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About the Journal

The Uganda Higher Education Review: Journal of the National Council for Higher Education (NCHE) provides a visible outlet for definitive articles that discuss the theory, practice and policies relating to the role, development, management and improvement of higher education from national, regional and international viewpoints. The journal provides a platform for scholars, researchers and higher education institutions to make a contribution to scholarly debate through the publication of quality peer-reviewed articles.

The journal publication is done twice a year, that is in May and September. The journal is committed to the publication of both experienced and early-career researchers so its editorial policy pays overriding attention to helping contributors to reach the level of quality that is deemed fit for the publication through ensuring relevant, fair and penetrating reviews as well as timely relay of feedback to contributors.

The objective of the journal is to publish original research on higher education. The primary aim of this journal is the dissemination of important research work that will promote a sustainable, accessible and quality higher education that is relevant for social transformation.

Aims and Scope

The Uganda Higher Education Review is a broad-based journal that covers all aspects of higher education. Papers containing new ideas, creative approaches and/or innovative applications are welcome. Papers that discuss the theory, practice and policies relating to the role, development, management and improvement of higher education from national, regional and international viewpoints are sought.

NB: The journal is open access.

This journal is a product of the call for papers and research areas of focus in this Volume 12, Issue 1, 2024, and includes the following:

1. The adoption of emerging technologies in the digital transformation of higher education.
2. Financing and investment in higher education
3. Improving access and exclusivity to higher education in Uganda: Addressing Uganda's low Gross Enrolment Ratio.
4. The role of the private sector in the enhancement of graduate skills and employability through technology innovation.

Foreword
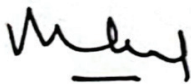
The National Council for Higher Education (NCHE) is mandated under Section 4(b) of the Universities and Other Tertiary Institutions Act 262, to promote and develop the processing and dissemination of information on higher education for the benefit of the public. In line with this mandate, NCHE has consistently advanced scholarly discourse in higher education through *The Uganda Higher Education Review Journal*, published semi-annually in May and November.

It is my privilege to present to you **Volume 12, Issue 1 (November 2024)** of the journal, now available electronically via **DOI: 10.58653** and with **ISSN 1813-2243 (print)** and **2958-5473 (online)**. The articles in this issue embody a profound commitment to rigorous inquiry, intellectual curiosity, and scholarly excellence.

This edition explores critical themes, including:

1. Financing and Investment in Higher Education.
2. The Adoption of Emerging Technologies in the Digital Transformation of Higher Education.
3. Improving Access and Inclusivity in Higher Education in Uganda: Addressing the Nation's Low Gross Enrolment Ratio.
4. The Role of the Private Sector in Enhancing Graduate Skills and Employability through Technology Innovation.

I sincerely appreciate the contributors whose unwavering dedication to their fields has enriched the publication. I also acknowledge the exceptional efforts of the authors, NCHE staff and Management, the editorial team, and the reviewers. Their expertise and commitment have been instrumental in ensuring the quality and integrity of the research presented in this volume.

Professor Mary J. N. Okwakol
EXECUTIVE DIRECTOR/EDITOR-IN-CHIEF

Testing the Psychometric Properties of Organisational Citizenship Behaviour in the Context of Academic Staff in Universities in Uganda

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Abstract

Different tools have been developed to test organisational citizenship behaviour (OCB). However, psychometric properties developed and tested in a particular context do not guarantee their fit in all contexts and especially the operationalisation and application of dimensions of OCB may differ from country to country. Accordingly, in this study we set out to test the psychometric properties of Podsakoff et al.'s (1990) measure of OCB in the context of academic staff in selected universities in Uganda. Taking a positivism strand, we used a self-administered questionnaire and collected data from a sample of 159 academic staff drawn from Makerere University (Mak), Mbarara University of Science and Technology (MUST) and Mountains of the Moon University (MMU), who responded to a self-administered questionnaire on the instrument. Our analysis involved applying confirmatory factor analysis (CFA) retesting the reliabilities of the constructs using the Cronbach's alpha method and Pearson's linear correlations to check construct relatedness. We found that all the five constructs in the shortened version were valid, and that the five constructs were, however, interrelated. Based on Podsakoff et al.'s (1990) instrument, this research confirms the scale in the higher education context. We conclude that Podsakoff et al.'s (1990) instrument is valid and reliable. Nevertheless, we recommend other researchers to continue testing it in different contexts with the intent of refining it and also to have a sample size bigger than ours if the best results are to be obtained.

Keywords: *Academic; Correlation; OCB; Psychometric properties; University.*

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Introduction

Organisations that have employees who carry out tasks beyond their job descriptions outperform those that do not (Farris, 2018). That act of going beyond task bureaucracies is what Bateman and Organ (1983) refer to as organisational citizenship behaviour (OCB. Bateman and Organ (1983), for instance, define OCB as organisationally beneficial behaviours and gestures exhibited by an employee that are neither obligatory nor done for remuneration. They posit that OCB consists of informal assistance that an employee could choose to volunteer or withhold without regard to considerations of sanction or official incentives. Over the years, a number of taxonomies pertaining to OCB have been forwarded to explain OCB. For instance, Organ (1988) proposes an expanded five-factor OCB taxonomy consisting of conscientiousness, sportsmanship, civic virtue, courtesy and altruism; Anderson and Williams (1991) propose two constructs: OCB towards the individual (OCB-I) and OCB which is organization-oriented (OCB-O); while Van Dyne et al. (1994) delineate loyalty, participation and obedience.

The importance of OCB is well captured by different authors (e.g., Borman, 2004; Burns & Carpenter, 2008). Borman (2004) contends that an employee's high level of OCB promotes his/her productivity and, in the end, an organisation becomes more able to attract and retain such an employee. Burns and Carpenter (2008) also contend that an employee who engages in sportsmanship increases the time spent on constructive endeavours than trivial matters in an organisation. Yaakobi and Weisberg (2020) posit that OCB facilitates the social machinery of an institution, thus being an enabler for employees to focus on their tasks. This implies that OCB is important in an organisation like a university. Given its importance, OCB has attracted several studies.

Although a lot of research has been done on OCB, much of it has focused on understanding the relationship between constructs rather than construct development. Matembe et al. (2015) report that studies validating OCB in developing countries are relatively small in number, thus testing the psychometric properties of OCB in Uganda is paramount. In contributing to closing the gaps identified in the few studies on validating OCB tools, we tested Podsakoff et al.'s (1990) instrument of OCB in the context of academic staff in universities in Uganda. The main question in our study was: Is Podsakoff et al.'s (1990) instrument of OCB valid and reliable in the context of academic staff in universities in Uganda? Our objectives were: (i) to test the psychometric properties of the shortened version of Podsakoff et al.'s (1990) instrument of OCB in the context of academic staff in universities in Uganda; and (ii) to test whether the five constructs of the shortened version of the instrument, namely conscientiousness (CON), sportsmanship (SPO), civic virtue (CV), courtesy (CT) and altruism (ALT), were independent.

Literature Review

Organ (1988) proposes a five-factor OCB taxonomy consisting of conscientiousness (CON), sportsmanship (SPO), civic virtue (CV), courtesy (CT) and altruism (ALT). In that regard, Organ defines conscientiousness as an employee's behaviour showing acceptance and adherence to the rules, regulations and procedures of an organisation; and sportsmanship as an employee's willingness to tolerate less than ideal circumstances without complaining

about trivial matters. Organ also defines civic virtue as keeping up with issues that affect the organisation; courtesy as consulting with others before taking action; and altruism as voluntary behaviours or actions that help a colleague with work-related problems.

Podsakoff et al. (1990) developed a scale of OCB basing on the work of Organ (1988), who had suggested that OCB consisted of five dimensions. The dimensions were conscientiousness (CON), sportsmanship (SPO), civic virtue (CV), courtesy (CT) and altruism (ALT). Podsakoff et al. used definitions of the constructs of OCB as provided by Organ and generated items for each construct. Podsakoff et al. gave supervisors definitions of the five dimensions and asked them to create another category of dimensions in case there were items that did not fit any of the conceptual definitions. Podsakoff et al.'s scale had 24 items (CON with five items; SPO with five items; CV with four items; CT with five items; and ALT with five items) and consisted of only items regarding which at least 80% of the judges agreed on the item's coding.

Over the years, several researchers have tested the validity and reliability of Podsakoff et al.'s (1990) instrument of OCB. Argentero et al. (2008), for example, tested an Italian version of Podsakoff et al.'s (1990) instrument on 1,066 respondents after translating it into Italian from the original English version. They performed tests on respondents who had clerical roles in the service sector in Italy. Having done exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), they found that "all the items … loaded on the factor from which they were derived" (p. 67). Cronbach's alpha of the total scale was 0.84. From item analysis, all items were found to be "homogeneous" (p. 67). Their results showed that although the constructs of OCB were distinct, they were significantly correlated.

Mahembe et al. (2015) validated the OCB scale using a sample of 503 from the educational sector in the Eastern and Western Cape Provinces of South Africa. They carried out a confirmatory factor analysis (CFA) and found that CON, SPO, CV, CT and ALT were valid measures of OCB. They also reported having found adequate internal consistency coefficients ($\alpha \geq 0.70$) of OCB constructs with Cronbach's alpha coefficients of 0.97 (CON), 0.80 (SPO), 0.94 (CV), 0.97 (CT), and 0.98 (ALT). They, however, noted that "there is need to replicate the study using public and private sector employees to establish if similar results would be obtained" (p. 6). They again noted that whereas psychometric results of the OCBS indicated reasonable construct validity, there was limited or questionable discriminant validity.

Kumar and Shah (2015) checked the psychometric properties of Podsakoff et al.'s (1990) instrument among permanent professionals in Srinagar in Kashmir, India. They had 340 participants in the category of doctors from SKIMS Hospital, academic staff from the University of Kashmir, and bank officers from J and K Bank. They did a pilot study on Podsakoff et al.'s 24-item scale, which included an initial reliability test on 15% of their total sample size. During the tests, Kumar and Shah discussed the items with respondents and other experts. They dropped items that lacked internal consistency or that had been reported by respondents and experts as having been vague or confusing. They ended up with a final scale of only 15 items. Taking a benchmark of Cronbach's alpha values above 0.6 as acceptable, they found that four of the constructs were reliable with Cronbach's alpha coefficients of 0.71 (ALT), 0.65 (CV) and 0.66 (CON), while SPO (0.58) was not. As a

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result, they dropped sportsmanship from their analysis. Again, using principal component analysis, they found a three-factor structure of OCB, namely: ALT (respondents perceived ALT to be the same with CT), CV and CON. In summary, Kumar and Shah found that the validity and reliability of a brief version of the instrument was satisfactory. They, however, noted with concern that their "findings [were] limited to the items used to measure OCB in this particular study" (p. 59). They hence encouraged other researchers to investigate the validity and reliability of Podsakoff et al.'s scale in diverse and larger samples; this is the genesis of this sort of investigation.

Janadari et al. (2018) tested the validity and reliability of Podsakoff et al.'s (1990) instrument of OCB in Sri Lanka. They incorporated all the 24-item instrument of CON, SPO, CV, CT and ALT on 296 employees who were drawn from public sector organisations. They found that the five constructs of OCB were reliable, with their Cronbach's alpha values being well above 0.7 (i.e., ALT, 0.797; CV, 0.809; CON, 0.788; CT, 0.798; & SPO, 0.809). Janadari et al., however, point out that they only used a sample of employeees from Sri Lanka to test Podsakoff et al.'s measure and thus encouraged other scholars to do more research and explore OCB's "conceptual clarity and validity" (p. 7). Thus, the need for this investigation.

In addition to Janadari et al. (2018), Kumar and Shah (2015) and Mahembe et al. (2015), who reported contextual gaps in the instrument developed by Podsakoff et al., the length of Podsakoff et al.'s instrument has also been a concern to some researchers (e.g., Henderson et al., 2019; Kumar & Shah, 2015). Kumar and Shah (2015), in particular, report that when they reduced Podsakoff et al.'s (1990) original 24-item instrument to 15 items, they still found satisfactory validity and reliability of the brief version. Accordingly, Henderson et al. (2019) assert that a short version of an instrument reduces inflation of items, participant attrition, and survey costs. They thus stress that it is imperative to develop sound psychometric short tools for measuring OCB. To reduce the different gaps indicated in earlier studies, we sought to test the validity and reliability of the shortened version of Podsakoff et al.'s instrument of OCB among academic staff in universities in Uganda. In particular, we sought to: (i) establish the validity and reliability of each construct (CON, SPO, CV, CT and ALT) with the shortened version of the instrument; and (ii) to test whether the five constructs were independent of one another in the shortened version of the instrument.

Methodology

In this study, we adopted the positivist philosophical lane. The positivist paradigm aims at "identifying objective reality with adoption of a deductive approach based on theory and hypotheses" (Callingham & Hay, 2018). In this regard, I tested the applicability of Podsakoff et al.'s (1990) measure of OCB in the context of academic staff in universities in Uganda. I adopted a cross-sectional survey design. The survey method enabled me to collect data from a large number of respondents that I could generalise. With cross-sectional design, we took a random sample in order to understand the cross-section of interest (i.e., OCB and the antecedents as suggested by Podsakoff et al.'s model) at a particular point or

cross-section in time (Bordens & Abbott, 2018). We collected data using Podsakoff et al.'s (2000) instrument of OCB, which operationalised OCB as conscientiousness (CON) with five items; sportsmanship (SPO) with five items; civic virtue (CV) with four items; courtesy (CT) with five items; and altruism (ALT) with five items.

To be sure of our content validity, before collecting data, we carried out a preliminary validation of the instrument using face validity. This exercise helped us to avoid "contextually vague, irrelevant, ambiguous or confusing items" (Kumar & Shah, 2015, p. 53). Besides, the exercise helped us to reduce the items on CON from five to two; SPO from five to three; CV from four to three; CT from five to three; and ALT from five to three. In total, to measure OCB, our instrument remained with 14 items (Table 1). We scaled these items using the five-point Likert scale from 1(strongly disagree) to five (strongly agree).

Thence, we did confirmatory factor analysis (CFA) and reliability analysis (RA) for the valid items. For each item, we considered loadings measuring highly, that is above 0.5, on the factor. Mvududu and Sink (2013) recommend that only loadings with ≥ 0.5 should be considered. The Cronbach's alpha results above 0.7 were considered for internal consistency (de Souza et al., 2017). We also carried out correlations where we correlated OCB (dependent variable) with constructs of each of the four independent variables using Karl Pearson's linear correlation coefficient test.

Table 1: Constructs of OCB in the instrument

Construct	No. of Items adapted (*)	No. of Items in the Original Instrument (**)	Reliabilities of Items in the Original Instrument
Conscientiousness (CON)	2	5	0.82
Sportsmanship (SPO)	3	5	0.85
Civic virtue (CV)	3	4	0.70
Courtesy (CT)	3	5	0.85
Altruism (ALT)	3	5	0.85

Source: Podsakoff et al. (1990, pp. 124,125; Table 6, p. 126; Table 7)

Positivist researchers deal with relatively large samples which may represent the population and facilitate generalisation (Park et al., 2020). From the total population of 1,834 academic staff from the three universities at the time of data collection, based on Krejcie and Morgan's (1970) table of sample size determination, our sample size, out of 1,834, was 317 participants. Academic staff responded to a self-administered questionnaire and the proportionate figure for each of the three universities was Mak = 259, MUST = 22 and MMU = 36, making a total sample size of 317. We considered each college (in the case of Mak) and school or faculty (in the case of MUST and MMU) as a cluster, thus using cluster sampling. This is because positivists are strict about choosing their sample in that they use random sampling methods to select respondents. A total of 159 valid responses were obtained, yielding a (159/317) *100 = 50.2% response rate. The sample that provided data

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and the respondents' background characteristics is indicated in Table 2. As given in Table 2, a typical respondent was aged up to 40 years (almost 59%), was a male (over 72%), came from MMU (almost 43%), had a master's degree as his highest level of education (over 60%); was at the rank of Assistant Lecturer (almost 52%); and had served the university for 10 or more years (over 38%).

Table 2: Background characteristics of respondents

Background variables	Category	Frequency	Percent
Age in years	Up to 40	76	58.5
	41 to 49	36	27.8
	50 and above	18	13.8
	Total	159	100.0
Gender	Male	114	72.2
	Female	44	27.8
	Total	158	100.0
The university of affiliation	Makerere	67	42.1
	Mountains of the Moon	68	42.8
	Mbarara University of Science and Technology	24	15.1
	Total	159	100.0
Highest level of education	Bachelors	10	6.3
	Masters	96	60.4
	PhD	53	33.3
	Total	159	100.0
Academic ranks	Teaching Assistant	11	7.0
	Assistant Lecturer	82	51.9
	Lecturer	40	25.3
	Senior Lecturer	18	11.4
	Associate Professor	4	2.5
	Professor	3	1.9
	Total	158	100.0
Tenure of service	Up to five	42	26.4
	Five but below 10	56	35.2
	10 or more	61	38.4
	Total	159	100.0

To achieve our first objective, we used confirmatory factor analysis (CFA) on validity and the Cronbach's alpha (α) coefficient method on reliabilities. In the case of our second objective, we used the Pearson linear correlation (PLC) analysis to establish whether the constructs of Podsakof et al.'s (1990) instrument were independent.

Results

Validity and reliability of a shortened version of Podsakoff et al.'s instrument. To achieve our objectives, we determined the appropriateness of factor analysis of the OCB instrument, establishing the factors and factor rotation of the components. We also computed average indexes for the valid items and thereafter correlated them using the Pearson linear correlation (PLC). The first objective in this study was to test the validity and reliability of the shortened version of Podsakoff et al.'s (1990) instrument of OCB in the context of academic staff in universities in Uganda. To achieve this objective, we used confirmatory factor analysis (CFA) and Cronbach's alpha coefficient. Before computing the aggregate index of items on a multi-item variable, we checked whether the different items were valid measures of a particular variable. To ascertain whether the different constructs had been answered validly, we used factor analysis. Thus, using principal component analysis, we first ascertained total variance explained and the percentage of the total variation in items factor analysed, explained by each factor. In selecting significant factors, we followed the Kaiser Guttman rule (Sarstedt & Mooi, 2019) that "an intuitive way to decide on the number of factors is to extract all the factors with an eigenvalue greater than 1" (p. 271) because each component/factor that has an eigenvalue greater than 1 accounts for extra variance than a single factor. Further to the validation of items on a multi-item variable, we checked whether all its valid items were jointly answered reliably and thus computed the reliability indices and Cronbach's alpha (α) for the different constructs.

During factor analysis, we considered factors with eigenvalues greater than 1 as significant. For an item to be highly loaded on a factor, we used 0.5, being the threshold magnitude as suggested by Mvududu and Sink (2013). We regarded the final alpha above 0.7 (de Souza et al., 2017) as the yardstick by assessing whether particular items were jointly a reliable measure of a given construct. The results of these tests are presented in the subsequent subsections of conscientiousness, sportsmanship, civic virtue, courtesy and altruism.

Conscientiousness. We used confirmatory factor analysis (CFA) to reduce the two items (CON1, CON2) on conscientiousness (CON) to only one significant factor. The factor had an eigenvalue of 1.556, meaning that the factor accounted for 1.556/2 * 100 = 77.776% of the joint variation in the two items. The respective loadings of the two items on the factor are given in Table 3.

Table 3: Factors and Cronbach's alpha for items of conscientiousness

Item	Description	Factor	Loadings	α
CON1	I obey university rules and regulations even when no one is watching		0.882	0.713
CON2	My attendance at work is above the norm		0.882	
	Eigenvalue		1.556	
	% variance		77.6	

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In Table 3, each loading was high (greater than 0.5), meaning that each of the two items was a valid measure of CON. The reliability ($\alpha = 0.713$) of two items as per Table 3 was high (greater than 0.7), meaning that the two items were jointly reliable measures of CON.

Sportsmanship. We applied confirmatory factor analysis (CFA) to reduce the three items (SPO1, SPO2, SPO3) on sportsmanship (SPO) to only one significant factor. The factor had an eigenvalue of 1.813, meaning that the factor accounted for 1.813/3 * 100 = 60.446% of the joint variation in the three items. The respective loadings of the three items on the factor are given in Table 4.

Table 4: Factors and Cronbach's alpha for items of sportsmanship

Item	Description	Factor Loadings	α
SPO1	I do not waste time complaining about trivial matters in this university	0.737	0.666
SPO2	I do not find fault what the university is doing	0.751	
SPO3	I focus more on positive issues of this university than negative ones	0.840	
	Eigenvalue	1.813	
	% variance	60.46	

In Table 4, each factor loading was high (greater 0.5), meaning that each of the three items was a valid measure of SPO. We took the reliability ($\alpha = 0.666$) of the three items as high basing on de Souza et al.'s (2017) observation that values above 0.60 were satisfactory.

Civic virtue. Table 5 shows that we used confirmatory factor analysis (CFA) to reduce the three items (CV1, CV2, CV3) on civic virtue (CV) to only one significant factor. The factor had an eigenvalue of 1.785, meaning that the factor accounted for 1.785/3*100 = 59.488% of the joint variation in the three items. The respective loadings of the three items on the factor are given in Table 5.

Table 5: Factors and Cronbach's alpha for items of civic virtue

Item	Description	Factor Loadings	α
CV1	I attend meetings that are not mandatory but which I consider important for the University	0.789	0.658
CV2	I attend functions that are not required but help the image of the University	0.810	
CV3	I read and keep up with announcements, memos and so on, in this University	0.701	
	Eigenvalue	1.785	
	% Variance	59.488	

As shown in Table 5, each loading was high (greater than 0.5), meaning that each of the three items was a valid measure of CV. We took the reliability ($\alpha = 0.658$) of the three

items as high basing on de Souza et al.'s (2017) observation that values above 0.60 were satisfactory.

Courtesy. Using confirmatory factor analysis (CFA), we reduced the three items (CT1, CT2, CT3) on courtesy (CT) to only one significant factor. The factor had an eigenvalue of 2.065, meaning that the factor accounted for 2.065/3*100 = 68.818% of the joint variation in the three items. The respective loadings of the three items on the factor are given in Table 6.

Table 6: Factors and Cronbach's alpha for items of courtesy

Item	Description	Factor Loadings	α
CT1	I take steps to prevent problems with co-workers in this university	0.811	0.766
CT2	I am mindful of how my behaviour affects the jobs of other people in this university	0.851	
CT3	I do not abuse the rights of others in this university	0.826	
	Eigenvalue	2.065	
	% variance	68.818	

As in Table 6, each loading was high (greater than 0.5), meaning that each of the three items was a valid measure of CV. The reliability (α = 0.766) of three items as per Table 6 was high, meaning that the three items were jointly reliable measures of CT.

Altruism. We used confirmatory factor analysis (CFA) to reduce the three items (ALT1, ALT2, ALT3) on altruism (ALT) to only one significant factor. The factor had an eigenvalue of 2.118, meaning that the factor accounted for 2.118/3*100 = 70.608% of the joint variation in the three items. The respective loadings of the three items on the factor are given in Table 7.

Table 7: Factors and Cronbach's alpha for items of altruism

Item	Description	Factor Loadings	α
ALT1	I help others who have been absent from work at this university	0.811	0.783
ALT2	I orient new staff even when it is not required in this university	0.835	
ALT3	I help others who have work-related problems in this university	0.874	
	Eigenvalue	2.118	
	% variance	70.608	

As in Table 7, each loading was high (greater than 0.5), meaning that each of the three items was a valid measure of ALT. The reliability coefficients (α = 0.783) of the three items as per Table 7 was high, meaning that the three items were jointly reliable measures of ALT.

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Correlations among the constructs. Our second objective in the study was to test whether the five constructs (CON, SPO, CV, CT, and ALT) in Podsakoff et al.'s (1990) instrument were independent. We computed average indexes for the valid items of the respective constructs from Tables 3 to 7 and then correlated them using the Pearson linear correlation (PLC). The intercorrelations of the dimensions are as shown in Table 8.

Table 8: Intercorrelations of the constructs as per Podsakoff et al.'s (1990) instrument

	CON	SPO	CV	CT	ALT
CON		0.403**	0.454**	0.512**	0.445**
SPO			0.461**	0.379**	0.300**
CV				0.434**	0.519**
CT					0.513**
ALT					

Results from Table 8 suggest that the five dimensions of OCB – that is CON, SPO, CV, CT and ALT – were significantly interrelated. This means that the internal consistency was high but also dimensions of OCB measured related items.

Discussion

The five dimensions of OCB as given in Podsakoff et al's (1990) instrument are conscientiousness (CON), sportsmanship (SPO), civic virtue (CV), courtesy (CT) and altruism (ALT). Our first objective was to test the validity and reliability of each of the five constructs, namely CON, SPO, CV, CT and ALT in Podsakoff et al.'s (2000) framework of OCB. Basing on the results, construct validity and reliability of the five dimensions of OCB were found to be valid and reliable. This means that the dimensions are a reflection of OCB. Altruism had the highest factor loadings of 0.783, followed by courtesy with 0.766, and conscientiousness with 0.713. Low factor loadings were seen in sportsmanship with 0.666, and least was civic virtue with 0.658. This is in congruence with Meilani et al.'s (2020) five-factor model as given by Podsakoff et al. (1990), which they applied in the French context. Our study also found that the constructs of OCB (conscientiousness, sportsmanship, civic virtue, courtesy and altruism) were valid and reliable, just like in other studies (e.g. Henderson et al., 2019) which were done in a developed-world context such as the USA.

The overall Cronbach's alpha results of OCB ($\alpha = 0.717$) being above 0.7 (de Souza et al. 2017) indicated that all items were internally consistent and thus all reliably measured OCB. Similarly, previous studies (e.g., Kumar & Shah, 2015; Mahembe et al., 2015) that validated Podsakoff et al.'s instrument of OCB found the tool to be reliable. In particular, Kumar and Shah (2015), having reduced Podsakoff et al.'s 24-item instrument to 15, reported that the instrument was valid and reliable based on a Cronbach's alpha result of 0.658. Mahembe et al. (2015), on the other hand, tested the instrument on a South African sample of employees and reported that the original Podsakoff et al.'s first 24-item instrument was also valid with adequate internal consistency among items that measure OCB.

Our second objective was to test whether the five constructs of the shortened version of the instrument, namely CON, SPO, CV, CT and ALT, were independent. The results of the correlation analysis suggested that all the five constructs were significantly interrelated. These results corresponded with those of Kumar and Shah (2015), Mahembe et al. (2015) as well as Janadari et al. (2018), who found that these constructs were closely related. This brings into a question whether the five constructs measure different things. A call for continuous testing of the tool to ascertain which constructs relate most and suggestions of a merger framework as researchers expound may arise.

Conclusion

Our purpose was to establish the validity and reliability of Podsakoff et al.'s instrument of OCB. The results showed that the five constructs of OCB, namely CON, SPO, CV, CT and ALT, as given by Podsakoff et al.'s instrument, though interrelated, were a sound measure of OCB. Hence, we call upon other researchers on OCB to continue using the instrument with confidence. Despite the contribution of this study, its limitations can still be identified. Whereas we close contextual and psychometric gaps, our sample is small. The respondents were from a few public and private universities, thus the generalisation of the research findings to all academic staff should be treated with caution. It is thus necessary for future researchers to investigate the validity and reliability of Podsakoff et al.'s instrument in diverse and larger samples in higher education and beyond.

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Integrating STEM Education in Uganda's Higher Education to Produce Skills Required to Stimulate Industrialisation and Sustainable Economic Growth

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Abstract

The high cost of education, coupled with the high rate of unemployment, is a major concern for developing countries, including Uganda. The economic growth of any developing nation heavily relies on its capacity to create sustainable job opportunities across various sectors. An education based on Science, Technology, Engineering and Mathematics (STEM) can serve as a powerful driving force to overcome barriers and achieve this crucial milestone. The traditional methods of teaching, learning and research in higher institutions of learning (HIL) in Uganda mainly emphasise theoretical knowledge rather than practical skills development. This leads to a wider gap in the skills required of graduates for job creation, industrialisation and stimulating economic growth. This study aims to investigate the key factors that should be considered for the effective integration of STEM education into Uganda's higher education (HE) in relation to the needs of industry and community development. By adopting integrated STEM education, we envision that empowered graduates will become innovators and job creators. To gather comprehensive insights into the perception of integrated STEM education in HIL, qualitative data was collected from 42 respondents using an online semi-structured questionnaire. The data was analysed using descriptive statistics. The study established that although some integrated STEM education exists in academia, industry and the community, its full integration is limited by the inadequacy of quality staff, funding and the rather weak collaboration and partnership between academia, industry and community. The study recommends that there is need to enhance the integration of STEM education into Uganda's HIL by recruiting quality staff, increasing funding and strengthening collaboration and partnership between academia, industry and community. This will produce skilled graduates who are job creators and highly employable in industry, a requisite for sustainable economic growth in the 21st century.

Keywords: *STEM education; Higher education; Job creation; Industrialisation; Sustainable economic growth.*

Introduction

The integration of Science, Technology, Engineering and Mathematics (STEM) in academia, industry and the community has become a global priority in recent years, especially in highly competitive and developed countries, for example, in Europe, Asia and the United States (Lee & Lee, 2022; Rifandi & Rahmi, 2019; Marginson et al., 2013). This introduction briefly explores the multifaceted aspects of STEM education and its impact on various sectors in academia, industry and the community. It also highlights the significance of STEM in achieving the Sustainable Development Goals (SDGs) through skills development, job creation, industrialisation and fostering economic growth (United Nations, 2017).

The developing nations have also responded to this important UN call by aligning their National Development Plans (NDPs) in accordance with SDGs. For example, Uganda's Third National Development Plan (NDPIII) emphasises the importance of STEM education and its role in promoting industrial development and socio-economic transformation (Kagwa & Mugabi, 2017; Government of Uganda, 2020). By incorporating integrated STEM education initiatives into the national development plan, Uganda aims to prepare its citizens and the general community for the challenges of the future and enhance the nation's overall competitiveness on the global stage (Ecuru et al., 2011).

