Bista (eds.), *STAR scholar book series*, pp. 185–202.

Loucif, S., Gassoumi, L. & Negreiros, J., 2020, 'Considering students' abilities in the academic advising process', *Education Sciences* 10(9), 254. https://doi.org/10.3390/educsci10090254

Lundvall, B.Å., 2007, 'National innovation systems – Analytical concept and development tool', *Industry & Innovation* 14(1), 95–119. https://doi.org/10.1080/13662710601130863

Lynch, M.L., 2004, 'A survey of undergraduate student reactions to academic advising', *NACADA Journal* 24(1–2), 62–74. https://doi.org/10.12930/0271-9517-24.1-2.62

Machaba, F. & Bedada, T., 2022, 'University lecturers' preparedness to use technology in teacher training of mathematics during COVID-19: The case of Ethiopia', *South African Journal of Higher Education* 36(1), 171–192. https://doi.org/10.20853/36-1-4560

Mayayise, T., 2021, 'Extending unified theory of acceptance and use of technology with ISO/IEC 27001 security standard to investigate factors influencing bring your own device adoption in South Africa', *South African Journal of Information Management* 23(1), 1–9. https://doi.org/10.4102/sajim.v23i1.1376

Mhlungu, N.S., Chen, J.Y. & Alkema, P., 2019, 'The underlying factors of a successful organisational digital transformation', *South African Journal of Information Management* 21(1), 1–10. https://doi.org/10.4102/sajim.v21i1.995

Mudombi, S. & Muchie, M., 2014, 'An institutional perspective to challenges undermining innovation activities in Africa', *Innovation and Development* 4(2), 313–326. https://doi.org/10.1080/2157930X.2014.921272

Murphy, M.P., 2020, 'COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy', *Contemporary Security Policy* 41(3), 492–505. https://doi.org/10.1080/13523260.2020.1761749

Niosi, J., 2002, 'National systems of innovations are "X-efficient" (and x-effective) why some are slow learners', *Research Policy* 31(2), 291–302. https://doi.org/10.1016/S0048-7333(01)00142-1

Ohei, K.N. & Brink, R., 2019, 'A framework development for the adoption of information and communication technology web technologies in higher education systems', *South African Journal of Information Management* 21(1), 1–12. https://doi.org/10.4102/sajim.v21i1.1030

Oldenboom, E. & Kleinknecht, A., 1994, *An innovation survey in a Russian region; the case of Nizhny Novgorod (Gorki)*, SEO, Amsterdam.

Owusu-Fordjour, C., Koomson, C.K. & Hanson, D., 2020, 'The impact of COVID-19 on learning – The perspective of the Ghanaian student', *European Journal of Education Studies* 7(3), 1–14.

Pargett, K.K., 2011, 'The effects of academic advising on college student development in higher education', viewed 15 March 2022, from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1083& context=cehsedaddiss.

Pather, S. & Booi, E., 2020, 'An assessment of student resource readiness for online learning during COVID 19: A South African case study', in *Proceedings of ICERI2020 Conference*, 09–10 November 2020, p. 21125, IATED, Madrid, Spain.

Poelmans, S., Truyen, F. & Deslé, R., 2009, 'Perceived computer literacy among different types of undergraduate students: Findings of a survey', in *2nd international conference of education, research, and innovation*, pp. 16–18, 16–18 November, 2009, IATED, Madrid, Spain

Samara, E., Georgiadis, P. & Bakouros, I., 2012, 'The impact of innovation policies on the performance of national innovation systems: A system dynamics analysis', *Technovation* 32(11), 624–638. https://doi.org/10.1016/j.technovation.2012.06.002

Scherer, R., Siddiq, F. & Tondeur, J., 2019, 'The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education', *Computers & Education* 128, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Steele, G.E., 2016, 'Technology and academic advising. Beyond foundations: Developing as a master academic advisor', pp. 305–326.

Teasley, M.L. & Buchanan, E.M., 2013, 'Capturing the student perspective: A new instrument for measuring advising satisfaction', *NACADA Journal* 33(2), 4–15. https://doi.org/10.12930/NACADA-12-132

Tshabalala, M.M. & Marnewick, C., 2021, 'Agile as an enabler towards innovation-based organisational transformations', *South African Journal of Information Management* 23(1), 1–10. https://doi.org/10.4102/sajim.v23i1.1309

Wang, Y.M. & Patterson, J., 2005, 'Learning to see differently: Viewing technology diffusion in teacher education through the lens of organizational change', *Journal of Educational Technology Systems* 34(1), 69–82. https://doi.org/10.2190/FJU7-1549-8DWP-PG24

Xie, X., Zeng, S., Peng, Y. & Tam, C., 2013, 'What affects the innovation performance of small and medium-sized enterprises in China?', *Innovation: Management, Policy & Practice* 15(3), 271–286. https://doi.org/10.5172/impp.2013.15.3.271