Furthermore, developing countries, including Uganda, recognise the importance of HE training and public-private partnerships (PPPs) in achieving SDG targets. Governments play a vital role in creating an enabling environment for STEM education by investing in education, research and innovation (Hodson, 2003). Public-private partnerships can bridge the gap between academia and industry, allowing for knowledge transfer and industry-relevant skill development. The establishment of STEM education-focused universities like Busitema University (BU) plays a pivotal role in promoting STEM education and research (Marginson et al., 2013).

Whereas there have been several attempts to bridge the wide gap between theoretical and practical skills development in HIL, integrated STEM education is considered to be key in eliminating the disparity between the skills possessed by graduates and the demands of industry. The major reason behind the mismatch in graduate skills is the fact that there is more emphasis on theoretical content delivery than on promoting integrated STEM education that advocates for practical skills. Thus, there is a need to reorganise curricula so that they align with market needs, practical exposure and real-world problem-solving (John, et al., 2018).

Furthermore, integrated STEM education offers practical exposure to real-world challenges and aligns with the needs of the job market. There is need to emphasise the importance of experiential learning, internships and industry-academia collaborations to bridge the gap between theoretical knowledge and practical skills (Ruhanen, 2006). To this effect, integrated STEM education in HIL would produce graduates that can significantly impact communities through job creation. By equipping graduates with STEM entrepreneurial skills, they gain opportunities for sustainable livelihoods and economic upliftment (McKinney et al., 2017).

Integrated STEM education is considered as a channel for enhancing graduates' employability by equipping them with in-demand skills and competencies. The need to explore the various approaches, such as career counselling, mentorship, industrial attachments, career guidance for HE, entrepreneurial skills development programmes, and professional certifications, so as to enhance graduates' prospects in the job market (Cranmer, 2006).

The quality of academic staff in integrated STEM education plays a pivotal role in shaping the overall learning experience and research output of students. There is a need to explore how the competence, expertise and dedication of academic staff impact the effectiveness of teaching methods, students' understanding of STEM education concepts, and the quality and quantity of research produced (Waugh, 2002). By investigating the correlation between the capabilities of academic staff and educational outcomes, this study sheds more light on the importance of investing in faculty development and continuous improvement to enhance the overall quality of STEM education.

The integrated STEM education in HIL is increasingly recognised as essential drivers of innovation, economic development and social progress (Sasson, 2019). However, the successful implementation of integrated STEM education initiatives relies on effective collaborations and synergies among academia, industry and community stakeholders. The concept of integrated STEM education in partnership with academia, industry and the community can be well understood in the following analytical framework.

Analytical Framework

The general analytical framework of integrated STEM education is represented in the schematic model in Figure 1 that helps in identifying the existing gaps by not looking at HE/HIL in isolation from the key stakeholders in industry and the community. This model provides a unified framework that integrates activities across these sectors. Figure 1 gives an outline of the various fields and the major skills that are produced under the different STEM fields. By fostering cooperation, knowledge and skills exchange, the model aims to promote a holistic approach to STEM development, which can lead to the creation of a skilled and competitive workforce capable of addressing real-world challenges.
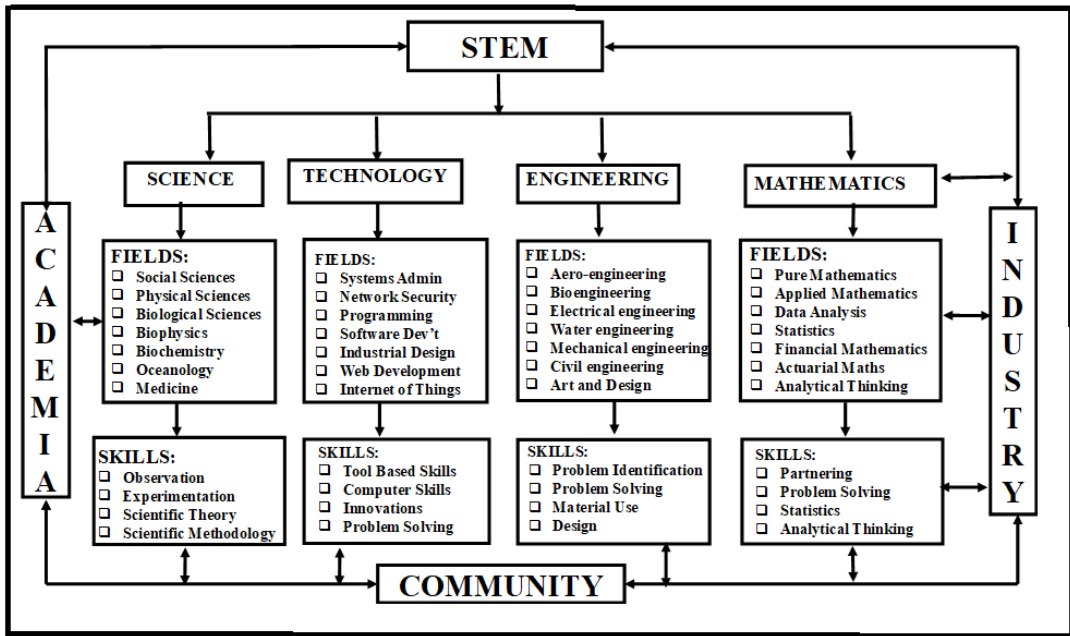
Figure 1. The integrated STEM education schematic model

The integrated STEM education schematic model is divided into several key components, each representing a distinct domain where integrated STEM activities can be implemented. The component of STEM education in academia focuses on the role of academic institutions, ranging from primary to university levels and technical institutions, in nurturing future innovators and problem-solvers. The major activities emphasised under STEM education in academia include enhancing the curriculum to integrate hands-on STEM activities, project-based learning, building teaching and research capacity, teacher training and entrepreneurship education in academic curricula to enhance students' practical skills.

The component of STEM education in industry underscores the importance of collaboration between academia and industry to translate research and knowledge into tangible applications and research commercialisation. The key activities emphasised under this component include fostering partnerships and collaborations between universities, research institutes and industries to promote technology transfer, joint research projects and internships for students. This can further be strengthened by establishing dedicated spaces to support start-ups and facilitate the commercialisation of research findings, fostering a culture of entrepreneurship within industries.

The component of STEM education in the community recognises the transformative power of STEM education and activities in empowering local communities, ordinary citizens, disadvantaged groups, unemployed graduates and entrepreneurs. Among many activities, it emphasises developing short-term courses that provide practical skills in areas like coding, digital literacy, robotics and the enhanced graduate skills need for manufacturing industry.

The above components can be enhanced by integrated STEM projects which should be designed to address the pressing issue of unemployment and skill gaps in the labour

market. These projects are aimed at driving practical solutions and fostering unified collaboration between academia, industry and the community. The major integrating project activities include facilitation mentorship programmes, increased access to resources, and unlocking new opportunities by experts from academia, industry and the community with students, youth, graduates, women and disadvantaged groups to bridge the gap between theory and practice.

The integrated STEM education schematic model provides a comprehensive and cohesive framework that aims to integrate and promote STEM activities in academic, industrial and community settings. The successful implementation of the model relies on the commitment of stakeholders, the presence of qualified staff, and supportive policies that foster an environment conducive to STEM development. Through the integrated STEM projects and activities, the model seeks to address immediate challenges and contribute to the overall growth and development of the nation.

STEM education has been widely studied, embraced and fully implemented in developed countries (Lee & Lee, 2022, Marginson, et al., 2013). This is not, however, the case with developing nations like Uganda. The schematic model above emphasises the strong linkage between academia, industry and the community in fostering STEM education through collaboration, knowledge exchange, targeted support, skills development and producing innovative workforce capable of driving sustainable socio-economic growth and transformation. This study identifies the existing research gaps as lack of systematic description of STEM education practices, defined factors that can shape stakeholders' participation and problems that are faced in its implementation in Uganda.

Based on the above background, our study was guided by the following research questions (RQs):

RQ1. What are the effects of the quality of academic staff in HIL on teaching, learning, research and innovation output in integrated STEM education?

RQ2. What is the scale of practical teaching, learning, research and innovation efforts in terms of funding and time spent on research and innovation output in STEM education?

RQ3. What is the impact of academia, industry and community partnerships and collaborations on the perceived success of integrated STEM education?

By answering these research questions, we offered valuable insights into the factors that influence the quality and effectiveness of integrated STEM education in academia, industry and the community. The findings will provide evidence-based recommendations for enhancing the role of academic staff, optimising resource allocation, and fostering strong partnerships between academia, industry and community, ultimately contributing to the holistic growth and transformation of STEM education in Uganda.

Literature Review

The literature review was structured on the basis of the identified key components of the integrated STEM education analytical framework as discussed in the previous section.

Integrated STEM education has been fronted by many scholars as a catalyst for socio-economic growth and transformation of developing nations (Lee & Lee, 2022). The

integrated approach to teaching and research in STEM education cultivates innovative skills and produces a proficient and skilled workforce to contribute to the creation of competitive industries (Ahmed, 2016). Developing nations need to increase their investment in integrated STEM education to be able to empower their citizens with relevant innovation and entrepreneurial skills to ensure sustainable economic growth in the 21st century (Rifandi & Rahmi, 2019).

For HIL to successfully integrate practical STEM education in HE, it is imperative to first establish the teachers' attitude and quality in relation to STEM teaching, research and innovation. These teachers are responsible for shaping students' STEM skills that are required in industry and general community development (Johnson, 2006). This calls for retooling the HE teachers and enhancing the teacher training programmes to reflect contemporary approaches to integrated STEM education (Tytler & Self, 2020). Many teachers in HIL have been trained through the traditional curricula that emphasised classroom-based and theoretical teaching, while other teachers are resisting the changeover to the contemporary approaches required for effective STEM teaching and research. It would be futile for integrated STEM subjects to be introduced in HIL in the absence of qualified staff and relevant curricula. Many STEM researchers have recommended the enhancement of knowledge, experiences, mentorships and background preparation for teachers to be adequately equipped to effectively impart integrated STEM education (Hill et al., 2020).

The HIL offering STEM education need to enhance the training procedure for the pre-service and in-service teachers so that they are better prepared and equipped with STEM practical skills before they are deployed in schools and HE institutions (Pimthong & Williams, 2018). These STEM subject instructors in HIL need to enhance their teaching and research skills so as to be innovative in introducing subject content that is well aligned with contemporary thinking regarding the subjects (Dailey et al., 2015). There is also a need to equip teachers with diverse, multidisciplinary knowledge and skills in the various STEM subjects and also for the teachers to learn how to work with other teachers in the same field. This also calls for the creation of professional development opportunities in integrated STEM education that will help teachers nurture students' critical thinking, innovation, collaboration, creative problem-solving and scientific communication skills. Such initiatives could further promote the use of innovative approaches to STEM teaching and research, the development of low-cost and affordable STEM teaching materials, as well as conducting STEM research in academia, industry and the community (Nakabugo et al., 2019; Nakayiwa & Tumuhairwe, 2021).

Reliable internet connectivity and updated ICT resources are vital in enhancing STEM teachers' interest and skills development. These resources still remain a big challenge in developing countries. Lack of these resources hinders the process of STEM teaching, research and innovation at all levels of academia. This same challenge also hinders teachers' exposure through collaborations and partnerships with other HIL. Thus, scientific research and technological capabilities play a fundamental role in STEM education (Skliarova et al., 2022; Khayyat & Lee, 2015). Many related studies have explored technological initiatives aimed at promoting research infrastructure and fostering a research culture in academic institutions to enhance STEM education research outputs (Wasswa & Kituyi, 2019; Muhumuza et al., 2022).

In the context of Uganda, the establishment of dedicated STEM universities, such as BU, signifies a commitment to promote STEM education and its impact on producing a skilled labour force. This goal is liable to fail at implementation level because of inadequate funding to provide both human and infrastructural resources that are important for motivating both staff and students to commit more time and effort to STEM research, innovation and skills development. There are several case studies, evaluations and research papers that examine the need for resources if the STEM universities have to be successful and able to make a contribution to the broader goals of the nation (Mugabi et al., 2020; Marginson et al. 2013; Kisubi et al., 2021).

Inadequate funding greatly contributes to the challenge of STEM education and the mismatch between the skills possessed by graduates and the demands of industry. Inadequate funding also leads to the production of half-baked graduates that cannot meet industrial needs. Many research studies have been conducted that cast more light on the causes and consequences of this disparity and the potential strategies for aligning STEM education with industry needs (John et al., 2018; Mugisa et al., 2017; Kyamugambi et al., 2019).

The current education system is characterised by a costly education whose main result is a large number of unemployed graduates. Despite the current efforts to emphasise a STEM education, high unemployment rates among STEM graduates remains a big concern. The major reason behind this phenomenon is inadequate funding to motivate STEM teachers and students to dedicate more effort and time to producing skills required for job creation and in industry. This has been analysed in recent research studies, and interventions aimed at addressing the issue and improving employment prospects for STEM graduates have been recommended (Langdon et al., 2011; Nansubuga & Walugembe, 2018; Nakabugo et al., 2021). Studies have also explored the factors contributing to graduate unemployment and proposed strategies to enhance graduates' employability through entrepreneurship and skills development (Osmani et al., 2015).

The significance of a robust STEM education in equipping graduates with all the necessary and in-demand skills to make them highly employable cannot be overemphasised. This crucial role of enhancing graduates' employability can only be achieved through adequate funding and exposure to varied experimentation both in industry and in the community. Such initiatives that have focused on improving graduates' prospects through career counselling, skills development programmes, and industry attachments have been fully explored by various scholars (Cranmer, 2006; Kiwanuka et al., 2019; Nansubuga et al., 2021; Wasswa et al., 2022;Walakira, F. E., & Semakula, D., 2021)).

The power of strong collaboration between academia, industry and community in accelerating the attainment of SDGs cannot be overemphasised. The United Nations has also recognised the pivotal role of STEM education in achieving the SDGs. Target 9.5 specifically highlights the need to enhance scientific research and technological capabilities, emphasising the role of STEM in driving innovation and sustainable industrialisation (United Nations, 2017; Ecuru et al., 2011). The achievement of Target 9.5 can further be accelerated by encouraging and funding STEM education in HIL as key tools to enhance innovation for skills development, job creation, industrial growth and community development. Researchers have explored how STEM education aligns with

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the broader goals of the SDGs and its potential to contribute to the Fourth Industrial Revolution (4IR/Industry 4.0), as well as social and economic development (El-Jardali et al., 2018; Nsamba et al., 2022; Namuddu & Kiyingi, 2019).

Methodology

Here are the details of the methodology, elaborating on the online survey and its design for each target group: academic staff, students, industrialists and community members. The survey was structured on the basis of a general theoretical model outlined in the model that outlines the linkage between academia, industry and the community and the expected STEM activities, respectively, as briefly discussed below.

To comprehensively investigate the integration of STEM in Uganda's higher education for job creation and sustainable economic growth, we employed a mixed-methods approach, with the primary data collection method being an online survey. This survey was designed to gather insights and opinions from various stakeholders in academia, industry and the community, who included academic staff, students, industrialists, and community leaders in education, government, non-governmental organisations (NGOs) and small and medium enterprises (SMEs). This aimed at understanding the perceptions, experiences and challenges associated with integrated STEM education and its impact on the various sectors.

The online survey was designed using an online user-friendly platform, Google Forms, to ensure ease of access and participation for respondents. The questions were a combination of multiple-choice, Likert scale and open-ended questions to gather both quantitative and qualitative data. To ensure the survey's validity and reliability, a pilot test was conducted with a small sample of participants before the full survey was launched. The survey link was distributed through various channels, including email invitations to academic staff and industrialists, notifications on educational platforms, and community-based organisations (CBOs) and SMEs for community members. The respondents' confidentiality and anonymity were assured, and informed consent was obtained before participants engaged in the survey. The data obtained from the survey was analysed using descriptive statistics, to derive meaningful insights. The results of the survey were then presented in the research findings section, after which the implications were discussed to inform the recommendations and conclusions of the study.

Results and Discussion

The chapter provides a discussion of the results related to the quality of STEM staff, funding for STEM research and innovation, and STEM partnerships and collaborations in academia, industry and the community.

Quality of STEM education in academia, industry and community

The first aspect we examined in this study was the quality of STEM staff in academia that mainly feeds a trained and skilled labour force into industry and the community. The study focused on assessing the qualifications, expertise and competence of lecturers involved in STEM education and the core duties of conducting practical teaching, research, innovation and outreach.

The research findings indicated that academia comprises men and women who are qualified to support STEM education at the university, of whom 66.7% are male while 33.3% are female. Of these respondents, 40.5% hold a doctorate, 23.8% a master's degree, 46.2% a bachelor's degree in education, and a small percentage – 9.5% – a certificate. A good percentage of the lecturers are at the rank of associate professor and professor, which provides a good ground for support in research and innovation. The results indicated that the staff have sufficient expertise to effectively deliver STEM education through conducting practical teaching, research, innovation and outreach to the general community and to industry, as can be seen in Figures 1(a)–(e). However, 72.1% (Figure 2a) raised concern regarding the need for continuous professional development programmes, which include refresher courses, workshops or conferences, observational and field visits to other institutions, mentoring or coaching, peer observation, qualification programmes, attending conferences or seminars, engagement in continuous research and outreach programmes so as to enhance the teaching and research skills of STEM staff. One can refer to the results indicated in Figures 1(a)–(e) and Figures 2(a)–(f) for responses on the STEM education staff demographic information of STEM and STEM education courses, programmes, teaching, research and innovation, respectively.

In the industrial sector, the results suggest a mixed perception of the quality of STEM education. While 51.2% of the respondents expressed satisfaction with the expertise and qualifications of industry professionals, 32.6% identified skill gaps and a need for upskilling programmes to align with the rapidly evolving technological landscape. The findings further emphasise the importance of industry-academia partnerships to bridge these gaps and ensure that the skills of STEM staff in industry are up-to-date and relevant.
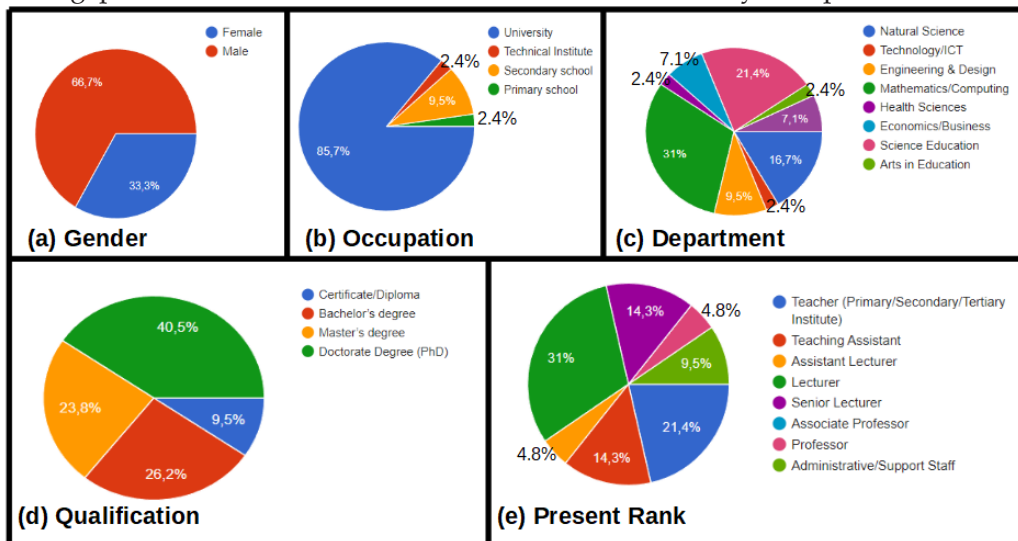
Figure 1(a)-(3), show responses on staff demographic information and qualification

In connection with the community, the research findings indicate a need for enhancing the quality of STEM staff. The participants highlighted the importance of providing training and capacity-building programmes for individuals working in community-based STEM initiatives. The results also emphasise the significance of mentorship and knowledge

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transfer programmes to empower community members with the necessary skills and expertise to actively engage in STEM activities.

Funding STEM research and innovation

The second aspect explored in this study is the availability and adequacy of funding in terms of resources to support STEM education with regard to teaching, research and innovation. This involved examining the financial resources allocated to support research projects, the availability of grants and scholarships, and the overall investment in STEM-related activities, including practical teaching, experimentation, research, innovation, entrepreneurial skills development and outreach activities. The research findings revealed that STEM programmes exist in universities as indicated in Figure 2(a), where 72.1% of the respondents agreed with the argument. This level of existence is through integrated teaching and learning of some STEM courses at undergraduate level, as can be seen in Figures 2(d) and 2(e).

In addition, the participants expressed concerns about the limited grant and financial opportunities available to support STEM projects, which hinders the advancement of scientific knowledge and the development of innovative solutions, as indicated in Figure 3(c). Only a small percentage – 34.9%– agreed that grant opportunities were available. Related to this fact, 60.5% (Figure 3(c)) of the respondents expressed concern about lack of sponsorship for students in STEM-related fields. The study thus identified this as a setback to research and innovation in universities since potential STEM students may not have an opportunity to engage in STEM-related research and innovation owing to lack of support.
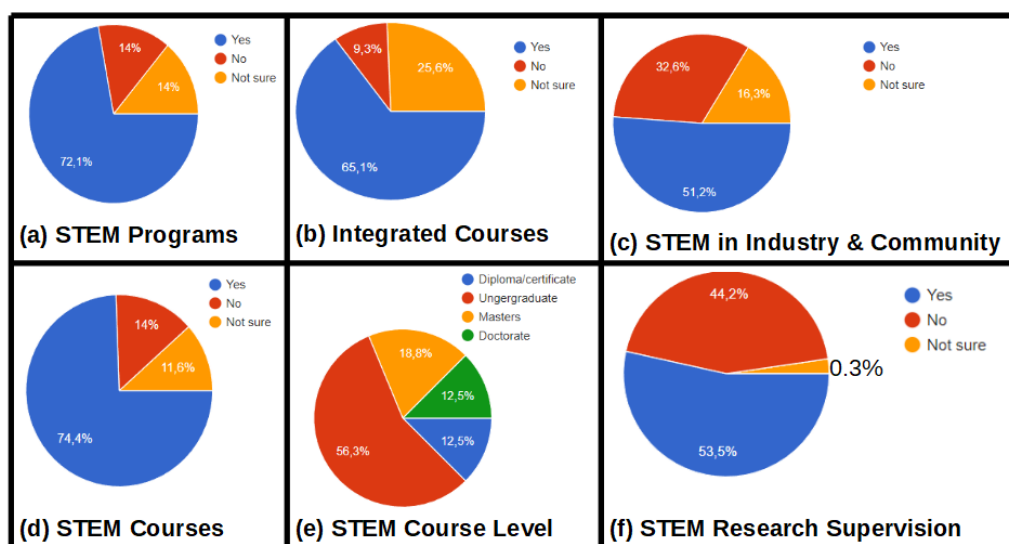
Figure 2(a)-(f), show responses on STEM teaching, research and innovation

The study also reveals that, on average, 34.9% of the respondents, as indicated in Figure 3(d), justified the need for strengthening higher education policies to promote STEM education. In addition, an average of 44.7% of the respondents, as indicated in Figure 3(e), justified the need for increasing the infrastructural resources, including laboratory space, lecture

space, laboratory equipment, ICT infrastructure, library resources, internet resources and stable power supply, which are needed for a robust integrated STEM education. On the whole, the study emphasised the need for increased investment in STEM teaching, research and innovation. This includes advocating for increased government funding, encouraging private sector partnerships, attracting grants and sponsorship opportunities, and strengthening collaborations between academia, industry and the general community to secure additional financial resources. The findings underscore the crucial role of adequate funding in promoting scientific discoveries, technological advancements and sustainable development.

The study further revealed that the academic staff are not given adequate time for field trips and outreach activities. Table 1 shows that only 26.2% (percentage of high and very high) of the respondents agreed that the staff were allowed time for field trips, while 45.3% (low and fair) expressed disagreement. There is need to create more opportunities for the effective use of consultation time as justified by a small percentage of 33.3% (at high and very high levels of satisfaction). There is great need to make available refresher courses, consultations and relevant training in STEM, as well as effective use of consultation time and funding. The competency-based curriculum (CBC) in lower secondary schools is an indication of the shift away from the traditional knowledge-based curriculum (KBC) that had dominated Uganda's education system right from primary up to university level (Wambi et al., 2024).

STEM partnerships and collaborations in academia, industry and community

The third aspect examined in this study was the extent and effectiveness of STEM partnerships and collaborations among academia, industry and the community. This includes assessing the level of cooperation, knowledge exchange, and joint initiatives between these sectors.
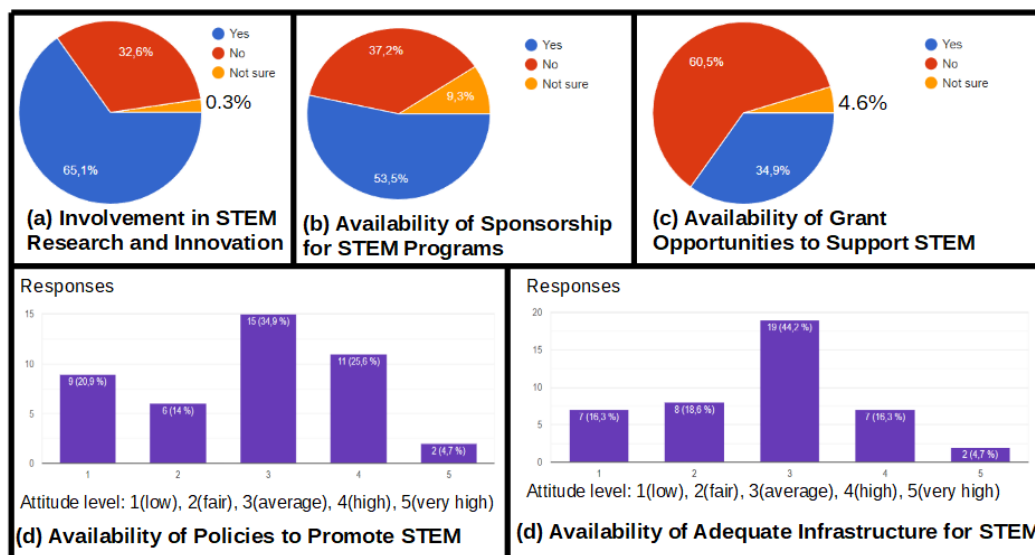

Figure 3(a)-(d), show responses on STEM policies, sponsorship, and infrastructure

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The research findings suggest that while some collaborations and partnerships exist, there is still need for improvement in fostering effective STEM collaborations. Table 2 reveals that 38.1% of the participants identified the need for building a culture of collaboration and partnership for higher-level connections and increased communication between academia, industry and the community to leverage expertise, resources and opportunities. The findings highlight the potential benefits of collaborative efforts, such as technology transfer, joint research projects, internships and knowledge-sharing.

Table 1. Responses on funding STEM research and innovation

Responses	Level of Satisfaction and Number (or Percentage) of Respondents				
	Low	Fair	Average	High	Very high
Availability of time for field trips	12 (28.6%)	7 (16.7%)	12 (28.6%)	9 (21.4%)	2 (4.8%)
Provision of adequate funds	11 (26.2%)	1 (2.4%)	16 (38.1%)	11 (26.2%)	3 (7.1%)
Effective use of consultation time and funds	11 (26.2)	12 (28.6%)	14 (33.3%)	4 (9.5%)	1 (2.4%)
Availability of refresher courses in STEM	7 (16.7%)	12 (28.6%)	11 (26.2%)	9 (21.4%)	1 (2.4%)

The study further shows that only 88.4% (fair + average+ high+ very high) of the participants see the importance of enhanced staff development in partnerships and collaborations to enhance the impact of STEM activities. This would include establishing formal channels for communication, promoting knowledge exchange platforms, and facilitating joint initiatives that address real-world challenges. The findings underscore the value of collaborative efforts in driving innovation, improving the relevance of STEM education and research, and maximising the socio-economic impact of STEM initiatives.

Overall, the results and discussion highlight the significance of addressing the quality of STEM staff, securing adequate funding for research and innovation, and fostering effective partnerships and collaborations in academia, industry and the community. These findings provide valuable insights for policymakers, educational institutions, industry leaders and community stakeholders to enhance the success and impact of STEM initiatives and contribute to sustainable socio-economic development.

Table 2. Partnerships and collaboration in academia, industry and community

Responses	Level of Satisfaction and Number (or Percentage) of Respondents				
	Low	Fair	Average	High	Very high
Building a culture of collaboration and partnership	5 (11.5%)	10 (23.8%)	10 (23.8)	16 (38.1%)	1 (2.4%)
Availability of funds to enhance collaboration	8 (19.0%)	11 (26.2%)	15 (37.5%)	6 (14.3%)	2 (4.8%)
Enhanced staff development in partnership	5 (11.2%)	12 (28.8%)	13 (31%)	10 (23.8%)	2 (4.8%)
Availability of modes of staff research and exchange	8 (19.0%)	12 (28.6)	10 (23.8)	10 (23.8%)	2 (4.8%)

Conclusion and Recommendations

Conclusion

In this study we explored the integration of STEM education in HIL (or HE) in partnership with general academia, industry and the community to promote job creation, industrialisation and sustainable economic growth in Uganda in the 21st century. The research findings highlight several critical factors influencing the success of integrated STEM education initiatives and their impact on national development. Through a comprehensive analysis of STEM in different contexts, the study has identified areas that require attention and strategic interventions.

The study discovered that while academia generally has qualified staff to support integrated STEM education in terms of teaching, research and innovation, there is still a wide gap between HE, industry and various sectors in the community. This is mainly attributed to the challenges in finding highly skilled STEM education professionals and experts, the greater emphasis on theoretical content than on practical teaching and a general lack of financial and/or infrastructural resources to support integrated STEM activities. Thus, there is a need for continuous professional development for academic staff through mentorship programmes, refresher courses and adequate facilitation for workshops and conferences so as to produce professionals who can enhance the quality of STEM education across all sectors in academia, industry and the community.

The study revealed limited funding for integrated STEM education in terms of supporting teaching, research and innovation in HIL in partnership with industry and the community. The general limited infrastructure and human resource to support STEM education hampers technological advancements, industrialisation and socio-economic development through the production of the skilled labour force required in the 21st century. Thus, governments, private corporations and development partners should collaborate to increase investment in integrated STEM education at all levels of academia, industry and the community.

The study further revealed that the level of integrated STEM education partnerships and collaborations between academia, industry and the community is currently at its lowest. Strengthening partnerships between the HIL, industry and community stakeholders can lead to an increase in resources and drive a high level of teaching, research, innovation, skills development, knowledge exchange and other competences which is required by the labour force to support socio-economic transformation.

Therefore, embracing STEM in academia, industry and the community holds the key to unleashing Uganda's potential for job creation, industrialisation and sustainable economic growth. By implementing the recommended strategies and collaborating across sectors, stakeholders can pave the way for a brighter future driven by innovation, knowledge and skills.

Recommendations

Based on the research findings, the study puts forth the following recommendations to enhance the integration of STEM in Uganda's education for job creation and sustainable economic growth:

1. The government should increase investment in HIL to support STEM education. This should include investing more human, material and technological resources that can favour the incorporation of practical STEM activities, project-based learning, entrepreneurship skills development and enhanced partnerships with other institutions.

2. The government should make funds available to facilitate and strengthen partnerships between academic institutions, industry and various sectors in the community that key players in fostering technology transfer, joint research projects, industrial and field attachments, internships and general exposure to modern STEM resources. Comprehensive assessments of both industry and community needs can help align STEM education and research problem formulation with the general market and societal demands.

3. The government should attract more development partners to create and make available more dedicated funding opportunities for integrated STEM education in terms of practical teaching, research, innovation and entrepreneurial skills development in the academic, industrial and community sectors. In line with Kaweesi et al.'s (2019) view, this can be achieved through encouraging healthy donor-recipient working relationships, providing grants to promote research and innovation, public-private partnerships, and establishing venture capital initiatives.

4. HIL as well as stakeholders in industry and community should establish mentorship programmes that connect experienced STEM professionals with youth, graduates, women, unemployed graduates and other interest groups. This can help bridge the skills gap and empower individuals to engage in innovation and entrepreneurship.

In order to further strengthen the integration of STEM education in academia, industry and the community in terms of teaching, research and innovation at all levels, the study suggests the following recommendations:

1. **Increase the number of technology hubs and maker spaces:** An increased number of community-based technology hubs and maker spaces should be established to provide access to STEM resources, tools and training for local communities and entrepreneurs.

2. **Enhance vocational training programmes:** Develop enhanced short-term vocational training courses that provide practical STEM skills, especially in areas like coding, digital literacy, robotics and advanced manufacturing.

3. **Promote gender diversity in STEM:** Encourage women's participation in STEM fields through scholarships, mentorship and networking opportunities. A diverse STEM workforce can drive innovation and creativity.

4. **Organise STEM innovation competitions:** Organise innovation challenges and entrepreneurship competitions to encourage youth to develop impactful solutions for local challenges. This can nurture a culture of innovation and problem-solving.

5. **Enhance curriculum development:** Continuously improve STEM curricula and programmes to ensure they align with market needs and equip graduates with relevant skills.

6. **Facilitate networking and workshops:** Organise networking events and workshops that bring together youth, graduates and women with industry experts to explore career opportunities and knowledge-sharing.

Future Research

While this study provides valuable insights into integrated STEM education for job creation and economic growth in Uganda, owing to the limited time frame in which this study was conducted, in future we plan to conduct a comparative analysis of integrated STEM education efforts across countries to identify best practices and lessons learnt. This longitudinal study will, among others:

a) Track the impact of integrated STEM education on job creation and economic growth based on countries where such initiatives have been successfully implemented over an extended period so as to provide more comprehensive insights.

b) Assess the effectiveness of existing integrated STEM education policies in countries where the same have been successfully implemented and accordingly recommend strategies for enhancing policy implementation.

c) Investigate the role of digital technology in promoting integrated STEM education in terms of teaching, research and innovation based on identified countries where great success has been registered.

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Leadership Behaviour and Organisational Commitment of Academic Staff at Kyambogo University, Uganda

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Abstract

This study examined the influence of leadership behaviour on the organisational commitment of academic staff at Kyambogo University. Specifically, the study examined the influence of directive, supportive, participative and achievement-oriented leadership behaviours on the commitment of academic staff to their job. Using a positivist research paradigm, this correlational study involved a sample of 175 full-time academic staff of Kyambogo University. Data was collected using a self-administered questionnaire and analysed using Partial Least Square Structural Equation Modelling (PLS-SEM). The results indicated that while participative leadership behaviour positively and significantly influenced the organisational commitment of academic staff, directive and supportive leadership behaviours had a negative and insignificant influence on organisational commitment of academic staff. Nonetheless, achievement-oriented leadership behaviour had a positive but insignificant influence on academic staff job commitment. Therefore, directive leadership behaviour impedes the organisational commitment of academic staff, supportive leadership behaviour leads to low organisational commitment of academic staff, participative leadership behaviour is essential for the organisational commitment of academic staff, and achievement-oriented leadership behaviour contributes less to organisational commitment of academic staff. It was recommended that university leaders should minimise the use of supportive and directive leadership behaviours in preference for participative leadership behaviour while not entirely ignoring engagement in achievement-oriented leadership behaviour.

Keywords: *Achievement-oriented; Directive; Leadership behaviour; Organisational commitment, Participative; Supportive.*

Introduction

The concept of organisational commitment (OC) was introduced in scholarship by Becker (1960). Becker described OC as an attitude of consistent behaviour that endures over time. He argued that OC was a result of 'side-bets', that is the benefits associated with staying and working for an organisation such as organisational-specific skills, mortgage and status, among others, which an employee would lose if he/she was to leave an organisation (Joarder et al., 2020). Mowday et al. (1979) described organisational commitment as strong acceptance, participation in and loyalty to the organisation. Allen and Meyer (1990) indicated that OC described a three-component model that included affective (AC), continuance (CC) and normative commitment (NC). AC denotes the identification and emotional bond of employees with the organisation which makes them stay with the organisation. CC is the desire of employees to stay with an organisation due to the personal investments in the organisation, including relations with colleagues, security, career growth, contextual work skills and other accruing advantages that make it expensive to start again in another organisation. NC is the felt responsibility to stay with the organisation because of the investments made in it such as time, money, education and development.

Organisational commitment of academics is crucial for the success of universities because committed academics invest more effort in their work, which helps universities to achieve their goals and objectives. In addition, committed academics are less likely to engage in counterproductive behaviours, serve better, are more compatible, are productive, and exhibit higher levels of responsibility, loyalty and contentment (Mugizi et al., 2015). Further, OC affects other work-related outcomes like continued stay on the job, higher job effort, role fulfilment, and better job performance (Mwesigwa et al., 2020). Nevertheless, globally the organisational commitment of academic staff is low. For instance, in the USA, about 20% of academic staff in public universities exhibit low continuance commitment by leaving their positions annually (Ssali et al., 2019). In Austria, 68% of academics in public universities wished to quit their jobs, suggesting the existence of low affective and normative commitment (Ng'ethe, 2014). In Asian countries, the situation is not any different. For instance, Rathakrishnan et al. (2016) revealed that 18.18% of academic staff in public universities in Malaysia exhibited low commitment by leaving universities for other jobs, while in China, 50% of academic staff in public universities displayed low commitment by quitting their jobs (GuiXia & Rashid, 2019).

In Africa, the organisational commitment of academic staff, especially continuance commitment, is low. For example, in South Africa, close to 85% of academic staff in higher education institutions resign after serving between six and 10 years (Seeletse & Thabane, 2016). In Tanzania, 70.9% of academic staff also exhibit low continuance commitment by leaving universities, with 30% of academic staff leaving Dar es Salaam University between 2012 and 2016 (Amani & Komba, 2016). In Uganda, the Rwendeire Visitation Committee Report (2017) revealed that over 69 academic staff exhibited low continuance commitment by leaving Makerere University between 2015 and 2016. This was not far from the Auditor General's Report (2018), which indicated that 78.8% of the academics at Busitema University displayed low commitment by not engaging in research and yet this is one of the core functions of university academic staff.

At Kyambogo University, which was the context of this study, academic staff seem to exhibit low organisational commitment, as indicated by Rwothumio et al. (2016), who

reported that academic staff delayed in marking and returning students' coursework scripts and that there was a high rate of absenteeism and low morale among the academic staff, besides poor delivery of lectures to students, revealing the existence of low affective and normative commitment. Nabunya et al. (2018) pointed out the prevalence of low innovation in instruction, supervision and community outreach among academics, indicating low affective and normative commitment. There existed a challenge of lecturers losing the coursework and examination marks of students and delays in issuing transcripts due to delayed submission of results by academic staff, which suggest low normative and affective commitment (Azikuru et al., 2017). On the other hand, Okello (2019) indicated that a challenge at Kyambogo University which affected the work attitudes of academic staff related to leaders' behaviour (university officials, deans and heads of departments) characterised by non-inclusiveness and incoherence. Kasule (2019) reported that Kyambogo University governance at both unit and institutional-wide levels was characterised by lack of effective representative committees, transparency in decision-making, genuine consultation processes and open channels of multi-directional communication. This study was thus attracted to examine whether the leadership behaviours of Kyambogo University leaders influenced the level of organisational commitment of the lecturers. Basing on the Path-goal Leadership Theory leadership behaviours, namely directive, supportive, participative and achievement-oriented leadership behaviours, this study tested the hypotheses to the effect that:

H1: Directive leadership behaviour has a statistically significant influence on the organisational commitment of academic staff.

H2: Supportive leadership behaviour has a statistically significant influence on the organisational commitment of academic staff.

H3: Participative leadership behaviour significantly relates to the organisational commitment of academic staff.

H4: Achievement-oriented leadership behaviour significantly relates to the organisational commitment of academic staff.

Theoretical Review

The Path-goal Leadership Theory by House (1971), which postulates that a leader's behaviour is significant for employees' positive work attitudes such as organisational commitment, informed this study. The Path-goal Leadership Theory posits that the leader should act in a way that builds upon an employee's strengths and address any weaknesses in order to increase his or her good work attitude (Nzeneri, 2020). Therefore, effective leaders, through their behaviours, guide subordinates to select the best option along the paths to achieve organisational goals (Jabbar & Hussin, 2019). The leaders influence their subordinates' work attitudes by providing the direction (directive leadership) and support (supportive leadership), and by giving employees the chance to participate in organisational activities (participative leadership) and setting achievable targets (achievement-oriented leadership) to ensure that the goals of employees are well-matched with the organisational goals (Sodikin & Fachrunnisa, 2022). Generally, the Path-goal Theory identifies four categories of leadership behaviours that influence employee work attitudes, namely

directive, supportive, participative and achievement-oriented leadership behaviours (Yan-Li & Hassan, 2018). Therefore, this study examined how leaders' behaviour in terms of directive, supportive, participative and achievement-oriented leadership behaviours influenced organisational commitment of academic staff at Kyambogo University.

Leadership Behaviours and Organisational Commitment

Leadership behaviour is a way by which the leader provides direction and goals through motivation and the definition of rules (Fries, 2021). Therefore, leadership behaviour relates to the characteristics exhibited by the leader in providing direction to his or her subordinates. The Path-Goal Leadership Theory identifies four leadership behaviours, namely directive, supportive, participative and achievement-oriented leadership behaviours (Yan-Li & Hassan, 2018). Directive leadership behaviour describes the leader's conduct that involves assigning tasks to subordinates, explaining the ways to complete the tasks, providing schedules for tasks, communicating performance standards, stipulating a clear set of guidelines as well as providing clear expectations for the performance of subordinates. As such, directive leadership behaviour produces high levels of employee commitment due to the clear rules of conduct it provides (Farhan, 2018). Supportive leadership behaviour refers to tendencies by which a leader offers emotional support to subordinates, as well as encouragement and understanding, and responds to their needs. Therefore, a leader's supportive behaviour enhances organisational commitment because it is a demonstration of a genuine interest in employees, and this is reciprocated with employee commitment to the organisation (Ashfaq et al., 2021).

Participative leadership behaviour describes the situation in which a leader encourages employee involvement in decision-making to facilitate effective organisational decisions and collaborative problem-solving. Thus, participative leadership enables employees to participate in decisions and to solve problems, hence better enhancing their organisational commitment (Adıgüzel et al., 2020). Achievement-oriented leadership behaviour involves the leader believing in the abilities of followers, encouraging ongoing performance and regularly conveying his or her goals and aspirations to subordinates with high-performing standards. As such, achievement-oriented leadership behaviour leads to employee commitment because subordinates are motivated since obstacles are removed, thus influencing organisational employee commitment (Olowoselu et al., 2019)

Scholars (e.g. Ongechi, 2018; Okello, 2018; Banjarnahor et al., 2018) related directive leadership behaviour to organisational commitment of employees. All these studies indicate that the two variables had positive and a significant relationship. On their part, scholars (Mwaisaka et al., 2019a; Rana et al., 2019) related supportive leadership behaviour to organisational commitment. Relatedly, in empirical studies, Okello (2018) and Rana et al. (2019) related supportive leadership behaviours to organisational commitment. Further, scholars (e.g. Adigüzel et al., 2020; Bakare & Ojeleye, 2020; Banjarnahor, 2018; Ongechi, 2018; Okello, 2018) examined the link between participative leadership behaviours and organisational commitment. The findings indicated that the link was positive and significant. In addition, scholars (Mwaisaka et al., 2019b; Ongechi, 2018; Olowoselu et al., 2019) have investigated the link between achievement-oriented leadership behaviours and organisational commitment. Their findings indicated that the relationship was positive and significant. Although the above empirical studies suggested the existence of a positive

and significant association between the four leadership behaviours and staff commitment, they, however, revealed contextual and empirical gaps. For instance, except for the study conducted in a university by Banjarnahor et al. (2018), most of the studies were done in other contexts, hence not capturing the dynamics of educational institutions. For instance, studies by Ongechi (2018) and Mwaisaka et al. (2019a, 2019b) were done in the context of commercial banks, while Adigüzel et al. (2020) focused on employees in the manufacturing sector.

Still, studies that were done in educational institutions (e.g. Okello, 2018; Bakare & Ojeleye, 2020) were done outside Uganda and, hence, their findings may not be applicable to higher education institutions (HEIs) in Uganda owing to variations in organisational dynamics. At empirical level, there are studies that reported controversial results. For example, while all the other studies reported the existence of a positive link between leadership behavioural types and organisational commitment, in a study done in Kenya, Kasimu (2016) revealed no significant association between achievements-oriented leadership behaviours and organisational commitment. This suggests lack of agreement between the achievement-oriented leadership behaviour and organisational commitment among scholars. Thus, the above gaps attracted this study in the context of a university in Uganda to examine how leadership behaviour in terms of directive, supportive, participative and achievement-oriented leadership influences the organisational commitment of academic staff.

Methodology

This section covers the methodology that was the basis for data collection and analysis.

Research design and sample

This study adopted the correlational research design. Using this research design, the study collected data relating to variables to establish the association between them. The correlational design produced data that was the basis for determining the extent to which the predictor variables influenced the criterion variable. Data was collected from 175 respondents from a population of 406 full-time academic staff of Kyambogo University. The table developed by Krejcie and Morgan (1970) for determining the sample size from a given population was used to determine the sample. The sample was selected using stratified sampling, where academic staff were categorised according to faculties and schools and then randomly selected, which created an opportunity for every academic staff member to participate in the study. This helped in producing the results necessary for generalisation of the findings.

Measures of constructs

Leadership behaviour (independent variable) was measured in terms of directive, supportive, participative and achievement-oriented leadership behaviours with measurement indicators adopted from Yan-Li and Hassan (2018). Organisational commitment was measured in terms of affective, continuance and normative commitment basing on measurement indicators by Allen and Meyer (1996). The responses were measured on a five-point Likert scale with one (Strongly Disagree [SD]) representing the worst-case scenario and five (Strongly Agree [SD]) representing the best-case scenario.

Data collection and analysis methods

Data was analysed using Partial Least Square Structural Equation Modelling (PLS-SEM), specifically the SmartPLS 3 software owing to its ability to produce higher-order constructs, interaction terms and estimate of complex models with many latent variables (Sarstedt et al., 2020). Using SmartPLS, measurement models and structural equation models indicating the influence of leadership behaviour and organisational commitment of academic staff were established. Thus, using SmartPLS, the measures of the different constructs were established as well as the influence of the predictor variable on the outcome variable.

Findings

This section covers the empirical results of the investigation of this study into the leadership behaviour and organisational commitment of academic staff. The results include the demographic attributes of the study participants, measurement and structural equation models.

Demographic attributes of the study participants

The findings on the demographic characteristics of the academic staff who participated in the study show that the demographic attributes studied included sex, academic ranks, teaching experience and academic qualifications. The findings revealed that males were the majority percentage (72.0%), while the females were 28.0%. The results on the academic rank of academic staff show that a larger percentage (40.0%) were assistant lecturers, followed by lecturers (39.4%), senior lecturers (13.1%), associate professors (3.4%), graduate fellows (2.9%) and professors, at 1.1%. The results on teaching experience show that the larger percentage (74.3%) had spent over 5 years and above teaching, followed by 17.7% who had taught for 3 to 4 years, 5.1% for 1 to 2 years and 2.9% for less than a year. The results on academic qualification show that the larger percentage (48.6%) of the study participants had master's degrees, 48.0% had PhDs, 1.7% bachelor's degrees and another 1.7% had post-graduate diplomas. The demographic characteristics results indicate that various academic staff took part in the study. Therefore, the data collected was representative of the university academic staff.

Measurement models

The study determined content validity of the instruments by ensuring that the measures of the variables (independent and dependent variables) were fit for structural modelling. Validity tests included calculating average variance extracted (AVE), that is the extent to which constructs measuring a concept are theoretically related, heterotrait-monotrait (HTMT) discriminant validity (independence of constructs measuring a concept), and factor analysis, which establishes the validity of individual indicators of constructs. The results are shown in Table 1.

Table 1: AVE and heterotrait-monotrait (HTMT) discriminant validity assessment

Constructs	AVE	AC	CC	NC	
AC	1.087				
CC	1.257	0.266			
NC	1.350	0.408	0.653		

Constructs		AO	DL	PL	SL
AO	0.610	0.432			
DL	0.617	0.768	0.769		
PL	0.514	0.794	0.465	0.909	
SL	0.554	0.458	0.629	0.908	0.703

Key: AC (Affective Commitment), CC (Continuance Commitment), NC (Normative Commitment), AO (Achievement-Oriented), DL (Directive Leadership), PL (Participative Leadership), SL (Supportive Leadership), AVE (Average Variance Extracted)

Table 1 shows that AVE values for the different constructs were above 0.5, which is the minimum level of convergent validity (Shrestha, 2021). Therefore, the various constructs were appropriate measures of the concepts as they attained convergent validity. In addition, Table 2 shows that the HTMT discriminant validity condition was fulfilled because all the values were below the maximum value of 0.90 (Purwanto & Sudargini, 2021). Therefore, the measures were discriminately valid. Further, reliability tests were carried out to establish whether the different constructs were reliable, hence appropriate for structural equation modelling. Reliability establishes whether indicators of each construct are internally consistent (Souza et al., 2017). Composite reliability (CR) and Cronbach's alpha (α) were used to determine the internal consistency of indicators measuring the different constructs. CR was preferred because of Cronbach's alpha limitation that all indicators of the construct are the same across the population, which lowers reliability values. Moreover, Cronbach's alpha is sensitive to the number of items in the scale, which typically results in underestimating internal consistency. However, CR is liberal since it considers the external characteristics of the indicator variables (Hair et al., 2020). Table 2 presents the reliability results.

Table 2: Cronbach's alpha and composite reliability for the study constructs

Organisational Commitment	Cronbach's Alpha (α)	Composite Reliability
Affective Commitment	0.813	0.859
Continuance Commitment	0.774	0.838
Normative Commitment	0.591	0.754
Achievement-Oriented	0.838	0.886
Directive	0.875	0.906
Participative	0.838	0.880
Supportive	0.899	0.918

Table 2 shows that, with the exception of normative commitment, Cronbach's alpha values were greater than the minimum value of 0.70, indicating that the indicators of the construct were internally consistent. For composite reliability (CR), all the values were higher than the minimum value of 0.70 (Purwanto & Sudargini, 2021). Since in this study CR was preferred because of its flexibility, the indicators of the constructs were reliable.

Structural equation model

Structural equation modelling was carried out to establish the measures of leadership behaviour and organisational commitment of academic staff and whether leadership behaviour influenced organisational commitment. The results are depicted in Figure 1.
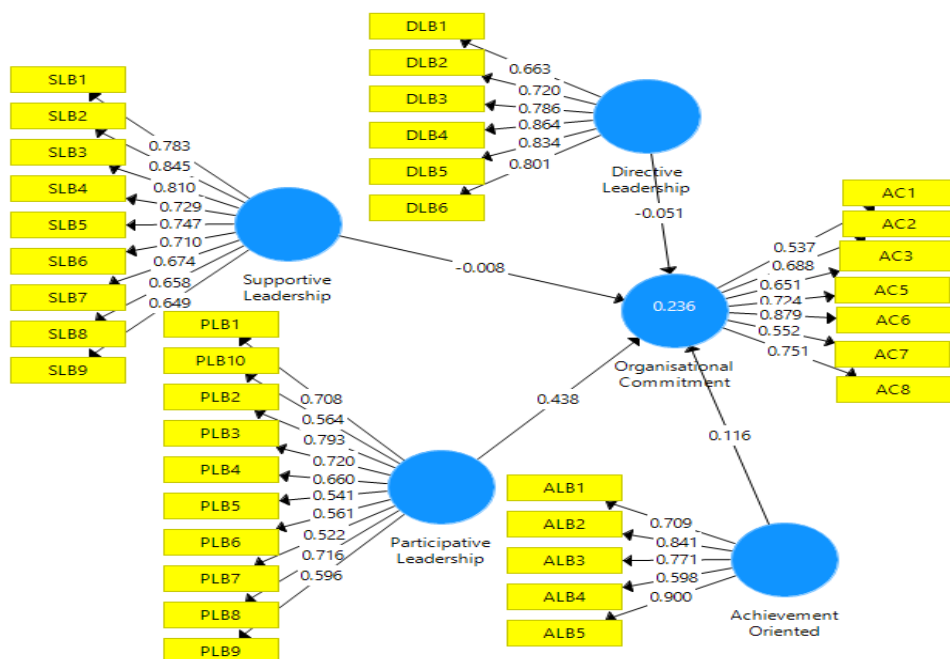
Figure 1: Structural equation modelling for leadership behaviour and organisational commitment

Figure 1 shows that four constructs, namely directive, supportive, participative and achievement-oriented leadership behaviours, measured the variable of leadership behaviour. The model shows that all the indictors of directive, supportive, participative and achievement-oriented leadership behaviours measured the constructs, as the factor loadings were above the minimum value of 0.50 (Sarstedt et al., 2021). However, for organisational commitment, out of the three constructs (effective, continuance and normative) only one (affective) proved to be an appropriate measure of the variable. Nonetheless, out of the eight indicators, only seven loaded highly with the fourth indicator dropped. Therefore, in the context of the university studied, organisational commitment was in terms of affective commitment. The model tested the hypotheses to find out whether i) directive leadership has a statistically significant influence on the organisational commitment of academic staff (H1), ii) supportive leadership behaviour had a statistically significant influence on the organisational commitment of academic staff (H2), iii) participative leadership behaviour relate to the organisational commitment of academic staff (H3), and iv) whether achievement-oriented leadership behaviour relates to the organisational commitment of academic staff (H4). Hypothesis test results in Figure 1 are presented with the structural model estimates in Table 3.

Table 3: Structural equation model estimates for leadership behaviours and organisational commitment

Leadership Behaviour and Organisational Commitment	B	Means	STD	T	P
Directive Leadership Organisational Commitment	-0.051	-0.028	0.089	0.575	0.566
Supportive Leadership Organisational Commitment	-0.008	0.012	0.116	0.067	0.946
Participative Leadership Organisational Commitment	0.438	0.426	0.138	3.184	0.002
Achievement-Oriented Organisational Commitment	0.116	0.124	0.097	1.186	0.236
R2 = 0.236					
Adjusted R2 = 0.216					

The results in Table 3 revealed that directive (β = -0.051, t = 0.575, p = 0.566 > 0.05) and supportive leadership behaviours (β = -0.008, t = 0.067, p = 0.946 > 0.05), respectively, negatively and insignificantly influenced the organisational commitment of academic staff. Nevertheless, participative leadership behaviour (β = 0.438, t = 3.184, p = 0.002 < 0.05) positively and significantly influenced the organisational commitment of academic staff, while achievement-oriented leadership behaviour (β=0.116, t = 1.186, p = 0.236>0.05) positively but insignificantly predicted the organisational commitment of academic staff. The path model estimates show that the four leadership behaviours, namely directive, supportive, participative and achievement-oriented leadership behaviours, contributed a 23.6% (R^2 = 0.236) variation in the organisational commitment of academic staff, while the 76.4 variation in organisational commitment was attributed to other factors not considered in this study. However, the significant factor, namely participative leadership behaviour, contributed 21.6% (adjusted R^2) variation in organisational commitment of academic staff. The coefficient of determination suggested that 78.4% of variation in the organisational commitment of academic staff was accounted for by other factors not considered in this study.

Discussion

The results revealed that the implementation of directive leadership behaviour negatively and insignificantly influenced the organisational commitment of academic staff. This is contrary to the findings of scholars like Banjarnahor et al. (2018) and Ongechi (2018), who reported a positive and significant link between directive leadership behaviour and organisational commitment. Further, the findings were contrary to the Path-goal Theory (House, 1971), which asserts that directive leadership significantly influences employee organisational commitment. Since the results of this study contradict those of all prior researchers, it can be adduced that the way directive leadership was implemented at Kyambogo University did not improve the organisational commitment of academic staff. This was because of the leaders' emphasis on always reminding academic staff about what was expected of them, strictly emphasising standard guidelines and regulations, and

explaining the level of performance expected of them in a way that undermined academic staff commitment to their responsibilities.

The results also revealed that supportive leadership had a negative and insignificant link with organisational commitment. This finding did not agree with that of earlier researchers such as Ab Rahman and Jantan (2020), Kasimu (2016), Okello (2018) and Ongechi (2018), who found a positive and significant link between supportive leadership behaviour and organisational commitment. Further, the findings were contrary to the Path-goal Leadership Theory (House, 1971), which opines that supportive leader influences employee organisational commitment. The results of the study being contrary to the findings of prior researchers means that supportive leadership behaviours exercised by leaders at the university did not significantly influence the commitment of academic staff. The leaders put little emphasis on friendly working relations, did not understand the points of view of academic staff and did not create a pleasant working environment. The findings, however, revealed that participative leadership behaviour positively and significantly impacted the organisational commitment of academic staff. This is in agreement with studies such as Adigüzel et al. (2020) and Bakare and Ojeleye (2020), which revealed that participative leadership behaviours significantly impact the organisational commitment of academic staff. This means that participative leadership behaviour of the university leaders significantly influenced the organisational commitment of academic staff.

Further, the results revealed that achievement-oriented leadership behaviour positively but insignificantly impacted the organisational commitment of academic staff. The results are not in line with the findings of most previous researchers. For example, Mwaisaka et al. (2019b), Olowoselu et al. (2019) and Ongechi (2018) agreed that achievement-oriented leadership had a positive and significant link with organisational commitment. The findings of this study being inconsistent with the results of previous researchers implied that achievement-oriented leadership behaviours used by leaders at Kyambogo University minimally promoted the organisational commitment of academic staff. The leaders emphasised letting academic staff know that they are expected to work at their highest level, setting challenging performance goals, and demanding continued improvement in performance without recognising their effort.

Conclusion

The study concluded that participative leadership behaviour is essential for the organisational commitment of academic staff, especially when university leaders listen receptively to ideas and suggestions of the academic staff, involve them in different administrative activities and listen to their suggestions even when they disagree with them. Directive leadership behaviour may enhance the organisational commitment of academic staff, especially when the communication style is unidirectional, from top to bottom, when university leaders always remind academic staff about what is expected of them, emphasise standard guidelines and regulations, and explain to them the level of performance expected of them. The implementation of supportive leadership behaviours may lead to low organisational commitment of academic staff, especially when leaders' support is seen as hypocritical and cosmetic, as opposed to being genuine. The study also concluded that the implementation of achievement-oriented leadership behaviours may

somewhat contribute to organisational commitment of academic staff especially when leaders and subordinates mutually agree on the expectations, and performance goals with leaders demanding for continued improvement in performance in a measured tone.

Recommendations

The study recommends that university leaders should improve on the implementation of supportive leadership behaviour to promote the organisational commitment of academic staff. This should involve cultivating genuine friendly working relations, understanding the points of view of academic staff and creating a pleasant working environment (Banjarnahor et al., 2018). Further, university leaders should sustain the use of participative leadership behaviour to deepen the organisational commitment of academic staff. As Olowoselu et al. (2019) advised, they should continue to: receptively listen to the ideas and suggestions of academic staff; involve them in different administrative activities; and respectfully disagree with them. University leaders should, also, learn how achievement-oriented leadership behaviour can be impactful. They should appreciate that the potency of such behaviour on staff commitment depends on how much staff value the set goals and their expectancy of attaining those goals (Lumbas et al., 2016). Finally, university leaders need to learn the best way of engaging in directive leadership behaviour to enhance its impact on staff commitment. As noted by previous scholars (Mutmainnah et al., 2022), the quality of direction offered and how this is done by leaders can have a direct impact on staff commitment. In agreement with the above scholars, the current study contends that leaders at Kyambogo University should act as role models to earn respect, trust and admiration from staff. Through intellectual stimulation, leaders will, then, be able to encourage staff to take on challenging tasks.

Limitations

Several drawbacks, that provide opportunities for other studies, emerged from the study. First, the results for most of the hypotheses were contrary to what was hypothesised. For instance, except for participative leadership behaviours, the hypotheses about the influence of directive, supportive and achievement-oriented leadership behaviour were rejected. Since this study was conducted in one public university, future scholars should further test these hypotheses in several universities, including private ones. In addition, future researchers should conduct a national survey on both public and private universities to achieve more general and comparable results. Finally, this study used the positivist approach to make inferences for generalisation of the findings. Future scholars should use the mixed-methods approach for in-depth exploratory analysis.

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Initial Person-Environment Fit Practices and Academic Staff Engagement in Private Universities in Uganda

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Abstract

Employee engagement is an important element for the sustained competitive advantage of organisations. Therefore, it is important to examine practices likely to enhance it among employees. This article examined the relationship between initial person-environment fit practices and academic staff engagement in private universities in Western Uganda. Particularly, the study examined whether the initial person-environment fit practices, namely recruitment, selection and socialisation, were significantly related to the employee engagement of teaching staff. The study was correlational, involving a sample of 222 academic staff from three private universities. Data was analysed using partial least squares structural equation modelling (PLS-SEM). The results indicated that the model was appropriate, for the constructs were fit for structural modelling. Hypothesis test results revealed that recruitment, selection and socialisation were significantly related to employee engagement among teaching staff. It was concluded that the implementation of an appropriate recruitment and selection process, as well as the proper socialisation of new academic staff, promotes their work engagement in terms of absorption, dedication and vigour. Therefore, it was recommended that appointment boards and human resource directorates in universities implement appropriate recruitment and effective selection practices that promote academic staff engagement. Further, human resource directorates, deans of faculties and heads of departments should make an effort to socialise new teaching staff to promote work engagement among teaching staff.

Keywords: *Engagement; Person-environment; Recruitment; Selection; Socialisation*.

Introduction

Employee engagement today has increasingly become a common phrase in the workplace because it is viewed as a potent remedy for enhancing employee effectiveness (Jha et al., 2019). The concept of work engagement has gained enormous popularity as it is seen as a secret element for improving employee performance due to the fact that engaged employees are considered to be psychologically connected to their workplaces, hence work hard for the success of the organisation (Nanteza et al., 2023). Work engagement is vital for the performance of organisations and has been advanced as being critical to the success of organisations by enhancing their competitive advantage (Sekhar et al., 2018). Therefore, employee work engagement enhances employee productivity in organisations because the energy and focus inherent as a consequence of being engaged pushes individuals to achieve to the best of their abilities, which improves the quality of their job performance (Abun et al., 2020; Sonnentag, 2017). Engaged employees are a key resource to organisations for sustained competitive advantage. This has made employee engagement become a concept of focus in management circles for promoting organisational competitiveness (Turner, 2020). Therefore, work engagement is important for the effectiveness of organisations such as universities.

The concept of employee engagement encompasses the experience of strong energy while at work and feeling highly motivated. The concept relates to the energy inherent in an individual related to positive work behaviours and output (Green et al., 2017). Employee engagement involves an emotional commitment to the organisation and its goals, leading to a sense of purpose and meaning. This, in turn, fosters a positive work environment, encourages employee participation, and drives business success (Turner, 2020). Schaufeli (2017) contends that employee engagement is the fulfilling work-related state of mind exhibited by three traits, that is absorption, dedication and vigour of employees. Absorption is the state of mind involving the employee being happily absorbed in and concentrating on work with time passing rather quickly and experiencing difficulty of disentangling one's self from the work (Stankevičiūtė et al., 2021). Dedication denotes heavy involvement of individuals in their work with inner challenge, pride and inspiration (Linggiallo et al., 2021). Vigour is the tendency of resilience in an employee despite workplace obstacles and high investment of effort in the job even when confronted with work challenges (Soelton et al., 2020).

The term employee engagement was coined by Gallup Research Group, an American analytics and advisory company, in the 1990s following 25 years of surveys involving employees and managers (Gallup Jr., 1991). Three specific behaviours exhibited by engaged employees are say, stay and strive (Bailey, 2022). The employees say (talk highly about the organisation to others both within and outside the organisation), stay (show a strong zeal to be part of the organisation) and strive (exert effort and become part of the agenda for the success of organisation) (Schaufeli, 2013). This means that it is important for the success of organisations because of the commitment it builds in employees. Nonetheless, employee engagement globally is a challenge. Firdinata and Hendriyani (2019) indicated that globally, generally 14 per cent of employees were actively disengaged while 17 per cent were highly disengaged. In Uganda, the situation is not any better. A survey carried out in 2018 by the Federation of Uganda Employers in conjunction with Makerere University showed that Ugandan workers from various sectors that were highly engaged were 49 per

cent, with 6 per cent disengaged and 45 per cent averagely engaged. This implies that those lowly engaged were 51 per cent (Musenze et al., 2020). Therefore, the larger percentage of Ugandan workers was lowly engaged to their jobs. The low engagement levels suggested that their productivity was low. The low engagement levels amongst Ugandan workers attracted this study to examine the relationship between the initial person-environment fit practices of recruitment, selection and socialisation in connection with employee engagement. As such, the study tested the following three hypotheses:

H1: Recruitment has a statistically positive significant relationship with the work engagement of academic staff in private universities in Western Uganda.

H2: Selection has a statistically positive significant relationship with the work engagement of academic staff in private universities in Uganda.

H3: Socialisation had a statistically positive significant relationship with the work engagement of academic staff in private universities in Uganda.

Literature Review

Theoretical review

The person-environment (P-E) fit theory, with its roots in the in person-environment interaction theory advanced by Lewin in 1935, informed the study investigations. The fundamental assumption of fit is that outcomes are a function of the interaction between individuals and their environments, where good fit typically results in positive outcomes for the individual (Kristof, 196). Jansen and Kristof-Brown (2006) advanced that the person-environment fit theory comprises person-vocation (PV), person-organisation (PO), person-group (PG), person-job (PJ) and person-person (PP), which are related to the five stages of employment: pre-recruitment, recruitment, selection, socialisation or orientation, and long-term tenure. The conjecture in the P-E fit dimensions is that they are highly or lowly salient at different stages in an individual's career, with PV being relevant prior to thinking about becoming part of an organisation and PJ and PP fit being relevant at the job search level. PJ and PO are visible during the selection process, while PO and PJ are salient during socialisation. All five fit forms are relevant during long-term tenure and determine the employees' positive or negative work attitudes (Dimopoulos et al., 2021; Edwards & Billsberry, 2010). The P-E fit dimensions show the need for congruence between the individual and the work environment. Hence, matching the characteristics of the employee is very important at all stages of employment and leads to positive work dispositions such as employee engagement (Lahlouh et al., 2019). The P-E fit theory suggests that at different stages of employment, including recruitment, selection and socialisation, matching the fit of an employee is very important. Therefore, P-E fit theory was the basis for relating the initial P-E fit practices of recruitment, selection, and socialisation with employee engagement.

Recruitment and employee engagement

Recruitment is searching for potential employees in ample numbers and quality to facilitate the selection of the most suitable candidates to fill the job needs of an organisation (Georgia et al., 2013). With recruitment, an organisation is able to attract the maximum number of applicants with the requisite qualifications (Dash, 2018). The recruitment

process enables attracting and engaging candidates the organisation needs (Armstrong, 2010). Scholars such as Angundaru et al. (2016), Budriene and Diskiene (2020), Gill (2007), Jani and Balyan (2016), Karumuri (2017), Lewis (2019), O'Bryan and Casey (2017), Onday (2016), Sivapragasam and Raya (2017) and Shilpa (2013) reported the existence of a positive association between recruitment and employee engagement. However, the literature above revealed contextual gaps, as all the previous studies were conducted in foreign contexts. This highlighted the need for a study in the Ugandan context that addresses the local specifics that differed from those in other settings.

Selection and employee engagement

Selection encompasses determining the extent to which the attributes (competencies, experience, qualifications, education and training) of job candidates match the person specification (Almeida & Fernando, 2017). An evidence-based selection process that facilitates the employment of candidates that possess a higher level of calibre, are devoted to work and are focused on achieving their regular and extraordinary tasks leads to hiring individuals likely to be engaged with their job roles (Kerdpitak & Jermsittiparsert, 2020). In their reviews, Budriene and Diskiene (2020), Karumuri (2017), Lewis (2019), O'Bryan and Casey (2017), Onday (2016) and Shilpa (2013) indicated that selection is positively and highly related to employee engagement. Similarly, in their empirical studies, Gill (2007), Jani and Balyan (2016), Kerdpitak and Jermsittiparsert (2020), Nawaz et al. (2020) and Sivapragasam and Raya (2017) reported that selection was positively and significantly linked to employee engagement. However, Vuong and Suntrayuth (2020) established that selection had no significant relationship with employee engagement. While the literature above suggests that scholars had made an effort to examine the link between selection and employee engagement, methodological and empirical gaps have emerged. At the methodological level, a number of scholars carried out reviews, hence the need for more primary data on the same. At the empirical level, the study by Vuong and Suntrayuth (2020) came up with findings contrary to those of other scholars, as it reported that selection had no significant relationship with employee engagement, whereas other studies found that a significant relationship existed. This empirical gap suggested that the importance of selection varied in different contexts and organisations, which called for this study.

Socialisation and employee engagement

Socialisation is the ongoing process by which new employees are made to understand the culture of the workplace and the people therein to chart the way forward on how to relate with them (Fu et al., 2017). Socialisation helps new employees understand the mission, vision and values of the organisation they have joined (Hewitt et al., 2004). Organisational socialisation enables newcomers to adjust to the tasks at hand and become socially integrated, leading to important job outcomes such as engagement (Saks & Gruman, 2018). This most likely leads to employee engagement. In their study, Villavicencio-Ayub et al. (2014) reported that organisational socialisation positively and significantly correlated with the work engagement of employees. Accordingly, a good adjustment to the organisation as a result of the implementation of a socialisation process led to higher levels of employee engagement. Relatedly, Albrecht et al. (2015) and Ongel (2012), in their reviews, indicated that socialisation led to employee engagement. Also, McGee (2015) and Mmako and Schultz

(2016), in their empirical studies, reported the existence of a strong positive correlation between socialisation and higher levels of employee engagement. Overall, a literature search suggested that limited studies had been carried out on socialisation and employee engagement. Indeed, Saks and Gruman (2018) indicated that much less is known about how socialisation determines employee engagement among new workers. This literature gap made it essential for this study to be carried out.

Methodology

Research design and sample

This study employed the correlational research design, which sought to ascertain relationships between initial person-environment fit practices and employee engagement among teaching staff. The correlational research design was adopted because it would enable the researcher to collect data for establishing relationships between two or more variables in the same population (Queirós et al., 2017). Therefore, the findings of a correlational study enable the researcher to determine the degree to which two variables change together. Since correlational studies are quantitative in nature, the study adopted a quantitative approach; hence, the data was analysed using quantitative methods. Data was collected from a sample of 222 academic staff from three private universities in South Western Uganda namely Bishop Stuart, Ibanda, and Kampala International, Western Campus.

Measures of constructs

The study examined the relationship between employee engagement (dependent variable) and person-environment fit (independent variable). Employee engagement was assessed through three components: absorption (ABS), dedication (DED) and vigour (VIG). Person-environment fit was measured through three dimensions: recruitment (REC), selection (SEL) and socialisation (SOC). The measurement scales used were based on existing research, with recruitment and selection adapted from Mugizi and Nuwatuhaire (2019) consisting of six and seven items, respectively. Socialisation, adapted from Haueter et al. (2003), comprised seven items, while vigour, dedication, and absorption, based on Schaufeli et al. (2006), consisted of six, five, and six items, respectively. All items were measured using a 5-point Likert scale, ranging from 1 (very untrue) to 5 (very true), allowing participants to indicate their level of agreement or disagreement with each statement.

Validity and reliability

To establish whether the results obtained on the constructs were fit for structural modelling, a structural assessment model was done to ascertain the validity and reliability of the data collected using SmartPls 3 for structural equation modelling. Validity was determined using average variance extracted (AVE) and heterotrait-monotrait ratio of correlations (HTMT) for discriminant validity and reliability was tested using Cronbach's alpha (α) and composite reliability (CR). The data was further tested for collinearity using value inflation factor (VIF). The validity results follow in Table 1.

Table 1: *Heterotrait monotrait (HTMT) discriminant validity assessment*

Employee Engagement	AVE	Absorption	Dedication	Vigour
Absorption	0.552			
Dedication	0.748	0.443		
Vigour	0.506	0.655	0.705	
Person-Job-Fit	AVE	Recruitment	Selection	Socialisation
Recruitment	0.530			
Selection	0.530	0.827		
Socialisation	0.575	0.505	0.697	

The results in Table 1 revealed that the constructs explained variations in the items because AVE values exceeded the 0.5 threshold (Purwanto, 2021). Discriminant validity was also established using the heterotrait-monotrait (HTMT) ratio of correlations, a reflective test that ensures concepts and measurements in the same model are independent, confirming that each construct's indicators accurately measure the intended construct (Sarstedt et al., 2019). The HTMT correlations met the discriminant validity conditions, with all values falling below the 0.90 limit (Hair Jr et al., 2021). This confirmed the validity of the measures. Having established the validity of the measures through these tests, the results were deemed suitable for further analysis.

Table 2: *Reliability and collinearity*

Person Job-Fit	α	CR	VIF
Absorption	0.837	0.881	1.663
Dedication	0.888	0.922	2.358
Vigour	0.799	0.858	1.627
Recruitment	0.846	0.885	1.821
Selection	0.772	0.847	1.851
Socialisation	0.875	0.904	1.935

The reliability results presented in Table 2 confirmed the internal consistency of the items measuring the constructs, with Cronbach's alpha (α) and composite reliability (CR) values exceeding 0.70 for all constructs, indicating a satisfactory level of reliability. In testing reliability, CR was also carried out because of Cronbach's alpha limitation of assuming that all indicator traits are the same in the population, lowering reliability values. Composite reliability is liberal because it takes into account outer traits of the indicator variables (Hair Jr et al., 2021). In addition, the test results presented in Table 2 revealed no evidence of high correlation (collinearity) between the independent variables, as indicated by variance inflation factor (VIF) values less than 5, the standard threshold for detecting collinearity (Hair Jr et al., 2021). This suggests that the independent variable, person-job fit factors (recruitment, selection and socialisation), could independently predict the dependent variable, employee engagement of teaching staff (in terms of vigour, dedication and absorption), without issues of multicollinearity

Data analysis method

The study employed partial least squares structural equation modelling (PLS-SEM) using SmartPLS 3 software, leveraging its ability to develop models showing linkages between variables. SmartPLS facilitated the examination of causal relationships by illustrating the influence of the independent variable on the dependent variable. Specifically, SmartPLS helped elucidate the measurement models of the constructs (Tables 1 and 2), the relationships between indicators and constructs (Figure 1) and the linkages between constructs and variables. Given that the sample size exceeded 100 (n = 222), PLS-SEM was deemed suitable for testing the proposed relationships (Hair Jr et al., 2021) between initial person-environment fit practices and employee engagement among teaching staff.

Findings

Demographic attributes

The study participants' attributes (Table 3) showed a majority of males (72.1%), with the modal age group being 30–40 years (55.4%). Most participants held postgraduate qualifications (75.2%), and the majority were assistant lecturers (38.7%). Additionally, the largest group had worked for 5–10 years (39.2%), indicating a consistent profile among the participants.

Table 3: Demographic attributes of the study participants

Variables	Categories	Frequency	Per cent
Sex	Male	160	72.1
	Female	62	27.9
	Total	222	100.0
Age groups	Less than 30 years	30	13.5
	30–40 years	123	55.4
	40–50 years	50	22.5
	50 years and above	19	8.6
	Total	222	100.0
Education Level	Diploma	1	0.5
	Bachelor's degree	54	24.3
	Postgraduate qualifications	167	75.2
	Total	222	100.0
Position	Teaching Assistant	59	26.6
	Assistant Lecturer	86	38.7
	Lecturer	54	24.3
	Senior Lecturer	18	8.1
	Associate Professor/Professor	5	2.3

	Total	222	100.0
Years worked at the University	Less than 5 years	89	4.1
	5–10 years	87	39.2
	11 years and above	46	2.7
	Total	222	100.0

Structural equation model

To examine the causal relationships between the independent and dependent variables, a structural model (Figure 1) was developed, illustrating the factor loadings of the indicators for each construct and the relationships between the variables. The model results, presented in Figure 1 and Table 4, include the beta (β) coefficients representing the strength and direction of the relationships between constructs, p-values indicating the significance of these relationships, and R-squared (R^2) values representing the proportion of variance explained. Additional results, including t-test statistics and adjusted R^2 values, are provided in Table 4.
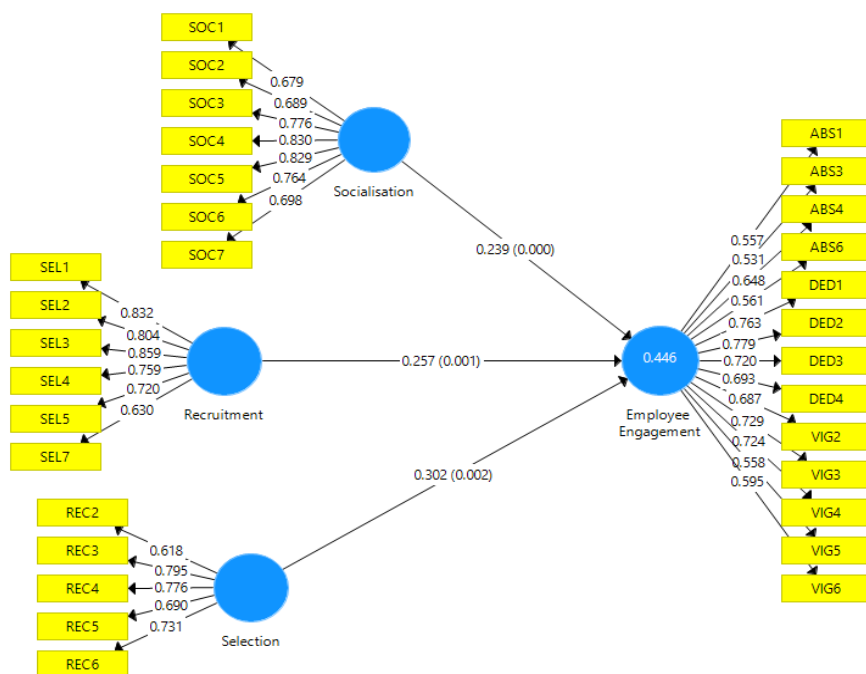
Figure 1: Structural equation model findings

The factor loadings in Figure 1 show that the construct of selection had six out of seven items loading highly, and socialisation had all seven items loading highly. For absorption and dedication, four out of six and four out of five items loaded highly respectively, while for vigour, five out of six items loaded highly. Recruitment had six out of seven items loading highly, while selection had six out of seven loading highly, and socialisation had all the items loading highly. The factors loading highly loaded above the minimum validity

value of 0.50 when using factor analysis (Hair Jr et al., 2021). Therefore, the retained items are valid measures of their respective constructs.

Table 4: Structural equation model predictions

	Beta	T Statistics	P Values
Recruitment Employee Engagement	0.257	3.219	0.001
Selection Employee Engagement	0.302	3.176	0.002
Socialisation Employee Engagement	0.239	3.694	0.000
R^2 = 0.446			
Adjusted R^2 = 0.442			

The results in Figure 1 and Table 4 show that the hypotheses (H1- H3) to the effect that recruitment (β = 0.257, t = 3.219, p = 0.001 < 0.05), selection (β = 0.302, t = 3.176, p = 0.002 < 0.05) and socialisation (β = 0.239, t = 3.694, p = 0.000 < 0.05) have a statistically positive significant relationship with employee engagement were supported. Adjusted R^2 suggested the three factors, namely recruitment, selection and socialisation, contributed 44.2% (R^2 = 0.442) to employee engagement. This implied that 55.8% of the variation in employee engagement of teaching staff was a result of factors other than those analysed, such as other job-fit factors which, according to the person-environment (P-E) fit theory include long-term tenure factors that might be individual and organisational. The respective beta values (βs) indicate that selection makes the most significant contribution to employee engagement, followed by recruitment and socialisation, respectively. Thus, optimising selection processes will yield the greatest returns in enhancing employee engagement, surpassing the effects of recruitment and socialisation.

Discussion

The results of the study showed the existence of a positive and significant association between the three job-fit factors, namely recruitment, selection and socialisation, and employee engagement among teaching staff. These results align with the person-environment (P-E) fit theory, which suggests that various stages of employment, including recruitment and selection, influence employees' positive work attitudes (Dimopoulos et al., 2021; Edwards & Billsberry, 2010). Hence, when teaching staff experience a good fit, they are more likely to exhibit high levels of employee engagement. The findings were also consistent with those by previous scholars such as Angundaru et al. (2016), Budriene and Diskiene (2020), Gill (2001), Jani and Balyan (2016), Karumuri (2017), Lewis (2019), O'Bryan and Casey (2017), Onday (2016), Sivapragasam and Raya (2017) and Shilpa (2013), who revealed that recruitment was positively and significantly associated with workplace engagement. This congruence across studies reinforces the notion that effective recruitment practices play a crucial role in fostering employee engagement.

The findings of the study also agreed with the findings of previous scholars, including those by Kerdpitak and Jermsittiparsert (2020), Budriene and Diskiene (2020), Gill (2001), Jani and Balyan (2016), Karumuri (2017), Lewis (2019), Nawaz et al. (2020), O'Bryan and

Casey (2017), Onday (2016), Shilpa (2013) and Sivapragasam and Raya (2017), who reported a positive and significant association between selection and employee engagement. While Vuonga and Suntrayuth (2020) found no significant relationship between selection and employee engagement, the overwhelming consensus among previous researchers suggests that selection is indeed related to employee engagement. Therefore, it can be inferred that effective selection practices contribute to enhancing employee engagement.

Further, the results concurred with the findings of previous scholars such as Villavicencio-Ayub et al. (2014), who reported the existence of a positive and significant correlation between organisational socialisation and employee work engagement. They noted that effective socialisation facilitates employees' adjustment to the organisation, leading to higher levels of work engagement. Similarly, Albrecht et al. (2015), O'Bryan and Casey (2017) and Ongel (2012) indicated that socialisation led to employee engagement. Mcgee (2015) and Mmako and Schultz (2016) also reported a strong positive association between socialisation and higher employee engagement levels. These findings collectively suggest that organisational socialisation plays a crucial role in fostering employee engagement, and the results of this study contribute to reinforcing this consensus.

Conclusions and Recommendations

The analysis revealed that selection has the most substantial impact on employee engagement, followed by recruitment and socialisation, respectively. This suggests that the selection process plays a critical role in fostering employee engagement, followed by the recruitment process, and then socialisation initiatives. These findings highlight the importance of optimising each of these stages to maximise employee engagement. Therefore, effective competitive selection promotes employee engagement. In addition, selection promotes employee engagement when the exercise involves evaluating the candidates' attitudes essential for the job and making background checks on the candidates, and when the immediate supervisor is involved. In addition, effective recruitment processes enhance engagement. This is especially so when the recruitment process is strictly based on merit and the job candidates are given sufficient relevant information about the institution when being recruited. The recruitment process also promotes academic staff engagement when the candidates are made to adequately understand the jobs they are seeking, their referees submit recommendations on their behalf, and reference checks are made on the candidates.

Further, through socialising new academic staff, their employee engagement is boosted. This is so because the socialisation process enables new staff to know the various departments in the institution, to learn the institution's history and to understand how their respective department and faculty operate, as well as to acquaint themselves with the values of the institution. Socialisation also enhances employee engagement when new employees are briefed on policies and rules, responsibilities, tasks and duties they have been hired for, and are briefed about how to obtain the resources needed to perform their jobs. Therefore, it was recommended that appointment boards and human resource directorates in universities should implement appropriate recruitment and effective selection practices that promote the employee engagement of teaching staff. Further,

human resource directorates, deans of faculties and heads of departments should make an effort to socialise new academic staff to promote the work engagement of teaching staff.

Limitations of the Study

This study provides crucial insights in promoting employee engagement among teaching staff through person-job fit practices. However, its scope was limited to private universities in one sub-region of the country. Future research should aim to include public universities and expand to different or all regions of the country to enhance generalisability. In addition, this study only explored three stages of employment, namely recruitment, selection and socialisation, omitting pre-recruitment and long-term tenure stages. Future studies should investigate all aspects of person-job fit to determine their collective impact on employee engagement. Furthermore, this study solely employed quantitative methods, limiting the depth of analysis. Future research should incorporate qualitative data analysis methods to provide a more comprehensive understanding of the concepts.

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Lecturers' Professional Competencies that Enhance University Students' Expectations about the Quality of University Education in Uganda

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Abstract

This study examines university students' expectations of their lecturers' professional competencies, which influence the quality of learning. The key professional competencies of university lecturers evaluated in this study included lecturers' mastery of the subject content, teaching methods, professional guidance and support given to students, and methods of assessment. The study followed a cross-sectional survey research design to collect data from 300 university students and 12 heads of departments in three public and three private universities. Quantitative data was analyzed using the Spearman rank-order correlation and multiple regression analysis, while qualitative data was grouped into themes and analyzed descriptively according to the study objectives. The study revealed a positive and significant correlation between the four professional competencies and the influence of quality learning outcomes in the university. However, the correlation coefficients for professional guidance and support, and methods of assessment and feedback were stronger than content mastery and methods of teaching. The study recommends that university lecturers should not focus only on the pedagogical professional competencies to influence students' outcomes but also on how they handle students' professional needs and assessment outcomes.

Keywords: *University Quality; Professional Competencies; Students' Expectations; Labour Markets.*

Introduction

University lecturers are central to any consideration of universities, and a majority of education policy discussions in universities focus directly or indirectly on the role of lecturers. There is a *prima facie* case for the concentration on lecturers in universities because they are the largest single budgetary element in the university and they influence students' outcomes more than other inputs (Hanushek & Machin, 2023). Moreover, parents, teachers, and administrators repeatedly emphasize the fundamental role that lecturers play in the determination of university quality. There remains little consensus among researchers on the characteristics of a good lecturer, let alone on the importance of lecturers in comparison to other determinants of university quality.

Whereas studies have highlighted active listening, adaptability, collaboration, creativity, empathy, engagement, focus on growth, lifelong learning, patience, preparedness and respect as the key professional competencies of a good teacher (Dolton et al., 2011; Cockburn & Haydn, 2014; Clement & Rencewigg, 2020), this study focused on lecturer-student interaction, professional competencies including mastery of subject content, the methods used to teach, professional guidance to students, and methods of assessment and feedback. The interest was to find out how these four professional competencies were related to students' satisfaction with their university experiences and their labour market expectations.

The problem of quality in Ugandan university education dates back to the founding of Makerere University in 1922 (Hayward, 2006). Makerere University was established as a technical college to serve students from the British East African territories of Kenya, Uganda and Tanzania (Cloet, Maasen & Bailey, 2018). In the initial stages of university education, quality was measured on the training of graduates in the practical skills of carpentry, building and mechanics. When the university expanded, other courses, in medical care, agriculture, veterinary sciences and teacher training, were introduced, which demanded more advanced models of quality assurance (Kasozi, 2003). With such curricula of university education in place, training was oriented towards employment and contribution to national development. These first endeavors for ensuring quality in university education were guided by the Phelps-Stokes Commission of (1924–1925), which suggested that the educational policies of missionaries were inadequate because they emphasized reading, writing and numeracy (Ssempebwa, Mulumba & Edopu, 2017) and that there was a need to teach agriculture and technical skills.

With the growing demand for university education in Uganda, in the second half of the 20th century, more students enrolled in Ugandan universities, as more public and private universities were established. Given this development in the higher education sector, the issue of quality of graduates gained traction, with the government and parents wondering whether there was value for the cost that they incurred on education. Lecturers' competencies in terms of subject content mastery, methods of teaching, engagement in students' professional guidance, and assessing students and giving feedback are increasingly being seen as important inputs in determining the quality of graduates (Kasozi, 2016; NCHE, 2018). This is because lecturers influence students' persistence in their course of study and students' labour market expectations.

Objectives of the Study

1. To establish the relationship between lecturer mastery of subject content and students' expectations about/of the quality of university graduates in Uganda.
2. To find out how the teaching methods used by lecturers are related to students' expectations about/of the quality of university education in Uganda.
3. To establish how the professional guidance given by lecturers is related to students' expectations about/of the quality of university education in Uganda.
4. To examine how lecturers' methods of assessing students are related to students' expectations about/of the quality of university graduates.

The Theoretical Perspective

This study was guided by the human capital theory advanced by Theodore Schultz in 1961, which suggests that individuals and nations invest in education to take advantage of better job opportunities and higher earnings (Gillies, 2015). Studies further suggest that individual decisions to pursue higher education involve an informal analysis of the costs of education as measured against the expected value of the returns to that education (Dolton, Tremayne & Chung, 2011). It is further suggested that the human capital theory assumes that education determines the marginal productivity of labour, which also determines earnings, and that intellectual formation constitutes a form of economic capital (Frazis, 2015).

The motivation for private and public investment in education is to increase the productivity of individuals, enhance employment prospects and increase earnings prospects. Therefore, university lecturers need to identify those professional competencies that improve learning among students and enhance skills for better employment and financial returns for these students when they join the world of work.

Literature on Lecturer Quality and Graduate Quality

Studies suggest that universities with highly-rated lecturers, highly-rated facilities, and top-rated courses signify customer satisfaction and increase the probability of students' retention and persistence in the course of study. For example, Chevalier and Dolton (2015), Cockburn and Haydn (2014) and Hanushek and Welch (2016) suggest that high-quality professors promote better educational outcomes compared to low-quality lecturers, who increase the probability of their students staying on their courses longer. Other studies, for example by Sultan and Wong. (2013) and Nadiri, Kandampully, and Hussain (2019) describe high-quality lecturers as those who:

- are knowledgeable and provide accurate and up-to-date information.
- use a range of teaching methods to stimulate learning and improve the quality of the lecture, such as podcasts, case studies, field visits, new links, and other initiatives, including providing lecture notes only after the lecture is finished.
- apply the knowledge taught in class to practical situations in some employment settings.
- give individualized attention to every student and extensive feedback to individual students for all the assessed work.

However, other researchers have evaluated university students' outcomes based on other lecturer characteristics such as years of experience, highest degree qualification, professional certification, verbal ability ((Darling-Hammond, 2012), ability to work with culturally diverse classes (Kaweesi et al., 2023) and professional conduct (Odden & Wallace, 2016). There is overwhelming evidence in the literature to suggest that when the differences in students' socio-economic status (SES), university environment and facilities, and the quality of academic programs are controlled for, lecturers are the most important determinants of university students' satisfaction and outcomes (Gore, 2017; Brennan & Shah, 2020).

In the context of Uganda, the available literature suggests that some higher education institutions lack adequate financial resources to attract and retain the qualified academic

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staff needed to deliver quality higher education (Kasozi 2016). Whereas the number of students in both private and public universities is estimated to be growing at a rate of 15% annually, for instance, from 108,295 in 2004 to 124,314 in 2005, the number of lecturers is growing at a rate of 1%, i.e. from 5,249 in 2004 to 5,258 in 2005 (NCHE, 2018). This indicates that universities in Uganda are operating below the required staff capacity, which affects the quality of university outcomes in terms of student satisfaction. This study, therefore, establishes students' assessment of the most important professional competencies of their lecturers, which satisfies their expectations of the quality of university education in Uganda.

Methodology

The research design, population, sample size and selection

This study leans more on the pragmatist research paradigm, which is rooted in the ontological principle and doctrine which suggest that truth and reality are free and independent of the viewer and observer (Muwagga, 2006; Genza, 2012). The study followed a correlational cross-sectional survey research design, which mainly allows quantitative approaches that enable the sampling of a large number of 'units of analysis' in a relatively short time and enabled the generalization of findings to many universities in Uganda. To a small extent, the qualitative approach was used to corroborate findings from the quantitative approach.

The target population for this study included all students enrolled in private and public universities as well as academic heads of departments in the same institutions. The accessible population was the university students selected from six universities (three private and three public) and they were the principal subjects for the study. Students from the graduating class were selected because they had spent enough time with their lecturers and could adequately evaluate those professional competencies that are important for the student's university experiences. To complement the findings from the students, interviews were conducted with 12 heads of departments selected from the six universities. The heads of departments were selected from different disciplines, which naturally do not face the same contexts. Therefore, most responses from these heads of departments differed in context. Besides, they also came from different universities, both private and public, and so they would certainly have differing opinions. The sample size for heads of departments was based on the principle of data saturation, in that after the 12 interviews, no new themes emerged, and therefore the 12 interviews were considered adequate for this study.

A sample of 300 students was selected for this study using the stratified random sampling methodology to include 50 students from each of the six sampled universities. The sample of 300 subjects was appropriate for this study because, following the Krejcie and Morgan table of sample size determination (Chuan, 2016), a minimum sample of 300 elements for a population of 100,000 and above is representative enough.

Data collection and analysis

A structured questionnaire was used as an empirical method to collect data from 300 university students as principal subjects of the study. A structured questionnaire was

preferred for this study because the study required standardized data on facts and opinions to be provided by respondents, and the respondents would give answers to identical items. To ensure that the main instrument for data collection (the questionnaire for students) was valid, the questionnaire was validated through expert rating of the question items by 10 lecturers during the pre-test phase and a content validly test was done on all the variables of the study. This was meant to ensure that the questionnaire items were clear. All variables registered a content validity index of greater than .80. The overall content validity index for knowledge competence was 0.81, methods of instruction was 0.86, career and professional support was 0.80, and methods of assessing examinations were 0.82. The CVI above 0.7 was good enough for the instrument to generate accurate data.

Cronbach's alpha was used to measure the internal consistency of the questionnaire administered to students. This reliability test method was appropriate for this study because it worked with multiple Likert scale variables (Warner, 2013). For each of the research variables, when alpha is equal to or greater than 0.7 (Muganda & Muganda, 2003), it indicates that the instrument is reliable in measuring what it was meant to measure. The knowledge competence alpha (α) was 0.9720, the methods of instruction alpha (α) was 0.8462, the career and professional support alpha (α) was 0.8339, and the methods of assessing examinations alpha (α) was 0.8254. Therefore, this instrument was reliable in collecting the data that it was meant to collect.

To ensure the validity and reliability of the interview guide, relevant interviewees who were heads of departments and knowledgeable about how lecturers' competence affected university students' satisfaction with university quantity were used. At the same time, the interview guide was given to five lecturers to review for clarity of language and dependability. This method of quality control was considered essential in ensuring the trustworthiness of the findings in terms of truthiness, applicability, consistency and neutrality (Cresswell, 2014).

The Spearman rank-order correlation (*rho*-coefficient) was conducted in IBM SPSS 24 to measure the strength and direction of the correlation between the predictor variables of lecturers' professional competencies and those of the quality of university education. The Spearman rank-order correlation was preferred for this analysis because the data selected was ordinal, which justifies the choice of method of analysis. A multiple regression analysis was then run to establish which lecturer professional competencies were most important in determining the quality of university graduates in Uganda.

Findings of the Study

The correlation between lecturers' professional competencies and their students' expectations of the quality of university education

The key professional competencies measuring the quality of lecturers were mastery of subject knowledge, use of appropriate methods of teaching, giving professional and career guidance to students, and use of objective methods to assess students' examinations. On the other hand, the quality of university education was measured by students' confidence to complete their program of study (retention), students' employment expectations as influenced by the lecturers, and students earning expectations as influenced by their lecturers. The hypothesis for these variables was:

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There is a positive and statistically significant relationship between lecturers' professional competencies and their students' expectations about the quality of university education.

The Spearman rank-order correlation analysis on these hypotheses revealed the following results in Table 1:

Table 1: Correlation between lecturer competence and quality of university education

Lecturers' professional competencies	Indicators of the Quality of University Education					
	Retention and Completion		Employment Prospects		Earnings Prospects	
	Rho	P-Value	Rho	P-Value	Rho	P-Value
Knowledge Competence	0.106	0.095	0.195	0.002	0.185	0.003
Methods of Instruction	0.213	0.001	0.264	0.000	0.345	0.000
Career and Professional Support	0.295	0.000	0.524	0.000	0.397	0.000
Methods of Assessing Examinations	0.176	0.005	0.354	0.000	0.327	0.000

Source: Primary data. ***Correlation is significant at the 0.01 level (2-tailed)

Table 1 shows that the correlation between students' responses on lecturer knowledge competence and retention or completion of programme rho = 0.106 with a P-value of 0.095; employment expectations rho = 0.195 with a P-value of 0.002; their earning expectations rho = 0.185 with the P-value of 0.003. These results suggest a positive and statistically significant correlation at the 0.01 level of significance, but the figures are small, meaning that the lecturers' mastery of subject content may not be a very important factor in determining students' satisfaction with the quality of university education.

The correlation between students' responses on methods of instruction used by their lecturers and retention and completion of study programme rho = 0.213 with a P-value of 0.001; employment expectations rho = 0.264 with a P-value of 0.000; and earning expectations rho = 0.345 with a P-value of 0.000. These results suggest a strong, positive and statistically significant correlation both at the 0.01 and 0.05 levels of significance.

The correlation between career and professional support given by the lecturers to students and course completion or retention is rho = 0.255 with a P-value of 0.000; employment expectation is rho = 0.524 with a P-value of 0.000; and earning expectations is rho = 0.345 with a P-value of 0.000. These findings also suggest a strong positive correlation which is significant at the 0.01 level of significance.

Finally, the correlation between students' responses on the variable methods of assessing students' examinations and students' retention and course completion has rho=0.176 with a P-value of 0.005; employment prospects has rho=0.354 with a P-value of

0.000; and influence on earnings prospects has rho=0.327 with a P-value of 0.000. These results also suggest a strong, positive, and significant correlation both at the 0.01 and 0.05 levels of significance.

From the above findings, there is evidence to suggest that the given professional competencies of university lecturers are positively correlated with the quality of university education in terms of students' labour market outcomes. However, the findings also suggest that students believe that the methods university lecturers use to deliver their courses, the professional and career support that they give to students, and the methods that they use to assess students' examinations determine students' university outcomes and labour market expectations more than how much mastery of the content these lecturers have.

Findings from the students' responses were also confirmed during the interviews with one of the heads of departments, who noted:

> Lecturers should be specialized in the fields which they teach. They should use interactive methods and, where possible, field placements for practical learning. They should be fair in handling students and guide students on professional conduct. Lecturers should be professional while assessing students' tests, coursework and examinations. *(Head of Department, 16 November 2023)*

These findings suggest that lecturers' professional competencies will enable students to be confident at the university and also give them confidence about the world of work. The students also emphasized that those lecturers who gave them advice about work opportunities motivated them to stay in their programmes of study because they saw them as valuable in the field.

Multiple regression analysis to determine lecturer professional competencies that are more predictive of the quality of university education

Multiple regression analysis was conducted in SPSS to establish which professional competencies of lecturers were more important to determine students' expectations about the quality of university education. These professional competencies included mastery of subject content, methods of teaching, professional conduct, and career guidance to students, as well as methods of assessing coursework and examinations. The indicators for the quality of university education in this study included students' ability to complete their programs of study (retention) and students' labour market expectations in terms of employment prospects and earning prospects.

Table 2 contains a model summary and ANOVA results for the three dependent factors of the quality of university education, namely retention, employment prospects, and earning prospects.

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Table 2: Model summary and ANOVA results for the model

IV: Lecturer Professional Competencies	DV: Indicators of Quality of University Education			
	Retention	Employment Prospects	Earning Prospects	
R	0.325	0.544	0.455	
R-Square	0.106	0.2282	0.207	
Adjusted R-Square	0.088	0.282	0.191	
F-Statistic	5.777	20.473	12.721	
P-Value	0.000	0.000	0.000	

Source: Primary data

The SPSS model summary and the ANOVA results in Table 2 indicate that the value of R=0.325 for retention, R=0.544 for employment prospects, and 0.455 for earning prospects. These findings suggest that whereas lecturer professional competencies may be good predictors of students' employment expectations and earning expectations, they may not be a good predictor of their persistence in their programmes of study (retention). The R-square value indicates that the predictors of the variable '*lecturer professional competencies*' in the models explain 10.6% of the variability in retention, but 22.8% of employment prospects, and 20.7% of earnings prospects.

On the other hand, the F-ratios of the ANOVA results indicate that the overall regression models are a good fit for the data. In Table 2, $F_{(5,244)} = 5.777$ with a P-value = 0.000 for retention and programme completion; employment prospects have $F_{(5,243)} = 20.473$ with a P-value = 0.000; and earnings prospects have $F_{(5,244)} = 12.721$ a P-value = 0.000. These findings suggest that the independent factors for the variable lecturer competence statistically and significantly predict the dependent variables in the model.

However, the results in the coefficients table suggest that the variable professional conduct and guidance from lecturers is the better predictor of the quality of university education compared to the other variables in the models. Evidence of this is presented in Table 3 below.

Table 3: Coefficient results for the models

IV: Lecturer Competence	DV: Indicators of Quality of University Education								
	Retention			Employment Prospects			Earning Prospects		
	Beta	T	Sig.	Beta	T	Sig	Beta	T	Sig.
Knowledge Competence	-0.036	-0.534	0.596	0.020	0.337	0.737	0.023	-0.361	0.718
Methods Competence	0.118	1.542	0.124	-0.012	0.176	0.861	0.195	2.702	0.007
Professional Conduct	0.249	3.166	0.002	0.438	6.235	0.000	0.259	3.489	0.001
Assessment of Exams	-0.007	-0.924	0.924	0.125	1.891	0.060	0.131	1.881	0.061

Source: Primary data

When the standardized *'beta'* in Table 3 is evaluated, the findings indicate that methods competence with *beta=0.118* and professional conduct and guidance with *beta=0.249* indicate a better prediction of retention compared to knowledge competence and assessment of examinations. Only professional conduct and guidance with *beta=0.438* are significantly predictive of employment prospects, and methods competence with *beta=0.195* and professional conduct and guidance with *beta= 0.259* are better predictors of earning prospects. These findings mean that professional guidance given to students at university and the methods of teaching and assessment used by lecturers are more related to labour market expectations compared to mastery of content by the lecturers.

When the t-test values are analyzed, the findings in Table 3 suggest that only the dependent factor professional conduct and guidance is statistically and significantly different from 0 (zero) with t= 3.166 and p=0.002 for retention, t=6.235 and p=0.000 for employment prospects, and t=3.489 and p=0.001 for earning prospects. These findings are logical because whereas mastery of subject content by the lecturers, the methods that lecturers use to deliver their lectures, and the methods that lecturers use in the assessment of examinations are important factors in determining students' performance, they may not necessarily affect students' ability to complete their programmes of study and their labour market expectations. On the other hand, the professional conduct of the lecturers and how they professionally guide their students in a particular programme may encourage students to complete their programmes of study and may affect labour market expectations in terms of employment and earnings.

The heads of departments who were interviewed agreed that good and competent lecturers were those who planned for their lectures, knew the subject content of the courses that they taught, used appropriate methods of teaching, professionally guided their students, and used fair and objective methods of assessment. These qualities were considered by heads of departments to be important in keeping students interested in their courses of study and they instilled in students' confidence about their labour market expectations.

However, some of the interviewed heads of departments also indicated that there was no clear-cut link between some of the above factors and retention and labour market effects. For instance, one of the heads of departments argued:

> Lecturers mastering their subject content and using good methods to deliver their lectures may affect how students perform in examinations at university. Much as they are important factors in determining the competence of the lecturer, it may be hard to determine their effect on students' willingness to complete their programmes of study and what they expect in the world of work for employment and earnings. (*Head of Department, 20 November 2023*)

These observations suggest that lecturer competence is an important factor in university education. The findings also suggest that whereas in some courses teaching for employment and earnings may be a direct objective and the lecturer orients content and methods to that, other courses may not directly focus on employment. Such courses provide general knowledge that students should put together to get employment.

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The interviewed heads of academic departments also pointed out that poor staffing, increasing numbers of students, and inadequate funding of mainly public universities have affected the efficiency of lecturers. For instance, one head of department observed:

> In my department, the lecturer-to-student ratio is high, and therefore lecturers will rarely concentrate on the individual needs of the students, which certainly affects the quality of our graduates, who find it a challenge to get better-paying jobs. Underfunding of universities has also affected the morale of lecturers and made it hard for departments to procure teaching resources mainly for practical subjects. This certainly affects students' competence and affects their expectations in the world of work. (*Head of Department, 22 November 2023*)

Another head of department noted:

> Students like it when their lecturers know what they are teaching when they use good methods of teaching when they professionally guide students on career options. This keeps students committed to their programme of study, but students may also not be sure whether these aspects will benefit them when we join the world of work. (*Head of Department, 24 November 2023*)

As a way forward, most participants suggested that lecturers should plan their lessons, use appropriate methods to teach, organize practical activities for their students, and guide their students to careers that are relevant to their study programmes. They also suggested that universities should be allocated adequate funding to pay lecturers well and on time and to procure the needed teaching facilities. It was also emphasized that universities should address the matter of staffing as a top priority, and that if these are achieved then the quality of university education will be enhanced. On the whole, the findings suggest that the quality of lecturers in terms of their competency is significantly related to the quality of university education in Uganda.

Discussion of Results

Lecturers' mastery of subject content and the quality of university graduates

Lecturer knowledge competence is correlated to retention or completion of the programme with rho = 0.106 and a P-value of 0.095; to employment expectations with rho = 0.195 with a P-value of 0.002; and earning expectations with rho = 0.185 with a P-value of 0.003. These findings agree with the human capital theory in the sense that students' positive expectation of the labour market prospects results from lecturers' competence and individuals invest in education expecting to acquire attributes that will increase their productivity and secure them employment and higher lifetime earnings in the labour market (Bolliger & Halupa, 2012; Gillies, 2015). When students' validation of the lecturers' competence is positive, they feel satisfied that their investment in education will similarly give them competences to make them successful in the labour market. Therefore, university lecturers should cultivate those competences which help students to develop skills to benefit from the world of work. In literature, the findings also agree with Ní Ríordáin, Paolucci, and Lyons (2019) who, in a related study, found that competencies such as knowledge of the subject, clarity of presentation, interaction with students, teaching creativity, clarifying of learning outcomes, class activity, and lecture notes are positively and significantly related to students' satisfaction. In a related way, other studies

by Obwogi (2011) and Fazile and Hasana (2015) have suggested that subject knowledge, teaching skills, lecturer attendance and lecturer attitude have a significant and positive effect on students' academic achievement. Carrell and West (2008) contend that students consider the specialist competencies of lecturers in the disciplines they teach as essential in influencing students' labour market expectations in terms of employment and earnings. Therefore, mastery of content that is taught by lecturers is an important component of students' satisfaction with what they benefit from the university.

Lecturer methods of instruction and the quality of university graduates

The second predictor of lecturer competence considered in this study were the methods of instruction used by the lecturers and the quality of university graduates. The results revealed that retention and completion of the study programme had rho = 0.213 with a P-value of 0.001; employment expectations rho = 0.264 with a P-value of 0.000; and earning expectations rho = 0.345 with a P-value of 0.000. These results suggest a strong, positive and significant correlation between methods of instruction and the quality of university education signified by students' retention, employment expectations and earning expectations. The link between extra qualification and development is guided by the human capital theory which suggests that education leads to the acquisition of productive skills, knowledge and other attributes which are of economic value not only to individuals who get high life-time earnings, but also to nations which benefit in terms of growth in Gross Domestic Product (GDP) (Shultz, 1972; Becker, 1993; Gonzalez & Oyelere, 2011). This is in line with the contention by Doyle (2008) and Monk, Walberg and Wang (2001), who contend that a lecturer has to do several activities, such as planning classroom activity properly, providing effective instruction, and evaluating the learning using appropriate methods and techniques. Other studies (Azikuru, Ezati & Onen, 2016; Hijazi & Naqvi, 2006) have suggested that effective planning of the teaching function and utilisation of appropriate methods of teaching have a strong effect on students' outcomes in terms of learning, satisfaction and confidence in the world of work. These findings agree with suggestions by Gonzalez and Oyelere (2013), Mutula (2001) and Mwaria (2007) that lecturer-student interactive methods were the most effective teaching methods, followed by student-centred methods, while lecturer-centred approaches were the least effective methods in influencing university students' learning outcomes. In a related manner, Usmani and Dawani (2013) agree that interactive methods which involve students in practical exercises are more effective in improving the academic performance and retention rate of university students. With regard to labour market expectations, studies suggest that graduates are moderately satisfied with the quality of higher education that they received, but that many perceive that their job prospects would have been improved by better teaching methods, a more relevant curriculum, and by having better qualified professors (Bartlet, Uvalic & Durazzi, 2016; Hijazi & Naqvi, 2006). These findings, therefore, suggest that effective methods of teaching by university lecturers have a strong effect on university students' satisfaction and on students' labour market expectations.

Career and professional support and the quality of university graduates

This current study found that the effect of career and professional support given by the lecturers to students is stronger in influencing retention and students' labour market expectations than content knowledge and methods competencies. The correlation between

career and professional support given by the lecturers to students and course completion or retention rho = 0.255 with a P-value of 0.000; employment expectation rho = 0.524 with a P-value of 0.000; and earning expectations rho = 0.345 with a P-value of 0.000. The findings on professional support agree with studies that suggest that individual decisions to pursue higher education involve an informal analysis of the costs of education as measured against the expected value of the returns to that education (Chevalier & Dalton, 2004; Groot & Oosterbeek, 1994). Kjelland (2008) notes that the human capital theory is based on the idea that education endows individuals with productivity-enhancing human capital and that this productivity results in increased earnings in the labour market. These findings, which suggest a strong positive correlation that is significant at the 0.01 level of significance, concur with those of Bettinger and Long (2004) and Carrell and West (2008) that lecturers who professionally guide their students and objectively assess students' work are highly rated by students. Thune and Storen (2015) also suggest that students who are guided by their lecturers and have participated in either project-based interactions or practice periods have better labour market situations after graduation than their peers who have not. Other studies agree that the lecturer's professional and pedagogical competencies are important factors in determining university students' learning outcomes (Sirait, 2016; Joensen, 2009). This suggests that the lecturer is an important factor in determining students' achievements and also labour market prospects.

Lecturers' methods of assessment and the quality of university graduates

The correlation between the variable methods of assessing students' examinations and students' retention and course completion has rho=0.176 with a P-value of 0.005; employment prospects has rho=0.354 with a P-value of 0.000; and influence on earnings prospects has rho=0.327 with a P-value of 0.000. These results also suggest a strong, positive and significant correlation both at the 0.01 and 0.05 levels of significance. Other studies agree that the lecturers' methods of assessing students are important in determining university students' learning outcomes (Sirait, 2016; Joensen, 2009). These studies also contend that a student's decision to drop out or continue with education until a degree is acquired depends on the student's academic achievement and the labour market opportunities, and these factors are also influenced greatly by the quality of practical and theoretical assessment methods (Joensen, 2009). This suggests that a lecturer is an important factor in determining students' achievements and their labour market prospects.

From these findings, there is evidence to suggest that lecturer knowledge competence, methods of instruction, professional guidance and support given to students, and methods of assessment are important factors in influencing students' satisfaction to complete their programmes of study and labour market expectations in terms of employment and earnings.

Conclusions

Lecturers are an important input in determining the quality of university education. All the predictors of lecturer quality are positively and significantly correlated with the predictors of quality of university education. However, multiple regression analysis indicated that some professional competencies of lecturer quality, mainly professional

guidance of students and methods of assessment, are better predictors of retention, employment and earnings compared to mastery of subject content and teaching methods.

Recommendations

Both private and public universities in Uganda need to improve their human resources by recruiting more qualified lecturers and enhancing staff development programmes, which should improve on the mastery of content and teaching methods that cater to the labour market needs of the country. Increasing the number of staff with higher qualifications and better competencies will improve efficiency not only in teaching but also in research and supervision of graduate programmes which, in the long run, should improve the quality of university education.

Limitations of the Study

The principal subjects for this study were mainly university students of the graduating class who gave their opinions on how lecturer professional competencies were affecting their course completion and their labour market expectations. However, these informants only gave their opinions mainly of what they expected from the labour market. A tracer study of graduates of various courses where they were employed and what they earned would have been ideal but this was limited by both time and resource constraints.

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I don't trust you (anymore)! – The Effect of Students' LLM Use on Lecturer-Student Trust in Higher Education

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Abstract

Trust plays a pivotal role in lecturer-student collaboration, encompassing teaching and research aspects. The advent of Large Language Models (LLMs) in platforms like Open AI's ChatGPT, coupled with their cost-effectiveness and high-quality results, has led to their rapid adoption among university students. However, discerning genuine student input from LLM-generated output poses a challenge for lecturers. This dilemma jeopardizes the trust relationship between lecturers and students, potentially impacting university downstream activities, particularly collaborative research initiatives. Despite attempts to establish guidelines for student LLM use, a clear framework that is mutually beneficial for lecturers and students in higher education remains elusive. This study addresses the research question: How does the use of LLMs by students impact Informational and Procedural Justice, influencing Team Trust and Expected Team Performance? Methodically, we applied a quantitative construct-based survey, evaluated using techniques of Structural Equation Modelling (PLS-SEM) to examine potential relationships among these constructs. Our findings based on 23 valid respondents from Ndejje University indicate that lecturers are less concerned about the fairness of LLM use per se but are more focused on the transparency of student utilization, which significantly influences Team Trust positively. This research contributes to the global discourse on integrating and regulating LLMs and subsequent models in education. We propose that guidelines should support LLM use while enforcing transparency in lecturer-student collaboration to foster Team Trust and Performance. The study contributes valuable insights for shaping policies enabling ethical and transparent LLMs usage in education to ensure the effectiveness of collaborative learning environments.

Keywords: *Large Language Models; lecturer-student collaboration; Informational Justice; Team Trust; Structural Equation Modelling.*

Introduction

"Hello GPT! Goodbye home examination?" is the title of a recent publication that succinctly summarizes the dilemma faced by millions of teachers and lecturers worldwide (Farazouli et al., 2024). Trust in students' unique work erodes rapidly when there is this pervasive concern that it might be simply generated using artificial intelligence (AI), more precisely a Large Language Model (LLM). In the dynamic landscape of higher education, the relationship between lecturers and students plays a pivotal role in fostering collaborative learning environments and research. Resilient trust relationships between lecturer and student empowers both parties: The lecturer gains a motivated and educated assistant in his research undertakings, while the interaction and joint work not only motivate students to actively participate but also cultivates essential interpersonal and professional skills (Laal & Laal, 2012; Mendo-Lázaro et al., 2022; Yang, 2023). Trust serves as the bedrock for the success of this collaborative research endeavour (Lewicka & Bollampally, 2022).

However, recent trends of increasing use of LLMs among students in higher education have jeopardized this relationship. LLMs, exemplified by ChatGPT, Google Bard (Gemini), or Meta's LLaMA, have become integral tools for students, aiding in various tasks such as assignment development, essay writing, and coding (Gamage et al., 2023; Ward, 2023). Trained on tons of data, LLMs can write, read, do research and respond like humans (Dwivedi et al., 2023). While the benefits of LLMs are acknowledged, concerns regarding academic integrity, quality issues, and the potential misuse of generated content have arisen (Lo, 2023; Strzelecki, 2023; Sullivan et al., 2023). The ethical use of LLMs becomes crucial to avoid compromising the integrity of educational practices. In addition, they put the lecturer in a weaker position, where he no longer can be sure that – whatever students deliver to them – is their work and created with academic integrity.

While most of the current discussion on the entry of LLMs in higher education focuses on its ethical implications, fairness, and its impact on educational issues such as a tool for new didactic concepts, most of these works focus on individual settings, such as homework, essays, or individual learning. Few, if any, mention how LLMs' presence affects the bidirectional working and trust relationship in teams of students and lecturers – although it is well documented that trust in this relationship is a crucial element for performance in teaching and research.

This paper explores the impact of students' LLM use on the lecturer-student trust relationship in higher education. The rise of LLM use introduces a complex interplay between technological advancements, ethical considerations, and the traditional foundations of trust in education and research. Understanding this dynamic is essential for shaping guidelines and strategies that ensure the positive integration of LLMs in the learning and research process.

Related Work and Research Gap

Trust in Lecturer-Student Collaboration

Lecturer-student collaboration, also referred to as collaborative learning (Laal & Laal, 2012; Yang, 2023), is defined by Laal and Laal (2012) as an umbrella term encompassing various educational approaches involving joint intellectual efforts by students, either

independently or in conjunction with teachers. It serves as a crucial mechanism in academic research, as teams consisting of lecturers and students are common in the context of higher education, although lecturers will mainly play a guidance role. Research project-based teaching approaches that motivate students to actively engage in the learning and research process also foster the development of interpersonal skills (Mendo-Lázaro et al., 2022). Seminar papers and theses represent two manifestations of such teaching approaches, empowering students to decide what, when, and how to study, under the guidance of the lecturer, thereby collectively shaping the learning experience and outcomes. Abbas et al. (2020) argue that there is a direct relationship between teacher-student trust dynamics and collaborative research, as the latter relies heavily on the former.

For any relationship to thrive, trust must be paramount (Lewicka & Bollampally, 2022). Hence, in the context of lecturer-student collaboration, positive outcomes necessitate both parties being trustworthy and trusted. Bain (2004) found, based on research on college teachers, "[…] that 'highly effective teachers' cultivated relationships characterised by openness with and trust in students" (Woodland & Woodland, 2011, p. 5). Similar sentiments are echoed by Florén (2003). Carless (2009) emphasizes the negative impact of distrust on performance, especially in learning-oriented assessment practices such as seminar papers or theses.

Beyond the educational context, there is additional evidence highlighting the interconnectedness of Trust, Collaboration, and Team Performance. Teams, in general, encompass various roles (Schmutz et al., 2019), both in academia and industry (where most research on teams originate). In the academic context, the teacher who acts as a facilitator/guide works closely with a team of students or a team leader, typically chosen by fellow students. Similarly, in regular work teams, the unit manager collaborates closely with a team leader to ensure the accomplishment of assigned tasks. In both scenarios, trust forms the foundation, as teams cannot deliver the expected outcomes without it (Ji & Yan, 2020).

Rise of LLM-Use among Students in Higher Education

The usage of LLMs among students in higher education is continually increasing. LLMs have undergone a revolutionary advancement in conversational AI and swiftly established positions in academia (Strzelecki, 2023). In consideration of their distinctive user-friendly features, LLMs like ChatGPT have garnered much attention and sparked controversy among students and academics ever since their release (Gamage et al., 2023). Many scholars foresee them becoming as ubiquitous as or even more ubiquitous than other famous search engines (Hack, 2023). Students leverage LLMs for various tasks, including producing texts, developing assignments, supporting essay writing, providing responses to questions, coding, and other tasks (Gamage et al., 2023). Ward's (2023) survey of 1,000 U.S. college students revealed that nearly 90% used ChatGPT for assignments or essays, aligning with the experiences reported by many lecturers nowadays.

On the positive side, literature highlights several beneficial effects of LLMs in higher education. These include increased engagement in Massive Open Online Courses (MOOCs) (Li & Xing, 2021), enhanced remote learning and collaboration (Lewis, 2022), and the creation of interactive, gamified, more tailored, or personalized assessment and teaching methods (Cotton et al., 2023; Ilieva et al., 2023; Kloker et al., 2024; Sullivan et al., 2023). Conversely, a significant portion of the discussion revolves around concerns

regarding quality and academic integrity (Gamage et al., 2023; Strzelecki, 2023; Sullivan et al., 2023). Thereby, most authors agree that it is fair for students to use LLM-generated responses as a starting point for their solutions or as a guide to building up well-structured, grammatically correct, and complete answers – as long as they augment them with their own ideas, knowledge, and critically validate the content (Lo, 2023). Failure to incorporate this "human loop" can lead to various problems, which Lo (2023) summarized, among others, in these three categories based on a short literature review: (1) Quality issues, where LLMs may deliver results based on biased data or invent information and citations; (2) Integrity issues, where students may claim LLM-generated content as their own or use it to circumvent plagiarism detection by using LLMs to rephrase original pieces of work (e.g., Cotton et al., 2023); and (3) Educational issues, where testing and assessing (as well as developing) of higher-order critical thinking of students may require new formats (e.g., Hsiao et al., 2023).

The second issue, in particular, raises concerns among academics (Gamage et al., 2023; Lo, 2023; Sullivan et al., 2023). The willingness and readiness of students to adopt these technologies is evident from lecturers' experiences and literature (Abdaljaleel et al., 2024; Cotton et al., 2023; Hsiao et al., 2023; Ward, 2023). However, prohibiting LLMs using technical means is deemed impractical (Sullivan et al., 2023), as is detection in the long run (Gorichanaz, 2023). The challenge lies in the ambiguous distinction between fair and unfair LLM use (Perkins, 2023; Roe & Perkins, 2022) – which is true for both lecturers and students. However, they put lecturers in a weaker position as they might no longer be able to assess students' work properly, bearing the question in mind whether hand-ins are authentically students' solutions. Consequently, this negatively affects the trust relationship in lecturer-student collaboration.

Derivation of Research Question

The use of LLMs in the context of higher education is still confronted with ambiguous and contradicting views (Gamage et al., 2023). Worldwide, universities grapple with establishing consistent policies and guidelines, ranging from embracing to outright banning of this technology. Students, too, perceive this ambiguity and fear that their use of LLMs might adversely affect the lecturer-student collaboration and relationship (Ofosu-Ampong et al., 2023; Singh et al., 2023). The rise of LLM use by students and its inherent ambiguity create a research gap, whether this new collaboration setting also affects team trust. While previous research primarily focused on the aspect of fairness (or cheating, respectively), the current study aims to investigate the overall impact, both positive and negative, on expected performance beyond "single-authored" essays.

In our study, we employ *Team Trust* as a central construct in lecturer-student collaboration, given its well-documented positive impact on *Team Performance*, as evidenced by a meta-analysis of 112 studies conducted by De Jong et al. (2016). It is plausible to suggest that *(Perceived) LLM Usage* by students may erode this *Team Trust*. In 2023, several studies that suggest this relationship have been published. For instance, Joshi et al. (2023) conducted interviews among lecturers (instructors) and students, revealing that especially instructors are worried regarding their ability to assess students' work any longer, as they cannot distinguish between LLMs output and actual student work.

Similar concerns are echoed, among others, by Perkins (2023). Concurrently, lecturers are aware that students perceive low risk in terms of detection for academic misconduct or plagiarism (Abdaljaleel et al., 2024; Gorichanaz, 2023). This causes anxiety among the lecturers and leads to accusations, whether valid or not (Gorichanaz, 2023) – thereby straining the trust relationship in lecturer-student collaboration (Grassini, 2023). Grassini (2023) already suggests that these concerns and a reduced ability to assess students' work fairly may undermine the effectiveness of the educational process.

Aligned with Costa and Anderson (2011), we argue that *Team Trust* is a multifaceted formative construct[1], implying that the relationship between *(Perceived) LLM Usage* might affect the individual reflective sub-constructs of *Team Trust* differently. Building on the work of Breuer et al. (2020), we identify perceived justice as an antecedent for *Team Trust*. We suppose that there might be a mediating effect of *Informational Justice* on *Perceived Trustworthiness*, as well as on *Cooperative Behaviour* (both reflective sub-constructs of *Team Trust*), whereby their effect on trust in the context of teams is already demonstrated by Kernan and Hanges (2002) and Palanski et al. (2011) (although on *Trust in Management* and overall *Team Trust*, respectively). We argue that this is an important mediation, reflecting the frequently reported information asymmetry regarding the origin of students' work outcomes when LLM use is assumed.

As another mediating path, we argue that *Procedural Justice* impacts both *Cooperative Behaviour* and *Monitoring Behaviour*, reflecting the existing ambiguity surrounding whether students' use of LLMs is a valid method or a violation of academic practices. In the absence of clear guidelines on fair LLM Usage in many universities, lecturers become the arbiters of this question. The effect of *Procedural Justice* on *Team Trust* is suggested by Colquitt (2004) and Dayan and Di Benedetto (2010). We also propose a mediating effect, though we recognize a valid justification for considering it as a moderating effect on the relationship between *(Perceived) LLM Usage* and *Team Trust*.

Exploring these relationships is of great importance in providing guidelines for future lecturer-student collaboration in environments where LLMs are not banned. We put the following explorative research questions: *How does the use of LLMs by students impact Team Trust and subsequently Expected Team Performance? (RQ1) What is the role of Informational Justice and Procedural Justice in this relationship? (RQ2)* We aim to shed light on these relationships and propose a research model and potential extensions for statistical and structural validation in a future study.

Methodology and Implementation

To identify potentially relevant relationships among the proposed constructs in Section 2.3, we conducted an online questionnaire. The survey comprised four sections: (1) An introduction that briefly explained the importance of the research to participants and requested thoughtful and truthful commitment. (2) The second part inquired about the main constructs in three blocks, with 10 questions per block and intra-block randomization of items. Two manipulation checks were included in these blocks. (3) The third part gathered demographics and additional control variables. (4) The final section concluded

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1   Reflective sub-constructs are: Prospensity to Trust, Perceived Trustworthiness, Collaborative Behaviour, Monitoring Behaviour (Costa & Anderson, 2011)

the survey with a short debriefing. Table 2 in the Appendix displays the final items in the online questionnaire.

The questionnaire items were measured using a 5-point Likert scale from "Strongly disagree" to "Strongly agree". This was the original scale for the constructs of *Informational Justice* and *Procedural Justice* (Colquitt, 2004; Dayan & Di Benedetto, 2010; Kernan & Hanges, 2002; Palanski et al., 2011). The formative construct of *Team Trust* from Costa and Anderson (2011), originally based on a 7-point Likert scale with similar labels, was easily adapted to the 5-point scale. Employing the same scale for all constructs allowed us to present all items within three clear blocks with intra-block randomization and two manipulation checks. The overall survey comprised 38 questions, an introduction, and a short debriefing.

The survey was implemented using the questionpro.com software and distributed among approximately 200 university lecturers at Ndejje University (Uganda) via WhatsApp between January 10th and January 14th, 2024. Participation was voluntary, and no incentives were offered, although we emphasized the supportive and positive impact of participants' answers on our research during the invitation.

A total of 32 responses were collected (see Section 5 for a discussion of the low return rate). The survey included two manipulation checks and we only considered responses that successfully passed the second check[2], resulting in 23 remaining respondents, including nine females. The average completion time among the included responses was 13 minutes and 55 seconds. The median age of participants fell within the range of 35 – 44 years, with more than 95% of participants aged between 25 and 54 years. Eighty-seven per cent had already supervised students; however, half of them had less than 41 students. This also reflects the fact that almost 70% of respondents would assess their research experience as rather low or medium. Seventy-four per cent of respondents reported having used LLMs at least once. Only 30% reported having had negative experiences with students' LLM use so far, and almost all of them more than once. Forty per cent of respondents teach in ICT, 13% in Social Sciences, with others scattered among various fields.

Results

As part of the analysis of the exploratory research objective, we employed PLS-SEM for data analysis. We only retained constructs with Cronbach's alpha (Cron. α) values that exceeded the threshold of 0.6. After tuning Cron. α by excluding items IJ1, PJ1, PW3, and TP1, we omitted *Propensity to Trust* (Cron. α = .56), *Collaborative Behaviour* (Cron. α = .24), and *Monitoring Behaviour* (Cron. α = .21).

For the remaining analysis, we followed the two-stage approach outlined by Hair et al. (2021). First, we assessed internal consistency reliability, convergent validity, and discriminant validity. For all retained constructs, both Cronbach's α and composite reliability (CR) exceeded the threshold values of 0.6 and 0.7, respectively. Subsequently, we evaluated convergent validity by examining each item's outer loading and the average variance extracted (AVE) for each construct. Most of the outer loadings exceed the threshold of 0.7. For the others, we still opted not to remove them, as, according to Hair et

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2   Respondents feedbacked, that the first manipulation check seemed to confuse participants - and was therefore excluded.

al. (2021), items with an outer loading between 0.4 and 0.7 should only be eliminated when AVE or measures of internal consistency and reliability move above the cut-off value, which we verified to not be the case. AVE for all constructs was above the cut-off value of 0.5, except for *Informational Justice* (IJ, .497) and *Perceived Trustworthiness* (PW, .472), which only slightly fell below the threshold. To assess discriminant validity, we employed three checks: consideration of cross-loadings, the Fornell-Larcker criterion, and the Heterotrait-Monotrait Ratio (HTMT). All three approaches provided supporting evidence of the discriminant validity of the constructs.

Table 1 presents the construct reliability for the reflective constructs in the survey, after adjusting Cron. α by dropping items IJ1, PJ1, PW3, and TP1.

Table 1: Reliability Measures of the Included Constructs (Cronbach's Alpha)

Construct	Mean	SD	Cron. α	CR	AVE	HTMT*
(Perceived) LLM Usage (LU)	3.03	1.22	0.83	0.97	0.55	No
Informational Justice (IJ)	3.20	0.95	0.75	0.80	0.50	No
Procedural Justice (PJ)	2.63	1.07	0.62	0.82	0.54	No
Perceived Trustworthiness (PW)	3.32	0.93	0.68	0.82	0.47	No
Team Performance (TP)	3.07	1.04	0.72	0.82	0.61	No

*Indicates whether HTMT CI includes 1.

Secondly, we checked for collinearity issues among predicting constructs and found that all VIF values are well below the threshold of 5, indicating the absence of collinearity issues[3] in our structural model.

To explore potential relationships in the data, we correlated the remaining constructs in Figure 1:
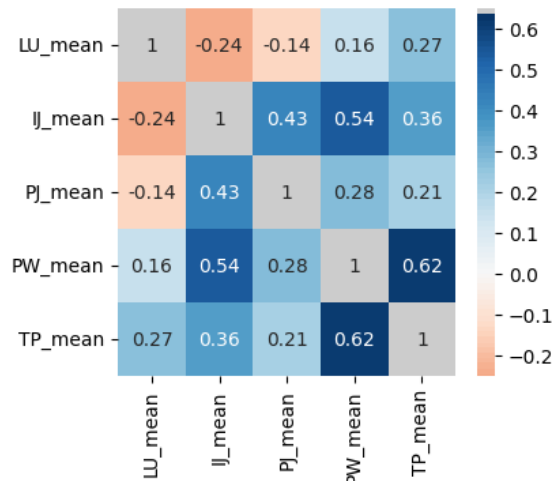

Figure 1: Correlation Matrix

(Perceived) LLM Usage (LU) is weakly negatively correlated with IJ and *Procedural Justice* (PJ), aligning our expectations based on literature. IJ and PJ exhibit positive correlations with

PT and *Team Performance (TP)*; also, in line with our hypotheses. LU is weakly positively correlated with PT, suggesting that the effect may be either mediated or moderated by IJ and PJ. Interestingly, LU is positively correlated with TP implying that, although the lecturer's perception of Team Trust is reduced, it does not negatively affect their expected team results.

In addition, the control variable "How often do you use Large Language Models, such as ChatGPT?" (C3) has a big influence (+.55, R2=0.31) on LU. Previous negative experiences with students' LLM use (C5) also demonstrate strong predictive power on LU (-.52, R2=.28 – note that it was not measured on a metric scale). The control variable assessing whether lecturers perceive LLMs as a fair tool in general (C8) has a substantial effect on IJ (note that it was measured as a binary). Consequently, we model it as a potential moderator for LU→IJ and LUPJ. The resulting SEM is illustrated in Figure 2.
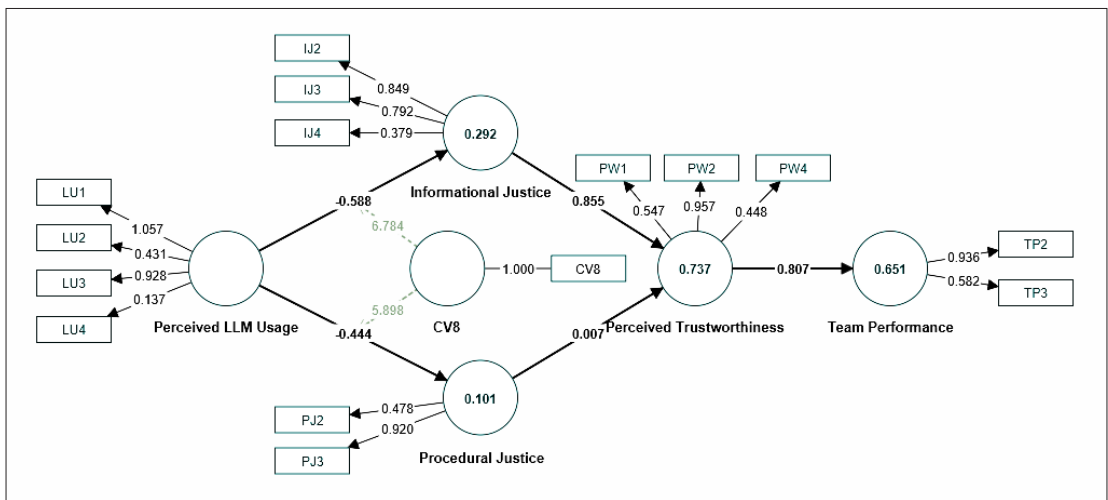
Figure 2: Suggested Structural Equation Model

Owing to the limited sample size, we refrain from conducting a significance analysis using bootstrapping. We also try to avoid overinterpreting the model, and merely highlight the most interesting tendencies for follow-up verification.

Firstly, when the moderating variable C8 is omitted, both path coefficients LU→IJ and LU→PJ are very low (below 0.1), as well as the corresponding R^2 values (below 0.1). Only after adding the moderator variable, path coefficients and R^2 values for IJ and PJ increase to relevant levels, although PJ's R^2 still remains low. Secondly, the path coefficient between IJ and PW is strong and already significant despite the small sample size, while the path coefficient between PJ and PW remains almost zero. Thirdly, the relationship between PW and TP aligns with expectations from the literature.

Discussion

As a first finding, LU tends to have a positive effect on *Expected Team Performance* (TP), suggesting – despite all the discussion regarding appropriate and fair use – positive expectations regarding students who use LLMs being able to produce better overall results (RQ1). This finding is in line with the arguments presented in several papers (e.g.,

Gamage et al., 2023; Gimpel et al., 2023; Roe & Perkins, 2022). However, there seems to be no quantitative evidence yet of this increased Team Performance for lecturer-student collaboration employing LLMs, such as seminar papers or theses, beyond "self-studies". Although our study suggests the same effect, it is crucial for future studies to evaluate this performance increase not in isolation but in conjunction with its (positive or negative) effects on expected teaching success (Gamage et al., 2023). To answer RQ1, it can be stated that the effect of LU on TP is positive.

As a second finding, based on the evaluation, the data suggests that *Perceived LLM Usage* (LU) by students is actually accepted by lecturers. This acceptance is evident not only in the control variable C8, where 87% of respondents answered that they perceive LLMs as fair tools in the context of higher education, but also in the Structural Equation Model (SEM), where the effect of *Procedural Justice* (PJ) to *Perceived Trustworthiness* (PW) is almost zero, and only the path LU→*Informational Justice* (IJ)→PW shows relevant effects. This suggests that the more crucial issue is that students make their use of LLMs transparent to the lecturer, particularly in cases where lecturers have doubts regarding the fairness of using LLMs. The high path coefficients argue towards the interpretation that this transparency moderates the relationship between LU and IJ. This finding aligns with suggestions by Gimpel et al. (2023) or Lo (2023), providing a great deal of evidence where lecturers acknowledge the positive usage scenarios of ChatGPT as long as transparency is ensured. To answer RQ2, it can be stated that PJ seems not to be relevant, while IJ influences the TP positively; however, LU has currently influenced IJ negatively. In other words, lecturers assume that students use LLMs secretly, although they would not have a problem with it if it was used transparently. They even expect better Team Performance if students would be open about their use.

As a third finding, we note that although the effect between PW and PT is as expected, it is essential to highlight that the applied *Team Trust* measure by Costa and Anderson (2011) performed poorly in our context. This might be due to several reasons, which need consideration in a follow-up assessment. *Team Trust* in the context of Costa and Anderson (2011) is a bidirectional construct, meaning that several items ask for two-sided trust relationships (e.g., PW1, PW2, CB1, CB3). Our study assessed only a unidirectional trust relationship from lecturers towards students. Future studies should reconsider the measure for trust or adapt the framing to yield better results. Overall, many of the measures for validity and reliability suggest that several items need to be revised, as some of them showed ceiling effects, such as those from *Monitoring Behaviour* and *Collaborative Behaviour*, which is likely the reason for their poor performance in reliability measures (Gaudet et al., 2021). It is also worth noting that although the effect between LU→IJ and LU→PJ was relevant, the R^2 for these constructs remained low, indicating that we missed out on relevant factors in these relationships. Future research should put emphasis here to further deconstruct the underlying principles and processes. RQ2 could, therefore, not be finally answered. However, we suggest a positive, by IJ-moderated relationship LU→PT.

One limitation of our study is that we omitted to include a theoretically unrelated construct to check for the Common Method Variance (CMV) (Podsakoff et al., 2003). As we did not offer incentives to our participants, keeping the survey short was regarded as the higher priority. Instead, we included the construct *Propensity to Trust*, which, as a

personality trait, is not theoretically related to the hypotheses in the left part of the model and can, therefore, be used as a provisional marker variable to estimate the effect of CMV. However, the construct turned out to be unreliable in our survey, for which reason we could not test for CMV. In future studies, we suggest the inclusion of the measure of *Life Satisfaction* by Diener et al. (1985), as suggested by Simmering et al. (2015) for this reason.

Another limitation is that we did not reach the necessary sample size to test for effect significance. We conducted a power analysis according to Cohen (1988), anticipating a large effect size and accepting a probability level of 0.1 (power level of 0.8) upfront. The sample size needed to detect effects was 40, and 116 to confirm the model structure. Therefore, we aimed for 200 contacts, expecting at least a 30% response rate, ideally 50%. However, this assumption proved incorrect. We subsequently asked individuals thereafter about their reasons for participating or not. The most common negative responses were: (1) Impersonal approach ("Not willing to spend time or effort for somebody I don't know."); (2) low interdependence among lecturers ("Not willing to spend time or effort, as I don't expect to need similar assistance in future."); and unfamiliarity with surveys ("I didn't know what to do"). Future research should involve more universities to increase the reach and sample size. Also, incentives might be considered. Several self-identified non-respondents later indicated that an introduction of the survey within an online meeting, allowing for immediate question clarification, would have been helpful.

A third limitation is that, for now, we only considered the context of Uganda, while the context of the literature we based our hypotheses on was in other geographical areas. However, trust and overall attitude towards technology are strongly dependent on culture and individual settings (Abdaljaleel et al., 2024; Dinev et al., 2006; Kloker et al., 2020; Peukert & Kloker, 2020). For this reason, it might be necessary to contextualize the theory and findings within this new context and validate some of the assumptions within a Ugandan setting once again.

Conclusion

In conclusion, this study delves into the intricate relationship between students' utilization of Large Language Models (LLMs) and the trust dynamics within lecturer-student collaboration in higher education. The escalating adoption of LLMs, like ChatGPT, introduces a paradigm shift, both creating opportunities and posing challenges for the educational landscape.

Our findings shed light on several critical aspects. Firstly, the acceptance of LLM Usage by lecturers suggests a nuanced perspective that recognizes the potential benefits as long as transparency is maintained. The importance of students making their use of LLMs transparent emerges as a pivotal factor moderating the relationship between LLM Usage and perceived Informational Justice. This nuanced perspective aligns with the acknowledgment of positive usage scenarios of LLMs, contingent upon transparent practices (Gimpel et al., 2023; Lo, 2023). This finding recommends that universities should rather encourage students to make their use of LLMs transparent instead of banning the technology or ignoring it.

Secondly, despite the ongoing discourse regarding the appropriate and fair use of LLMs, our study indicates a positive association between LLM Usage and expected Team

Performance. This suggests an optimistic outlook among lecturers, anticipating enhanced overall results when students employ LLMs. This finding resonates with previous arguments about the potential benefits of LLMs in educational settings (Gamage et al., 2023; Roe & Perkins, 2022). However, it calls for a nuanced evaluation of performance increases in the context of lecturer-student collaboration, especially in tasks such as seminar papers or theses, to be verified. This finding recommends that universities can even expect better overall results, when they allow and teach proper use of LLMs by students.

Thirdly, our exploration of the relationship between Perceived Trustworthiness, Procedural Justice, and Team Performance reveals problems in the construct of Team Trust in the current setting. The Team Trust measure utilized in our study, adapted from Costa and Anderson (2011), showed limitations, indicating the need for future refinement. The interplay between LLM usage, perceived Informational Justice, and Procedural Justice highlights the multifaceted nature of trust within collaborative learning environments. This finding suggests that as AI is entering the field of teamwork, theories might need to be adapted, maybe even from bidirectional to tridirectional relationships.

In light of these findings, the contribution of this study lies in its comprehensive examination of the intricate interplay between LLM Usage and lecturer-student trust dynamics. Although it needs to be regarded as preliminary first results and followed up with more statistical power, the identified nuances provide a foundation for future research and the development of guidelines for effective lecturer-student collaboration in the era of evolving technological, AI-powered tools. As universities worldwide grapple with integrating LLMs into educational practices, our study contributes valuable insights for shaping policies that foster ethical and transparent use, ensuring the continued trust and effectiveness of collaborative learning environments.

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Appendix

Table 2: Questionnaire Items

Construct	Items	Scale	Adapted from
(Perceived) LLM Usage	LU1: I guess students use Large Language Models, such as ChatGPT, on a regular basis. LU2: Large Language Models, such as ChatGPT, are not very common among students to work on assigned tasks. (R) LU3: The use of Large Language Models, such as ChatGPT, among students is increasing rapidly, also within the context of their studies. LU4: Students increasingly tend to use Large Language Models, such as ChatGPT, for their studies and research.	5-point Likert scale Strongly disagree Rather disagree Neutral Rather agree Strongly agree	Own scale
Informational Justice	IJ1: In my Lecturer-Student Collaboration, we provide each other with enough details for us to do our tasks. IJ2: The information the student provides me about his work is sufficient and fair. IJ3: In my Lecturer-Student Collaboration, we can trust the information that we share. IJ4: In my Lecturer-Student Collaboration, students intentionally hide details on how they come up with solutions. (R)	Same as above	(Kernan & Hanges, 2002; Palanski et al., 2011)
Procedural Justice	PJ1: In my Lecturer-Student Collaboration, the methods students apply to come up with their solutions are fair. PJ2: Students use unfair methods to come up with their solution. (R) PJ3: In my Lecturer-Student Collaboration, I cannot trust the way a student came up with a solution. (R)	Same as above	(Colquitt, 2004; Dayan & Di Benedetto, 2010)
Propensity to Trust	PT1: Most students do not hesitate to help a person in need. PT 2: The typical student is sincerely concerned about the problems of others. PT3: Students usually tell the truth, even when they know they will be better off by lying.	Same as above	(Costa & Anderson, 2011)

Perceived Trustworthiness	PW1: In my Lecturer-Student Collaboration, we can rely on each other. PW2: I have complete confidence in students' ability to perform tasks. PW3: In my Lecturer-Student Collaboration, students may have hidden agendas. (R) PW4: In my Lecturer-Student Collaboration, I guess students will keep their word.	Same as above	(Costa & Anderson, 2011)
Cooperative Behaviour	CB1: With students, I work in a climate of cooperation. CB2: In my Lecturer-Student Collaboration, some students hold back relevant information in our collaboration. (R) CB3: In my Lecturer-Student Collaboration, we discuss and deal with issues or problems openly. CB4: In my Lecturer-Student Collaboration, students minimize what they tell about themselves. (R)	Same as above	(Costa & Anderson, 2011)
Monitoring Behaviour (R)	MB1: In my Lecturer-Student Collaboration, I need to watch students' work and methods very closely. MB2: In my Lecturer-Student Collaboration, I check whether students keep their promises. MB3: In my Lecturer-Student Collaboration, I should keep their work under surveillance.	Same as above	(Costa & Anderson, 2011)
Expected Team Performance	TP1: In my Lecturer-Student Collaboration, students put considerable effort into their jobs. TP2: In my Lecturer-Student Collaboration, students are committed to producing quality work. TP3: In my Lecturer-Student Collaboration, students meet or exceed their productivity requirements.	5-point Likert scale (The original scale was a 19-point scale. We adapted for randomization purposes.)	(Alper et al., 1998)
Manipulation Checks	MC1: When I read this question carefully, I select "neutral". MC2: In case I answer all questions truthfully, I select "strongly agree".	See above	

Demographics and Controls	C1: What is your age?	18–24, 25–34, 35–44, […], 75 years and older	
	C2: What is your gender?	Male, Female (question was not mandatory)	
	C3: How often do you use Large Language Models, such as ChatGPT?	Never, Barely, From time to time, Often, Daily	
	C4: How many students have you supervised so far in Final Year Projects, or similar settings?	0, 1–20, 21–40, 41–60, 61–80, more than 81	
	C5: Have you made bad experiences with students using Large Language Models, such as ChatGPT, so far?	Yes, more than once Yes, once Never	
	C6: How would you assess your experience in research?	5-point Likert scale from Very Low to Very High (+ descriptions)	
	C7: Which field describes your professional expertise best?	ICT, Social Sciences, …	
	C8: Do you think Large Language Models, such as ChatGPT, are a fair tool in Higher Education?	Yes, No	

Physical Infrastructure Management and Curriculum Implementation in Public Universities in Northern Uganda

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Abstract

This study aimed to assess the level of curriculum implementation, evaluate the level of physical infrastructure management, and investigate the influence of physical infrastructure management in the areas of lecture room facilities, technology facilities and safety devices on curriculum implementation in public universities in Northern Uganda. The study employed a positivist approach. The sample consisted of 123 academic staff selected using a simple random sampling technique. Data was collected using a self-administered questionnaire and analysed using frequencies, percentages and means at the descriptive level, correlations at the bivariate level, and multiple linear regression at the multivariate level. The results showed that the level of curriculum implementation was low and the level of physical infrastructure management was moderate. Also, lecture room facilities had a significant positive influence on curriculum implementation. However, technology facilities and safety devices had a positive but insignificant influence on curriculum implementation. Therefore, it was concluded that physical infrastructure management, concentrating on lecture room facilities, technology equipment and safety devices, is vital for curriculum implementation in public universities. Thus, this study recommended that the government and public universities should make deliberate efforts to provide sufficient lecture room facilities, modern technology equipment and sufficient safety devices to further improve curriculum implementation, especially in activities such as preparation for teaching, content delivery and assessment of learning in the public universities.

Keywords: *Physical infrastructure management; curriculum implementation; Northern Uganda; Public universities*

Introduction

The concept of "curriculum implementation" entails putting into practice the officially prescribed courses of study, syllabuses and subjects with a focus on the preparation for teaching, content delivery and assessment of students' learning (Chaudhary, 2015). Globally, curriculum implementation in public universities dates back to the Italian University of Bologna in 1088, and the curriculum included degrees in grammar, rhetoric, logic, theology, canon law and notarial law, both secular and non-secular (Ruegg, 2021). Since then, a number of public universities have been established worldwide, but several stakeholders in countries like the USA, Europe and Asia have been concerned about the quality of the curriculum implemented in these universities. This has been exacerbated by the belief that academic staff's level of preparation for lectures is still low, there is less learner involvement during content delivery, and academic staff use limited approaches to assessment of learners (Anyiendah, 2017). In sub-Saharan Africa, universities often faced shortages of resources, including books, technology equipment and adequate lecture room facilities, which hindered effective teaching and assessment. In many of these universities, the academic staff members do not prepare well for lectures, students are not involved in the delivery of content and the academic staff employ old methods of assessment, which have contributed to increased concerns about curriculum implementation in public universities (Ajayi & Ayodele, 2015; Chaudhary, 2015). According to Moyahabo et al. (2018), tutors' pathetic preparation for teaching, heavy usage of traditional rote teaching-learning approaches and weak assessments of learning have been the main problems in public universities worldwide. A number of stakeholders have expressed concern about curriculum implementation in several public universities in countries like Nigeria, Senegal and Ghana. The recurrent infidelities in public universities related to learner assessments, content delivery and teaching preparation have validated these concerns (Kanake et al., 2015; Kweku, 2021).

In Uganda, numerous public universities have been established, and these universities have worked tirelessly towards improving the implementation of their curricula (Azikuru, Onen, & Ezati, 2017). However, the problems associated with curriculum implementation in public universities have continued to increase over the years. For example, Muganga et al. (2019) reported that over 60% of students in public universities in Uganda are not active participants in the classroom. Taye et al. (2019) reported that several students in public universities could not grasp the lessons sufficiently as some academic staff rushed to cover the content of the courses, leading to learners' memorising of content to simply pass examinations (Niyivuga et al., 2019). According to Govender (2018), to ensure that the curriculum is effectively implemented, infrastructure such as classrooms, laboratories and libraries must be provided in adequate quantities. Similarly, Alemiga and Kibukamusoke (2019) contend that for universities to successfully implement a curriculum, there is an urgent need for sufficient classrooms to alleviate the overcrowding of learners. Physical infrastructure management plays an essential part in ensuring effective implementation of a curriculum in the areas of preparation for teaching, content delivery and assessment of learning in public universities. Many universities in Uganda, including those in Northern Uganda, lack lecture rooms and facilities like chairs, tables and notice boards. There is inadequate technology equipment such as computers, projectors and safety devices.

Also, technology equipment and internet penetration are relatively low (Ajuaba et al., 2022). Therefore, it is vital to assess the levels of curriculum implementation, evaluate the level of physical infrastructure management, and investigate the influence of physical infrastructure management on curriculum implementation in public universities in Northern Uganda. However, a literature search revealed a dearth of studies showing how physical infrastructure management influences curriculum implementation in public universities. The study tested the following hypotheses that:

H_1 Lecture room facilities management has a statistically positive significant influence on curriculum implementation.

H_2 Technology equipment management has a statistically positive significant influence on curriculum implementation.

H_3 Safety devices management has a statistically positive significant influence on curriculum implementation.

Literature Review

This section presents the theory that underpinned this study and the literature review that related physical infrastructure management aspects of lecture room facilities, technology equipment and safety devices to curriculum implementation, showing gaps that emerged from the study.

Theoretical Review

This study was guided by Von Bertalanffy's systems theory, which was developed in the 1920s (Tabor, 2021). Systems theory posits that a system focuses on the arrangement of and relations between the parts and how they work together as a whole. The way the parts are organised and how they interact with each other determines the properties of that system. Ueland et al. (2021) further reveal that in systems theory, the ultimate unit of analysis is that parts of a system must be related and designed to work as a whole entity, and it consists of six components: individual, microsystem, mesosystems, exosystem, macrosystem and the chronosystem. The six components of systems theory were used as a lens to guide the study, namely: (1) individual: recognising the unique needs, abilities and learning styles of each student are crucial. Tailoring the curriculum to accommodate diverse learners ensures that each student can achieve their full potential. (2) Microsystem: The immediate learning environment, including the classroom, family and peer groups, directly impacts student engagement and success. Effective curriculum implementation considers these primary contexts. (3) Mesosystems: Interactions between different microsystems, such as the relationship between home and school, can significantly affect curriculum implementation. Coordinated efforts between these systems can support a cohesive learning experience. (4) Exosystem: External factors, such as policies and resources, indirectly influence the curriculum and its implementation. Understanding these factors can help educators navigate and leverage them to support student learning. (5) Macrosystem: The broader cultural, societal and economic context shapes educational values, expectations and resources. A curriculum aligned with these wider contexts can promote relevance and inclusivity. (6) Chronosystem: Changes over time, including

technological advancements, shifting societal norms and educational reforms, influence curriculum implementation.

Furthermore, this theory is relevant for physical infrastructure management for a number of reasons: (1) it encourages a holistic view of infrastructure management, considering how different components interact and affect the overall system. (2) Infrastructure systems are interconnected, and it enables managers to understand that changes in one component can affect others. (3) It emphasises the need for scalable and flexible solutions to adapt to changing needs and technologies. Infrastructure planning should allow for future expansion and technological upgrades, ensuring long-term sustainability and adaptability. (4) It enables managers to understand that effective infrastructure management requires input from multiple stakeholders, including government agencies, private sector partners and the community. Hence, engaging stakeholders in the implementation phases ensures that diverse needs are met and fosters collaboration and support. (5) Systems theory promotes sustainable practices by considering the long-term impacts of infrastructure projects on the environment and society. (6) Systems theory views infrastructure as dynamic and adaptive, capable of evolving with changing conditions and demands.

Although systems theory is a broad theory that does not particularly address how physical infrastructure is managed and how it affects the way curriculum is implemented, it does highlight the need to consider the university as a whole. This study, which was informed by systems theory, looked at university infrastructure management as part of a system for enhancing the way science courses are implemented. Therefore, based on systems theory, this study investigated physical infrastructure management as a component of a system and how it is used for improving curriculum implementation in public universities in Northern Uganda.

Physical infrastructure management and curriculum implementation

Physical infrastructure management involves the oversight, maintenance and optimisation of physical assets such as lecture room facilities, technology equipment, safety devices and other essential facilities that support the functioning of communities and Organisations. It ensures that these assets are safe, functional and efficient throughout their lifecycle (Ajibola et al., 2017). Different scholars (Almaiah et al., 2020; Eze et al., 2018; Jegede et al., 2021; Mugizi, 2021; Mwirichia & Barchok, 2017; Nassirpour et al., 2018; Rumanyika & Galan, 2015; Siddique et al., 2019) have studied physical infrastructure in universities. These studies shed light on assets like lecture room facilities, technology equipment and safety devices in relation to curriculum implementation. However, empirical and contextual gaps emerge from the studies above. For example, regarding lecture room facilities, Eze et al. (2018) found that most Nigerian universities lacked adequate lecture room facilities, making curriculum implementation cumbersome. Siddique et al. (2019) found that most public universities in Pakistan had inadequate facilities like desks, chairs, tables or lockers. Nassirpour et al. (2018) also found that inadequate physical infrastructure negatively impacted curriculum implementation in public universities. Ajibola et al. (2017) found that modern classroom materials and equipment are essential for effective curriculum implementation. However, these studies did not focus on lecture room facilities in public universities in Northern Uganda, which is the focus of this study.

With respect to technology equipment, this is a vital component in university curriculum implementation, enabling academic staff to deliver effective content (Ibrahim et al., 2020). Also, Almaiah et al. (2020) found in their study that technology equipment, such as projectors, computers, tablets and internet servers, significantly influences curriculum implementation. Jegede et al. (2021) emphasise the importance of technology and equipment for effective content delivery and supervision in the university system. Karakus (2021) also emphasises the need for sufficient and aesthetically pleasing technology equipment for universities to operate well. Rumanyika and Galan (2015) found that a lack of equipment hinders effective content delivery among academic staff in Tanzanian universities. Mwirichia and Barchok (2017) found that Kenyan universities were poorly equipped, negatively influencing content delivery. At the contextual level, except for the study by Mugizi (2021) done on university physical infrastructure in Uganda, all the other studies on physical infrastructure in universities were done outside Uganda. This study aims to explore the influence of technology equipment on curriculum implementation in public universities in Northern Uganda, hence the need for further research.

As regards safety devices, which are tools such as first aid kits, handwashing cans, sanitisers, gloves and laboratory goggles, among others, designed to protect academic staff and students from harm and prevent accidents or injuries in curriculum implementation, there are scholars (Williamson, 2018; Shirokova et al., 2017) who have studied safety devices and curriculum implementation. These studies were consistent in finding that safety devices have a positive and significant effect on curriculum implementation. Also highlighted was the need for sufficient safety devices in universities, including fire extinguishers, first aid kits, laboratory goggles and handwashing devices. Oketch (2016) notes that despite progress made by public universities in sub-Saharan Africa, most universities still have inadequate safety devices, which affects curriculum implementation. Ajuaba et al. (2022) and Kasule (2015) reported poor educational facilities, dilapidated equipment, poorly designed lecture rooms, inappropriate lighting, insufficient safety measures in fire emergencies, and a lack of personal protective equipment for staff, which has significantly affected the quality of the curriculum implemented in universities in Uganda. From the literature reviewed, it can be seen that several studies have been carried out on physical infrastructure in public universities by Ajuaba et al. (2022), Kasule (2015) and Oketch (2016), but their effect on curriculum implementation has not been shown. The researchers acknowledged the gaps in the literature requiring further investigation, hence the need for this study to establish the influence of physical infrastructure on curriculum implementation in public universities in Northern Uganda.

Methodology

This study employed a correlational research design and adopted the positivist approach because it emphasised observable and measurable facts and allowed the researchers to minimise bias and subjectivity, ensuring that findings were based on empirical evidence rather than personal beliefs or opinions. According to Creswell et al. (2018), the positivist approach typically involves quantitative methods, which allow for the statistical analysis of data. This can lead to precise and generalisable results, enabling researchers to draw broader conclusions from their studies. Furthermore, Savela (2018) points out that positivist

research often uses clear, concise and unambiguous language, which makes the findings easier to understand and communicate with others. This clarity is beneficial for the dissemination of knowledge and the application of research results in practical settings. We collected data from 123 academic staff using a self-administered questionnaire. The use of a questionnaire was preferred because of the large number of respondents that were targeted in this study. The questionnaire was subjected to a content validity index (CVI) and a Cronbach's alpha (α) test. The results are presented in Table 1 below.

Table 1: CVI and a Cronbach's alpha (α) test results

Constructs	CVI	α
Curriculum Implementation		
Preparation for teaching	0.83	0.85
Content delivery	0.86	0.84
Assessment of learning	0.82	0.77
Physical Infrastructure Management		
Lecture room facilities	0.85	0.79
Technology equipment	0.80	0.82
Safety devices	0.83	0.83

Source: Primary data

The results in Table 1 revealed that the content validity index (CVI) of the questionnaire was 0.84, which is above the threshold value of 0.70 (Eunseong & Kim, 2014). Also, a Cronbach's alpha (α) value of 0.878 indicating a good reliability. According to Eunseong and Kim (2014), a questionnaire can be used if its reliability is greater than 0.7. This allowed the researcher to consider the questionnaire reliable. The data collected was analysed using SPSS version 26.0 (spss.exe), showing frequencies, percentages and means, and standard deviations at the descriptive level, correlations at the bivariate level, and multiple linear regression at the multivariate level.

Results and Discussions

Results

The results on the influence of physical infrastructure management on curriculum implementation in public universities in Northern Uganda are presented in this section.

Demographic Characteristics

Table 2: Demographic information of the respondents

Items	Category	Frequency	Percentage
Gender	Male	77	62.6
	Female	46	37.4
	Sub-total	123	100
Age Bracket	25 – 35 years	38	30.9
	36 – 49 years	63	51.2
	Above 50 years	22	17.9
	Sub-total	123	100

Education Level of the Respondents	Doctoral degree	32	26.0
	Master's degree	88	71.5
	Post-graduate Diploma	3	2.4
	Sub-total	123	100
Rank of the Respondent	Professor	1	.8
	Associate Professor	4	3.3
	Senior Lecturer	3	2.4
	Lecturer	29	23.6
	Assistant Lecturer	86	69.9
	Sub-total	123	100
University of the Respondents	Lira University	27	22.0
	Muni University	38	30.9
	Gulu University	58	47.2
	Sub-total	123	100

Source: Primary data

The results in Table 2 shows the modal percentage of the respondents as males (62.6%), between the age bracket of 36 and 49 years, with a master's degree (71.5%), at the rank of assistant lecturer (69.9%) and from Gulu University (47.2%). This clearly meant that the number of males in public universities in Northern Uganda is bigger than that of their female counterparts. The study dealt with mature people who gave reliable views on university infrastructure and curriculum implementation in public universities in Northern Uganda. The respondents were literate, which enabled them to give clear and comprehensive responses, and all the respondents had sufficient ranks and gave objective answers to the questions raised in this study.

Descriptive Results on Curriculum Implementation

The study sought to assess how the academic staff perceived the level of curriculum implementation in public universities in Northern Uganda. The quantitative findings of the survey are presented in Table 3.

Table 3: Descriptive results on the academic staff perceptions on curriculum implementation

Curriculum Implementation items	Item Mean	
Preparation for teaching (*Aggregate* mean =2.43; SD=0.89)		
On preparation for teaching, the academic staff always:		
Prepare lectures following the course outline	2.06	
Formulate relevant objectives/competences prior to lectures	3.08	
Prepare relevant teaching methods and techniques prior to lectures	2.91	
Prepare relevant teaching and learning aids prior to lectures	2.63	
Prepare for lectures in accordance with the timetable	2.02	
Prepare and organise their lecture notes prior to lectures	2.02	
Adequately make a lecture work plan every semester	2.66	
Prepare reference materials and resources prior to lectures	2.78	

Make learner assessment plans prior to lectures	1.78	
Content delivery (*Aggregate* mean =2.79; SD=0.79)		
On content delivery, the academic staff always:		
Deliver lectures in line with objectives /competences planned	3.10	
Deliver contents with maximum clarity to learners during lectures	2.80	
Encourage interactive communications during lectures	2.03	
Use a variety of teaching and learning aids during lectures	2.67	
Use student-centred teaching methods and techniques during lectures	2.74	
Ensure a good teacher-student relationship during lectures	3.00	
Effectively manage time as planned during lectures	2.72	
Encourage lively lectures with humour	3.13	
Ensure logical flow and pace during lectures	3.17	
Register and follow up students' class attendance	2.71	
Control their emotions during lectures	2.68	
Assessment of learning (*Aggregate* mean =2.52; SD=0.89)		
On assessment of learning, the academic staff competently:		
Use formative assessment technique to assess students' performance	3.22	
Use summative assessment technique to assess students' performance	2.81	
Use diagnostic assessment technique to assess students' performance	2.54	
Use norm-referenced assessment technique to assess students' performance	2.24	
Use criterion assessment technique to assess students' performance	2.48	
Use benchmark assessment technique to assess students' performance	2.76	
Use classroom Assessment Technique (CAT) to assess students' performance	1.81	
Timely gives assessment feedback to students	2.32	
Overrall Mean for Curriculum Implementation =2.58; SD=.85		

Source: Primary data

Table 3 indicates the overall mean of curriculum implementation as 2.58 (51.6%) and a 0.85 standard deviation (SD). The results suggest that the respondents were largely of the view that curriculum implementation in public universities in Northern Uganda was low. In detail, the results revealed that the level of preparation for teaching was low, with an aggregate mean of 2.43 (48.6%) and a 0.89 SD. This suggests that there is a need for the academic staff in the three public universities to further improve their level of preparation for teaching, especially in the areas of teaching aids, methodologies, work and assessment plans, lecture notes and reference materials. In addition, the results exposed the levels of content delivery among the academic staff as moderate, with an aggregate mean of 2.79 (55.8%) and a 0.79 SD. The respondents found that academic staff delivered lectures with clarity and interaction, and the lecturer-learner relationship was good. However, improvements were needed in teaching aids, student-centred teaching, time management and lecture attendance tracking. The assessment of learning in public universities in Northern Uganda showed a mean of 2.52 (50.4%) and a 0.88 SD. The majority of respondents expressed the belief that assessment of learning is low among academic staff in the three

public universities, and recommended the use of various methods and timely feedback to improve assessment processes.

Descriptive Results on Physical Infrastructure Management

In order to stimulate the opinions of the respondents on physical infrastructure management so as to analyse whether it has an influence on curriculum implementation in public universities in Northern Uganda, the researchers administered a questionnaire covering three (3) dimensions, and the findings are presented in Table 4.

Table 4: Descriptive results on physical infrastructure management

Physical infrastructure management items	Item Means
Lecture Room Facilities (*Aggregate* mean =3.05; SD=0.89)	
In my lecture room there is a well-managed flip chart stand	2.19
In my lecture room chairs are adequate and well managed	3.75
In my lecture room chairs are comfortable	3.47
In my lecture room tables are adequate	3.21
In my lecture room tables are comfortable	3.06
In my lecture room there is a good notice board	2.54
In my lecture room there is a good whiteboard	3.25
In my lecture room there is a well-maintained and easy-to-use chalkboard	3.39
In my lecture room there is a good lectern/podium	2.58
Technology Equipment (*Aggregate* mean =2.1; SD=0.78)	
In my lecture room there is a functioning wall clock	2.38
In my lecture room there is a projector in good working condition	2.92
In my lecture room there is an LCD screen in good working condition	1.55
In my lecture room there is a reliable public address system	1.55
Safety Devices (*Aggregate* mean =2.67; SD=0.97)	
In my lecture room there is a fully equipped first aid kit	1.62
Handwashing cans/sanitisers are always available in my lecture room	2.05
Laboratory goggles and safety kits are made available for students and staff	2.35
The roof of my lecture room is very good	3.77
The wall of my lecture room is very clean and well-maintained	3.55
Overrall Mean for physical infrastructure management 2.60	

Source: Primary data

Table 4 shows the overall mean of physical infrastructure management as 2.60 (52%), with a 0.88 standard deviation (SD). These findings suggest that the respondents were generally of the opinion that the state of physical infrastructure management in public universities in Northern Uganda was moderate. More specifically, the results revealed that the level of lecturer room facilities was moderate, at an aggregate mean of 3.05 (61.0%). This means that lecture room facilities like flip charts, chairs, tables, notice boards and lecterns have been insufficient in the three public universities (Lira, Muni and Gulu). In respect to the state of technological equipment, the results revealed low levels, with an aggregate mean of 2.1 (42.0%) and a 0.78 SD. This implies that the respondents from the three public universities were of the view that the majority of the lecture rooms did not

have technology equipment such as functioning wall clocks, LCD screens and projectors in good working condition. Furthermore, the majority of the large lecture rooms lacked reliable public address systems. Therefore, most lecturers relied on traditional methods of teaching. With regard to whether public universities had safety devices in their lecture rooms, the results showed an aggregate mean of 2.67 (53.4%) and a 0.97 SD. This suggests that the majority of the respondents were of the view that lecture rooms in the three public universities had insufficient safety devices, such as a fully equipped first aid kit, handwashing cans and sanitisers. Furthermore, it was revealed that the condition of the roofs and walls of lecture rooms was good. According to NCHE (2014), the levels of university infrastructure are classified as 1 = unacceptable, 2 = acceptable, 3 = good and 4 = ideal. Therefore, the findings of this study indicate that the level of physical infrastructure management in the three public universities in Northern Uganda was within NCHE acceptable levels. This means that physical facilities like lecture room facilities, technology equipment and safety devices exist in the three public universities in Northern Uganda but are not sufficient for effective curriculum implementation. Hence, there is a need to expand physical infrastructure and its management in universities to further improve curriculum implementation.

Regression Analysis for Physical Infrastructure Management and Curriculum Implementation

The study conducted a regression analysis to determine the impact of physical infrastructure management on curriculum implementation in public universities in Northern Uganda, with the coefficient of determination presented in Table 5.

Table 5: Model summary for physical infrastructure management and curriculum implementation

Model	R	R Square	Adjusted R Square
1	0.551[a]	0.303	0.286
a. Predictors: (Constant), Safety devices, Technology equipment, Lecture room facilities			
b. Dependent Variable: Curriculum Implementation			

Table 5 shows the regression model summary, indicating a correlation coefficient of 0.551, an R2 value of 0.303 and an adjusted R square of 0.286. The R2 value indicates that management of physical infrastructure, such as lecture room facilities, safety devices and technology equipment, explained 30.3% of variations in curriculum implementation, while the remaining 69.7% can be explained by other factors. This indicates a strong correlation between physical infrastructure management and curriculum implementation.

Furthermore, the study generated an analysis of variance (ANOVA), and the results are presented in Table 6 below.

Table 6: ANOVA for physical infrastructure management and curriculum implementation

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6498.550	3	2166.183	17.280	0.000b
	Residual	14917.856	119	125.360		
	Total	21416.407	122			
a. Dependent Variable: Curriculum Implementation						
b. Predictors: (Constant), Safety devices, Technology equipment, Lecture room facilities						

*Source***:** Primary data

In Table 6, the regression model was found to be statistically significant, with a p-value of 0.000b, which is less than 0.05. This indicates that physical infrastructure management significantly influences curriculum implementation in public universities in Northern Uganda. The study examined the degree to which each variable of physical infrastructure management influenced curriculum implementation, and the coefficients are presented in Table 7.

Table 7:   Regression coefficients for physical infrastructure management and curriculum implementation

Model		Standardised Coefficients	Sig.
		Beta	p
1	(Constant)		0.000
	Lecture room facilities	0.409	0.000
	Technology equipment	0.094	0.257
	Safety devices	0.136	0.184
a. Dependent Variable: Curriculum Implementation			

Source: Primary data

The results in Table 7 indicate that lecture room facilities (β = 0.409, p = 0.000 < 0.05) had a significant positive influence on curriculum implementation. However, technology facilities (β = 0.094, p = 0.257 > 0.05) and safety devices (β = 0.136, p = 84.14 > 0.05) had a positive but insignificant influence on curriculum implementation. The results suggested that while hypothesis one was accepted, hypothesis two and three were rejected.

Discussion

The level of curriculum implementation

The study assessed the levels of curriculum implementation. The findings indicated a low level of curriculum implementation. This implies that preparation for teaching, content delivery and assessment of learning was still insufficient in public universities in Northern Uganda. These findings are in line with those of Chika (2019), Ivowi (2019) and Yunus (2019), who reported low levels of preparation of the course outlines, teaching methods and instructional resources in the public universities in Nigeria and Malaysia, respectively.

Relatedly, the quality of content delivery was reported to be low. For example, some of the academic staff did not achieve all their set objectives during lectures, and there

were problems associated with academic staff stating vague or unclear objectives that led to confusion among students. Furthermore, the study revealed that assessment of learning was insufficient in the three public universities in Northern Uganda. For example, many of the academic staff preferred using traditional summative assessments, such as administering final examinations, which encourage rote memorisation rather than deep understanding and application of concepts. This hindered the development of critical thinking and problem-solving skills in students.

Similarly, it was reported that only a few of the academic staff effectively used a variety of methods, such as CATs, criteria, benchmarks and norm-referenced assessments. These findings are in line with Romanov et al.'s (2019) revelation of challenges in the preparation of the lecture objectives among many lecturers. This was attributed to knowledge gaps, as many of the lecturers in the universities were not trained teachers and lacked the necessary facilities. In agreement with the study, Imran et al. (2023) and Umezulike and Charles-Ibezim (2022) reported low levels of preparation of teaching methods and techniques and attributed them to a lack of pedagogical training, collegial teaching, resistance to change, burnout and heavy workload among the academic staff. Relatedly, Odundo et al. (2018) also reported low levels of preparation of the teaching aids in the public universities in Africa. Zykrina et al. (2022) reported problems of assessment in universities as arising from inadequate access to appropriate assessment tools, technology, and knowledge gaps among the academic staff. With the findings of the study being consistent with the findings of previous scholars elsewhere, it can be deduced that curriculum implementation is still low in public universities.

The level of physical infrastructure management

The study findings also indicated the level of physical infrastructure management. In detail, the respondents were generally of the opinion that physical infrastructure management in public universities in Northern Uganda was moderate. More specifically, the results revealed that the level of lecture room facilities was moderate. This means that lecture room facilities like flip charts, chairs, tables, notice boards and lecterns have been insufficient in the three public universities (Lira, Muni and Gulu). With respect to the state of technological equipment, the results revealed low levels; this implies that the respondents from the three public universities were of the view that the majority of the lecture rooms did not have technology equipment such as functioning wall clocks, LCD screens and projectors in good working condition. Furthermore, the majority of the large lecture rooms lacked reliable public address systems. This implies that most lecturers relied on traditional methods of teaching.

Furthermore, the study indicated the level of safety devices in lecture rooms as moderate. This implies that lecture rooms in the three public universities had some safety devices but had insufficient safety devices, such as a fully equipped first aid kit, handwashing cans and sanitisers. Furthermore, it was revealed that the condition of the roofs and walls of lecture rooms was good. This study findings agree with different scholars (Almaiah et al., 2020; Eze et al., 2018; Jegede et al., 2021; Mwirichia & Barchok, 2017; Nassirpour et al., 2018; Rumanyika & Galan, 2015; Siddique et al., 2019), who revealed low levels of physical infrastructure in universities. Therefore, the findings of this study indicate that the level of physical infrastructure management in the three public

universities in Northern Uganda was within NCHE acceptable levels. However, there is a need to expand physical infrastructure management in universities to further improve curriculum implementation.

Physical infrastructure management and curriculum implementation

This study sought to investigate the influence of physical infrastructure management on curriculum implementation in public universities in Northern Uganda. The findings indicated that physical infrastructure management had a moderately positive influence on curriculum implementation in public universities in Northern Uganda. In detail, lecture room facilities had a significant influence on curriculum implementation. This means that lecture room facility management is significant for curriculum implementation in public universities in Northern Uganda. The findings of the study were in agreement with those of Almaiah et al. (2020), who identified lecture room facilities like furniture as a crucial factor influencing curriculum implementation in a university system. These authors observed that lecture room facilities must be readily available for effective content delivery. The study furthermore confirms the findings of Jegede et al. (2021), who found that furniture is crucial for effective content delivery and supervision in the university system. They further buttressed the fact that the inadequacy of lecture room furniture that universities are experiencing is a perfect reflection of what is going on with curriculum implementation in the university system.

Additionally, the findings revealed that technology equipment had an insignificant influence on curriculum implementation. However, it was revealed that at the universities under study, most of the lecture rooms had inadequate projectors and wall clocks. This study finding agrees with those of Eze et al. (2018), who reported that most universities in sub-Saharan Africa do not have adequate technology equipment to facilitate academic staff's content delivery. This means that in the absence of adequate technology equipment, curriculum implementation activities, such as preparation for teaching, content delivery and assessment of learning, become cumbersome. Also, the findings of this study support Nassirpour et al.'s (2018) finding that technology equipment such as computers and projectors has an adverse effect on curriculum implementation.

The study findings further revealed that safety devices had an insignificant influence on curriculum implementation. This finding agrees with those of Fefia (2021), Oketch (2016) and Williamson (2018), who reported that most universities in sub-Saharan Africa had insufficient safety devices required to handle emergencies or accidents and a lack of personal protective equipment for staff and students, among others, which negatively affected their curriculum implementation activities. Furthermore, this report agreed with NCHE (2018) that a number of universities in Uganda were poorly equipped and lacked essential safety devices, which are necessary for curriculum implementation activities such as preparation for teaching, content delivery and assessment of learning. With the findings of the study being consistent with the results from the previous scholars, it can be deduced that physical infrastructure management has a positive and significant influence on curriculum implementation in public universities in Northern Uganda.

Conclusion

It was concluded that curriculum implementation was low yet a vital component in public universities in Northern Uganda. Preparation for teaching by identification of the right teaching aids, methodologies, work and assessment plans, lecture notes and reference materials was low among the academic staff. Content delivery by the academic staff involved teaching aids, student-centred teaching methods, time management and lecture attendance tracking, which were moderately used. Assessment of learning by means of diagnostic, normative reference, criteria, CAT and benchmark techniques was believed to be low. Additionally, physical infrastructure management was moderate. Most lecture rooms had comfortable but inadequate chairs and tables. There were insufficient flip chart stands, notice boards, lecterns and whiteboards. Furthermore, it was concluded that a typical lecture room had no reliable technology equipment such as functioning wall clocks, projectors, LCD screens or a public address system. Additionally, a typical lecture room had a good roofing system and a clean wall but lacked first aid kits, handwashing cans, laboratory goggles and other kits. Further, lecture room facilities had a significant influence on curriculum implementation, while technology equipment and safety devices had a statistically insignificant influence on curriculum implementation in public universities in Northern Uganda. Overall, physical infrastructure management had a statistically significant influence on curriculum implementation in public universities in Northern Uganda.

Recommendation

This study recommends that the government and public universities should make deliberate efforts in a number of areas. First, there should be improvement in the low levels of curriculum implementation through ensuring adequate preparation for teaching, through identification of the right teaching aids, methodologies, work and assessment plans, lecture notes and reference materials by the academic staff. During content delivery, the academic staff should ensure adequate use of teaching aids, student-centred teaching methods and time management, and also constantly track lecture attendance. Second, there should be improvement in the management of lecture room facilities such as chairs, tables, flip chart stands, notice boards and whiteboards, besides the provision of good lecterns with aesthetically pleasing surroundings in every lecture room to ensure enhanced curriculum implementation. Third, it should be ensured that the required lecture room facilities are adequate and comfortable to use. Sufficient technology equipment should be planned for and provided, for instance reliable public address systems, computers and projectors, LCD screens, radios and wall clocks, in every lecture room to improve curriculum implementation. Sufficient safety devices, such as first aid kits, handwashing cans, laboratory goggles and safety kits, should be provided to further improve curriculum implementation in public universities.

Limitations

The study projected the use of mixed methods for data collection using self-administered questionnaires, interviews, observations and focus group discussions. However, owing to time and financial limitations, only a self-administered questionnaire was used, hence

the positivist approach. The study was carried out in three public universities in Northern Uganda out of thirteen public universities in Uganda, and only considered curriculum implementation at the undergraduate level.

Areas for Further Research

This study sought to investigate the influence of physical infrastructure management on curriculum implementation in public universities in Northern Uganda. However, owing to time and financial factors, the findings of this study could not be generalised to other universities in Uganda. This study, therefore, recommends further studies on similar concepts, especially in other public universities in Uganda. Furthermore, future studies in similar areas should be carried out using a pragmatic approach.

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Usability Evaluation of Learning Management Systems in Public Universities in Uganda: Lecturers' Perspectives

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Abstract

Recent studies in Uganda show that Learning Management Systems (LMS) were not usable, and some were complex to use, making it difficult for lecturers to use the platforms. As a result, there has been low uptake and usage of LMS in many universities. To investigate this claim, the study set out to evaluate the usability of LMS in four public universities in Uganda, namely Makerere University, Makerere University Business School, Busitema University and Gulu University. Google Docs was used to design a System Usability Scale (SUS) which was used to evaluate the usability of the LMS in the four public universities. An open-ended questionnaire was also included in the SUS to capture qualitative data. This questionnaire was sent to different staff mailing lists in the four universities. A total of 80 questionnaires were filled and analyzed. The findings showed that the average System Usability Scale score for the LMS used in the four public universities was 60, representing about 30% usability, which is poor. The study identified several usability challenges and ways to address the usability challenges. This paper, therefore, presents an IDSS usability model for improving LMS usability in learning institutions.

Keywords: *Learning Management Systems; Public universities; Usability.*

Introduction

On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global public health pandemic (Cucinotta, 2020). Since then, the virus has crossed multiple borders, which has led to a devastating impact on government institutions, businesses, and households across the globe. Due to the highly infectious nature of the virus, many countries agreed to temporarily close various sectors of the economy to control its spread. Educational institutions were among the most affected by this action. A report byUNESCO revealed that schools in over 190 countries were partially or fully closed due to the pandemic. This affected over 1.6 billion learners, which is about 60% of the world'sstudent population (UNESCO, 2020). The partial or full closure of educational institutions as a result of the coronavirus pandemic caused a massive lag in education systems worldwide.

There was, therefore, an urgent need to find solutions to the educational challenges brought about by the pandemic. Governments all over the world had to come up with a more pragmatic approach. One of the approaches that gained massive prominence was the use of ICT to aid off-campus learning. Many governments scrambled for ICT as the only solution to aid learning. This led to a surge in ICT investment (Adedoyin, 2023). The Government of Uganda, for example, considered adopting virtual learning for all its learners at different levels. The government's initial investment in virtual learning for students was worth USD 113 million. The Ugandan cabinet also approved the distribution of 10 million radio sets to an estimated 10 million households in the country worth USD 100 million (Medard, 2021). At university level, several online Learning Management Systems (LMS) were implemented to facilitate off-campus learning. Various educational institutions in sub-Saharan countries embraced online LMS.

The Use of LMS in Universities in Sub-Saharan Africa

While several universities in sub-Saharan Africa had implemented online LMS before the outbreak of the coronavirus, its uptake was largely low because of several coherent associated challenges. Maloma (2023) and Mtebe (2015) report that while the adoption of LMS was largely successful in developed countries, its uptake in sub-Saharan Africa has been very low, majorly as a result of usability challenges. Studies showed that usability challenges made up the biggest category of challenges affecting LMS in sub-Saharan Africa. For example, a study showed that 54% of interviewed Moodle users at the Open University of Tanzania indicated that the system was difficult to use, especially in uploading learning materials (Bhalalusesa, 2023; Bhalalusesa, 2013).

Another similar study conducted at Makerere University in Uganda found that 84.4% of students and 79% of faculty members indicated that the LMS was not easy to use (Mayoka, 2012). Yet another study conducted at the University of South Africa revealed that several usability problems hindered students from using the LMS (Mabila, 2014). As a result of these serious usability problems, Maloma (2023) and Mtebe (2015) observed that there was low uptake of LMS in many sub-Saharan African universities. For example, studies showed that only 20% of trained users were using LMS at the National University of Science and Technology of Zimbabwe (Dube, 2014). Similar studies also revealed that there was low uptake of LMS in universities such as Maseno University in Kenya,

Mondlane University in Mozambique, University of Zambia and four leading universities in Zimbabwe (Chitanana, 2008; Ssekakubo, 2011; Unwin, 2010).

When the world was struck by the COVID-19 pandemic, there was a widespread push by different institutions to embrace LMS. This exacerbated LMS usability challenges. A recent study conducted at Muni University, Mbarara University of Science and Technology, Makerere University, Gulu University and Busitema University, all in Uganda, discovered that some LMS were not usable and some were complex, making it difficult for lecturers to use the platforms (Bhalalusesa, 2023; Bwire, 2020). Bhalalusesa (2023) also conducted a usability study on the LMS used at the National Institute of Transport in Tanzania and found that the tutors encountered usability problems related to navigation, content, layout, interaction, feedback, help and support. Therefore, from the above studies, it can be seen that usability plays a pivotal role in the uptake of LMS. It is a very important aspect considered while evaluating an e-learning system and, therefore, an investigation of usability and its integration or contribution to the learning process is worthwhile (Maloma, 2023; Mtebe, 2015).

Usability

Several usability scholars have proffered different definitions and attributes of usability. For example, Michelle (1999) attributes usability to successfully learning and using a product to achieve a goal; while Dumas (1993) defines usability as performing tasks quickly and easily. Barnum (2020) and Rekha (1999) attribute usability to effectiveness, likeability, learnability and usefulness of a product. Nielsen (2012), on the other hand, defines usability as a quality attribute that assesses how easy user interfaces are to use in terms of five factors or components, namely learnability, efficiency, memorability, errors and satisfaction. However, for this study, we have adopted ISO9241-11:2018(en)'s definition as our working definition. According to the revised definition of usability in ISO9241-11:2018(en) , usability is the extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. ISO defines effectiveness, efficiency and satisfaction thus:

- *Effectiveness* means "accuracy and completeness". It can be measured by using two usability metrics: the success rate, also called completion rate (the percentage of users who were able to complete the tasks successfully), and the error rate (number of errors made while accomplishing a goal).

- *Efficiency* means "resources expended" and how quickly a user can perform work. Efficiency is about the resources (such as time or effort) needed by users to achieve their goals. It is the time (in seconds and/or minutes) the respondent takes to complete a task.

- *Satisfaction* means the extent to which expectations are met. It is important that users are satisfied with their experience.

According to Melis (2003), e-learning usability consists of two aspects, that is, technical usability and pedagogical usability. Technical usability involves methods for ensuring a trouble-free interaction between the user and the system, while pedagogical usability aims at supporting the learning process to achieve the learning objectives. It is usability from the viewpoint of learning and teaching. Both aspects of usability are intertwined and tap

the user's cognitive resources. Usability is considered one of the most important quality attributes, being a fundamental aspect of all software products. It is even more crucial in those systems that are designed for a wide variety of users (Guerrero, 2018)

Poor usability can reduce productivity. Flawed interface design, for example, can make it difficult for users to perform tasks correctly and with confidence (Koskie, 2022). It is the reason Mbete (2015) recommends that usability assessment of LMS should be conducted regularly because it is a critical factor in determining LMS usability problems. Determining and fixing such usability problems will increase LMS usage because many users will find the systems easy to learn, easy to use and user-friendly (Mbete, 2015). It is from this point of view that the study aimed to assess the usability of LMS in four public universities in Uganda and provide a usability model for improving LMS in universities in the country. To achieve this, four objectives were formulated as follows:

Objectives of the Study

Given the research problem identified above, this research sets out to:

(i)   Assess the usability of LMS in universities in Uganda.

(ii)   Investigate the usability challenges affecting different LMSs.

(iii) Identify ways in which these usability challenges can be addressed to bolster the uptake of LMS in Uganda.

(iv)   Develop a usability model for improving LMS usability in universities in Uganda.

Research Methodology

Objective 1: To assess the usability of LMS in universities in Uganda using the Simple Usability Scale (SUS)

To assess the usability level of LMS in public universities in Uganda, a Simple Usability Scale (SUS) was used. The System Usability Scale (SUS) is a standardized metric used to measure the usability perception of computer interfaces and a wide range of products and systems (Sauro, 2011). SUS is a simple, ten-item Likert scale type of questionnaire based on forced-choice questions, where a statement is made and the respondent then indicates the degree of agreement or disagreement with the statement on a 5- (or 7-) point scale. The ten-item Likert scale was designed on Google Form and presented to the respondents, who responded by either agreeing or disagreeing (based on a Likert scale of 5, that is, Strongly disagree, Disagree, Neutral, Agree, Strongly agree) with the following statements:

1.   I think that I would like to use this LMS frequently.

2.   I found the LMS unnecessarily complex.

3.   I thought the LMS was easy to use.

4.   I think that I would need the support of a technical person to be able to use this LMS.

5.   I found the various functions in this LMS were well integrated.

6.   I thought there was too much inconsistency in this LMS.

7.   I would imagine that most people would learn to use this LMS very quickly.

8.   I found the LMS very cumbersome to use.

9.   I felt very confident using the LMS.

10.   I needed to learn a lot of things before I could get going with this LMS.

Objective 2: To investigate the usability challenges affecting different LMS

To investigate usability challenges, another set of closed-ended ………….. designed based on a Likert scale of 5 (Strongly agree, Agree, Neutral, Disagree, Strongly disagree). These questions were separate from the SUS scale questions but put in the same questionnaire. The questions helped to collect the different responses on the challenges affecting usability in LMS in the four universities.

Objective 3: To identify ways in which usability challenges can be addressed

To identify ways of addressing the usability challenges of LMS in the four universities, a set of open-ended questions was administered to determine ways in which the usability challenges can be addressed. Open-ended questions are, as opposed to closed-ended questions, non-directive and allow respondents to use their terms and direct their responses at their convenience.

Sample Selection

Convenience sampling was chosen as the study sampling technique because of its time and cost convenience. Four out of the seven authors of this paper are staff of the four universities that were considered for the study. It was convenient for them to collect data from the universities in which they were employed. Google Form was used to design the data collection tool, which was sent to the different staff mailing lists in the four public universities. The minimum sample for a valid usability assessment or evaluation of a product or service is five respondents/respondents (Bourke, 2020; Nielsen, 2012). According to Nielsen (2012), engaging four to five respondents in a usability study will uncover 85% of the usability problems in a test iteration. Bourke (2020) and Macefield (2009) concur and observe that between two and 20 was valid, with five to 10 being a sensible baseline for identifying substantial usability problems. Based on this evidence, the study had marked a minimum sample of 10 respondents and above for each university, giving us a total sample of 40 respondents

Data Analysis

Simple Usability Scale (SUS)

To calculate the SUS score, the total score contribution for each item was summed up. For odd (positive) questions 1, 3, 5, 7 and 9, as stated below, the points given to the scale range from 0 (for Strongly disagree) to 4 points (for Strongly agree).

Question 1: I think that I would like to use this LMS frequently.

Question 3: I thought the LMS was easy to use.

Question 5: I found the various functions in this LMS were well integrated.

Question 7: I would imagine that most people would learn to use this LMS very quickly.

Question 9: I felt very confident using the LMS.

Table 1: Points allocated for positive questions

Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Points	0	1	2	3	4

Source:……………………………………..

For even (negative) questions 2, 4, 6, 8 and 10, as stated below, the points given to the scale range from 4 (for Strongly disagree) to 0 points (for Strongly agree).

Question 2: I found the LMS unnecessarily complex.

Question 4: I think I would need the support of a technical person to be able to use this LMS.

Question 6: I thought there was too much inconsistency in this LMS.

Question 8: I found the LMS very cumbersome to use.

Question 10: I needed to learn a lot of things before I could get going with this LMS.

Table 2: Points allocated for negative questions

Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Points	0	1	2	3	4

Source:…………………………………….

The sum of the scores was then multiplied by 2.5 to obtain the overall value of SUS for each respondent. Brook (1996) and Lewis (2018) present an example of a SUS questionnaire filled by a respondent and how the points are calculated. According to these authors, SUS scores have a range of 0 to 100, not as a percentage. The average SUS score is 68. If the score is below 68, then it means there are probably serious problems with the system's usability. If the score is above 68, then it means it is above average but can still be improved. A score of over 80.3 means that the users like the system and mostly recommend it to their friends, as illustrated in Table 3 below.

Table 3: SUS score grading and adjective rating (Brooks, 1996)

SUS Score	Grade	Adjective Rating
>80.3	A	Excellent
68-80.3	B	Good
68	C	Okay
51-68	D	Poor
<51	E	Awful

Source:……………………….

Data that was collected from closed-ended questions which were used to investigate the usability challenges were analysed using Excel and SPSS. Descriptive statistics was used to generate various statistical results. Data collected from the open-ended questions that were used to determine ways in which the usability challenges can be addressed was

analysed using content analysis. This technique helped to establish the pattern of certain words or concepts within the sets of texts. The data was then formatted to follow a pattern. The themes in the data collected naturally emerge using triangulation. The most preferred result occurred when several independent sources all pointed to a matching set of events or facts.

Presentation of Results

a) Demographics of the respondents

Table 4: The respondents' demographics

	MUBS	MAKERERE	BUSITEMA	GULU	
No. of Respondents	28	24	18	10	
RESPONDENTS DISTRIBUTION					
Categories	Lecturers	Assistant Lecturers	Teaching Assistants	Senior Lecturers	Professor
Percentages	50%	26%	14%	9%	1%

The study also investigated how long each respondent had used the LMS. The study revealed that 44% of the respondents have been using the LMS between 1 and 3 years, while 32 % had been using the LMS for over 7 years, as depicted in Table 3 above.

b) Assessing the usability of the LMS

The study assessed the usability level of LMS in the four public universities in Uganda. A Simple Usability Scale (SUS) questionnaire was given out, and the results obtained in the summary are presented in Table 7. The SUS score for each respondent was calculated using the procedure discussed in the methodology. Then the average SUS score for each university was derived from the SUS score for each respondent in the particular university. Afterwards, the average SUS score for the four universities was derived from the average SUS score for each university. From the findings, the highest average SUS score was from Makerere University Business School (65.0), followed by Gulu University (60.5). The lowest average SUS score was from Busitema University (56.9), followed by Makerere University (57.5). The average SUS score for the four universities was 60.

The implication of the general SUS score

Using Table 3, the SUS score of 60 indicates that the usability of the LMS is poor because the SUS score lies between 51 and 68. Lewis and Sauro (2018) and Martins (2020) observe that when communicating SUS scores to stakeholders, especially stakeholders who may not be familiar with SUS, it is best to convert the original SUS score into a percentile. Lewis and Sauro (2018) and Martins (2020) present a simple graph that converts the SUS score into percentages. According to their graph, presented in Figure 1, a SUS score of 60 represents a percentage score of 30%.
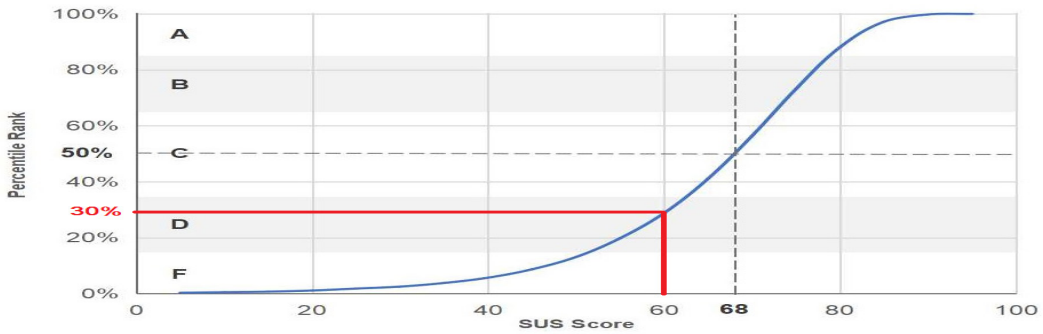
Figure 1: SUS score and its percentiles (Sauro, 2011)

Percentage-wise, the SUS score of 60 represents 30% usability, which falls below average – meaning the usability of the LMS is poor. The average score (at the 50th percentile) is 68. That means an SUS above 68, which is 50%, is above average and below 68 is below average. The usability of the LMS in Makerere University Business School, Gulu University, Makerere University and Busitema University was only 30%, which is poor. When the SUS scores for each of the four universities are converted into a percentile, the usability percentage score for each university is presented as follows: the highest usability percentage was from Makerere University Business School (40%), followed by Gulu University (31%), then Makerere University (25%), and the lowest usability percentage was Busitema University (22%).

c)   Challenges of using LMS
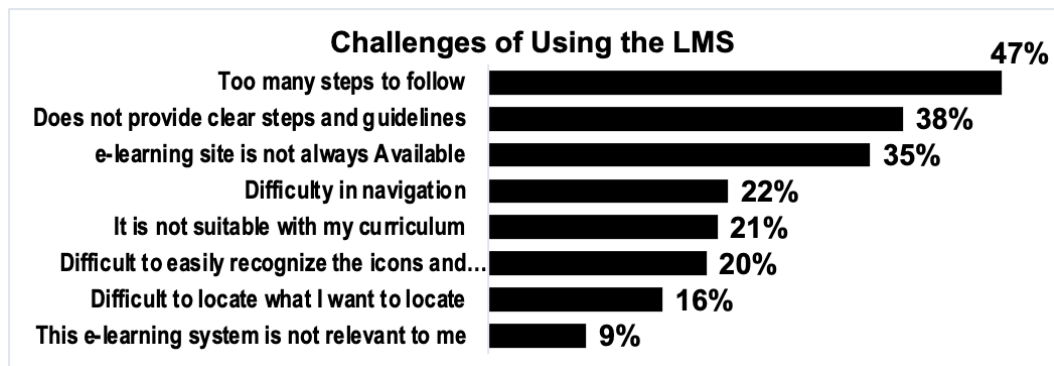
Figure 2: Challenges of using LMS

The study went ahead to investigate the usability challenges respondents faced while using the LMS. The results are summarized in Figure 2.

As shown in Figure 2 above, close to half (47%) of the respondents acknowledged that there were too many steps to follow while using the LMS. About 38% of the respondents said that there were no clear steps and guidelines, while 35% of the respondents revealed that the LMS was not always available online. About 22% of the respondents said that navigating through the LMS was difficult, while 21% said that the LMS was not suitable for their curricula. The study found that 20% of the respondents acknowledged the difficulty

of recognising icons and symbols in the LMS, while 16% and 9% of the respondents said that it was difficult to locate what they wanted and that the LMS was not relevant to them, respectively.

d)   Addressing the usability challenges

The study further investigated ways of addressing LMS usability challenges and the results of the investigation are presented in Figure 3 below.
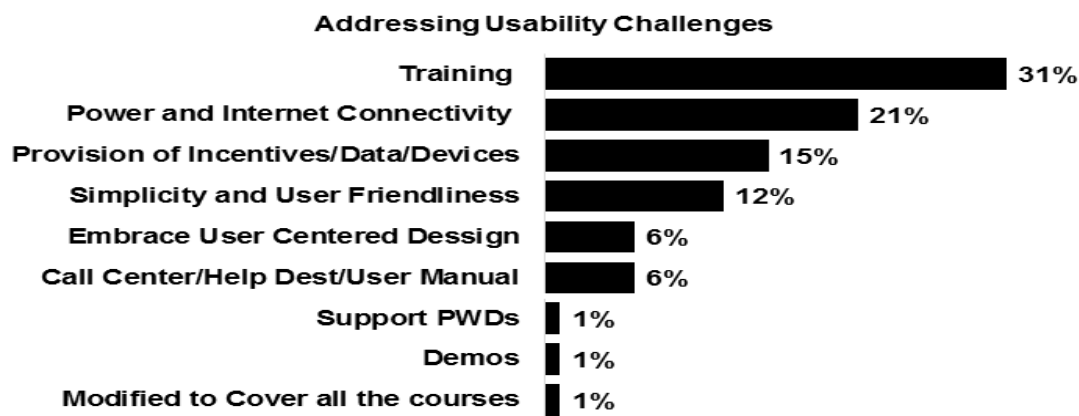
Addressing Usability Challenges

Category	Percentage
Training	31%
Power and Internet Connectivity	21%
Provision of Incentives/Data/Devices	15%
Simplicity and User Friendliness	12%
Embrace User Centered Dessign	6%
Call Center/Help Dest/User Manual	6%
Support PWDs	1%
Demos	1%
Modified to Cover all the courses	1%

Figure 3: Addressing LMS usability challenges

The study further investigated ways of addressing LMS usability challenges. From the study, 31 % of the respondents agreed on the need for regular training. One of the respondents said: *"More training should be extended to staff members."* Twenty-one per cent said that there was a need for power and internet connectivity. One respondent wrote: *"There is a need for regular availability of the Internet connection network and power at the University for both the students and the Academic staff."* The study also revealed that 15% agreed that the provision of incentives to lecturers as motivation was of paramount importance in addressing usability challenges. A respondent wrote: *"The university should provide personal internet data, improve internet connectivity, and provide digital equipment. "* About 12 % of the respondents suggested that simplicity and user-friendliness would improve the usability of the LMS. One respondent wrote: *"Improve general user experience and make the interface simple and easy to understand. "*

The study also found that 6% of the respondents said that embracing a user-centred design approach and having a call centre/user help desk would improve the usability of the LMS. A respondent wrote: *"Involve the teachers in content development and systems customization to suit their taste would improve the usability of LMS"* ; while another respondent wrote that *"the usability of the LMS can be improved by employing more staff on the Help desk".* One per cent of the respondents said that it was important to provide for PWDs, provide demos, and design the LMS to suit the teaching of other courses, especially practical courses.

Discussion of the Study Findings

a)   Assessing the usability of the LMS

From the usability assessment conducted, it was found that the SUS score for the LMS was 60. This indicates that the LMS usability was 30%, which reflects poor usability. Generally, poor usability has always been a challenge for many LMS in sub-Saharan universities. For example, a previous study carried out by Bhalalusesa (2013) found that 54% of interviewed Moodle users at the Open University of Tanzania indicated that the system was difficult to use, especially in uploading learning materials. A similar study conducted at Makerere University in Uganda found that 84.4% of students and 79% of faculty members indicated that the LMS was not easy to use (Mayoka, 2012). Another usability study conducted by Padayachee (2011) discovered that the LMS at the University of KwaZulu-Natal had several usability violations that made it difficult for many users to be able to use it. More recent studies, such as those by Bhalalusesa (2023) and Kaweesi (2022) also point to the same usability challenges. Whereas Bhalalusesa's study found out that the LMS used at the National Institute of Transport in Tanzania had serious problems with navigation, content, layout, interaction, feedback, help and support, Kaweesi's study discovered that some lecturers at Busitema University were not experienced in the use of the LMS.

Usability challenges may not be exclusive to sub-Saharan African universities. Kakasevski (2008), for example, found that Moodle had 75 usability problems in a study conducted to evaluate the usability of Moodle at FON University in Macedonia. The study also found that 80% of the students had significant problems with the features of online chat and discussion forums. Many sub-Sahara African universities use open-source LMS and, according to Almaiah (2019) and Mtebe (2015), the majority of open-source systems suffer from usability problems. To minimize the usability challenges associated with LMS in sub-Saharan universities, Almaiah and Mtebe recommend that universities conduct regular usability evaluations to find out any usability problems that might be hindering users from using these systems. The authors observe that fixing such usability problems will make LMS easy to use and user-friendly, and that this will increase LMS usage among both students and staff.

b)   Challenges of using the LMS

Too many steps

Several usability challenges were identified during the study. The study revealed that 47% of the respondents acknowledged that there were too many steps to follow. This resonates with the study by Bwire and his colleagues, who found that some LMS in the four universities (Muni University, Mbarara University of Science and Technology, Makerere University, Gulu University and Busitema University) were not usable and that some were too complex to use, making it difficult for lecturers to use the platforms (Bwire, 2020).

No clear steps and guidelines

The study also revealed that 38% of the respondents complained that there were no clear steps and guidelines. This is similar to what Kasse (2023) states in connection with the success of LMS. He asserts that such success is based on a supportive institutional policy

that guides all forms of users, including assessors, learners and technical staff, on the general use of digital assessment systems or LMS. The lack of policies creates subjective use of systems as opposed to objective use. Such policies must also align with the institution's strategic objectives.

Not always available online

The study further found that 35% of the respondents complained that the LMS was not always available online. Mayende (2013) confirms this and observes that this particular challenge majorly affects country learning centres. For example, the LMS online library collection was not accessible to most of the Makerere University students upcountry. Bada (2020) and Kasse (2023) all posit that an institution should use a stable LMS that is available and reliable at all times so that course instructors and learners can access their course environment at their convenience.

Navigation challenges

Other usability challenges that were identified include difficulty in navigating through the LMS (22%). Navigating through many LMSs has always been a challenge. This is in line with a previous usability study conducted at Walter Sisulu University, which identified the LMS navigation challenge as one of the top three challenges affecting LMS usage (Ssemugabi, 2006). Studies by Hasan (2018) found that usability issues with the Moodle LMS at Zarqa University in Jordan included difficulties with navigation and content organization.

Not suitable for their curricula

The other challenge identified during the study was that the LMS was not suitable for the users' curricula (21%). This is corroborated by a similar study conducted at Muni University, Mbarara University of Science and Technology, Makerere University, Gulu University and Busitema University, which found that it was quite difficult to develop online content that was well aligned with the curricula and learning outcomes of the course (Bwire, 2020).

Difficulty in recognising icons and symbols/Difficulty in locating what they needed

The respondents also pointed out the difficulty of recognising icons and symbols in the LMS (20%), and 16% said it was difficult to locate what they needed. This is a common design challenge for most LMSs. This is consistent with a fairly recent study conducted among students and teachers of two leading universities using Moodle in Pakistan that found that some of the icons could not be understood just by looking at them and that there was no supporting text that helped in understanding the desired meaning of icons. This made it difficult to locate what the user wanted (Arshad, 2016).

LMS was not relevant

The study also found that 9% said that the LMS was not relevant to them. The study, however, did not find out reasons as to why the respondents said the LMS was not relevant. Komuhangi, (2022) has attempted to provide an insight into this and posited that students or lecturers, for example, who did not consider e-learning a flexible way to study were less likely to consider using LMS.

c) Addressing the usability challenges using the IDDS model

The usability assessment of the four universities indicates that the LMS usability was 30%, which reflects poor usability. This poor usability, as the investigation found out, was caused by several usability challenges already identified in Figure 4. The study, therefore, proceeded to investigate ways of addressing LMS usability challenges. As the findings in Figure 5 show, the study derived a model which provides a taxonomy for classifying the ways of addressing LMS usability challenges in three broad categories, namely ICT Infrastructure, Design and Support Services (IDSS), as illustrated in Figure 2.
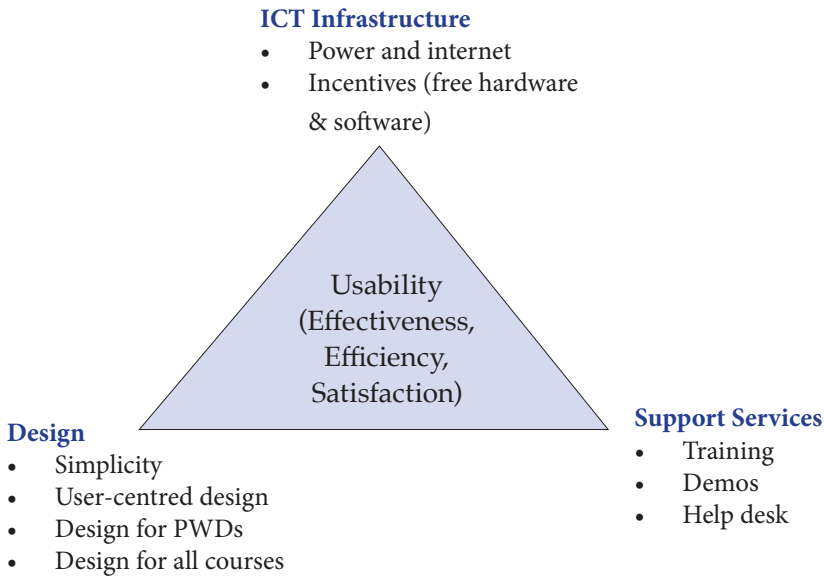
ICT Infrastructure
- Power and internet
- Incentives (free hardware & software)

Usability
(Effectiveness, Efficiency, Satisfaction)

Design
- Simplicity
- User-centred design
- Design for PWDs
- Design for all courses

Support Services
- Training
- Demos
- Help desk

Figure 2: IDSS model for improving usability of LMS

1. ICT Infrastructure

These are all forms of information and communications technology (ICT) infrastructure and systems that are required to enable effective and efficient use of LMS. This crucial ICT infrastructure includes:

Adequate power and internet connectivity

From the study, 21% of the respondents said that there was a need for adequate power and internet connectivity. One respondent wrote: "*There is a need for regular availability of the Internet connection network and power at the University for both the students and the Academic staff*". Scholars such as Adedoyin (2023), Amponsah (2023) and Kaweesi (2022) agree and emphasize the relevance of having a stable internet connection and power supply for the successful usage of LMS. Studies by Kumi☐Yeboah (2023) point out the necessity of having an adequate internet connection, a stable power supply, and relevant hardware and software to facilitate teaching and learning.

Incentives

The study found that 15% of the respondents agreed that the provision of incentives to lecturers as motivation was of paramount importance in addressing usability challenges. Another respondent wrote: "*The university should provide personal internet data, improve internet connectivity, and provide digital equipment.*" This is consistent with previous studies (Bwire, 2020) that confirmed that staff motivation and the provision of incentives enhance the use of LMS.

2.   Design

Developing an LMS that is easy to use involves the provision a user-friendly interface, identifiable icons and symbols, easy navigation, clear content, consistent layout, enhanced interaction and timely feedback.

Improve simplicity and user-friendliness

From the study, 12% of the respondents pointed out that emphasis should be put on improving the usability, simplicity and use of the LMS. One respondent wrote: "*Improve general user experience and make the interface simple and easy to understand.*" Another respondent wrote that "*the usability of the LMS can be improved by employing more staff on the Help desk.*" As discussed before, usability is considered one of the most important quality attributes, being a fundamental aspect in all software products. It is even more crucial in those systems that are designed for a wide variety of users like LMS (Guerrero, 2018). High on the list of usability issues to be concerned about is that of navigation of the LMS. According to Arshad (2016), navigation of the LMS is one of the most vital factors of usability to be considered for critical evaluation. Usability evaluation is a critical factor in determining LMS usability problems. Fixing such usability problems will increase LMS usage because many users will find the systems easy to learn, easy to use and, therefore, user-friendly (Mtebe, 2015).

User-centred design (UCD) approach

In an LMS environment, a user-centred design involves designing the course with the learner and the tutor in mind, taking into account their goals, needs and preferences. From the study, 6% of the respondents said that embracing a user-centred design approach would improve the usability of the LMS. A respondent wrote: "*Involve the teachers in content development and systems customization to suit their taste would improve the usability of LMS*". This is in line with Lambropoulos' (2006) observation that UCD can be a powerful approach for designing efficient and effective LMS.

Design for PWDs

One per cent of the respondents said that it was important to design for PWDs. This is consistent with Bagumas (2021) observation that LMS should be developed in such a way that users with visual, auditory, speech, dexterity, cognitive, mobility and other disabilities can engage with content easily and effectively. Beyond the intentional design of e-learning, it may also be paired with assistive devices and technology, as necessary.

Design for all courses

The study reveals that 1% of the respondents said there was a need to redesign the LMS to cater for other courses. This is consistent with Ouma (2023) who posits that there is a need to broaden the scope of LMS to embrace a wide range of aspects, such as distance learning, flipped classroom and blended learning, practical courses, and crafts, in addition to virtual learning. He recommends that the use of recorded videos and social media, especially where virtual learning is limited, can be a good boost to achieve learning objectives.

3.   Support Services

There is a need to provide technical support and assistance to LMS users.

Regular training

From the results displayed in Figure 2, 31% of the respondents recommended regular staff training. One of the respondents said: "*More training should be extended to staff members.*" Inadequate training of tutors is a great hindrance to LMS usage. A study conducted by Unwin (2010) in 25 African countries discovered that 74% of the tutors lacked adequate training and technical support. This hindered the universities from making full use of LMS features. Mtebe (2015), therefore, recommends that universities should set up functional Information Technology (IT) Units to provide support and regular training services to both students and faculty members.

Provide demos and user manuals

Another 1% of the respondents observed that there was a need for demos. According to Greenwald (2014), demos can be in the form of video tutorials, user manuals demonstrating how the system works, brochures, pictures and other tools.

Help desk

The study further found that 6% of the respondents hinted that there was a need for help desk services. One respondent wrote that "*the usability of the LMS can be improved by employing more staff on the Help desk.*" This is supported by the recommendations by Bagarukayo (2015) and Mayanja (2019) that e-learning support services (Greenwald, 2014) should be provided both online and offline. This could range from the provision of email addresses, telephone numbers, and chat rooms to hands-on services for handling tutors'/students' complaints.

Conclusion

Usability plays a pivotal role in the uptake of LMS. It is a very important aspect considered while evaluating an e-learning system and, therefore, an investigation of usability and its integration or contribution to the learning process is worthwhile. Usability evaluation is a critical factor in determining LMS usability problems. Fixing such usability problems will increase LMS usage because many users will find the systems easy to learn, easy to use and user-friendly. This study undertook a usability study of four public universities in Uganda to measure the usability level of the different LMS, identifying challenges and determining ways of addressing the challenges. The findings of the study revealed that the SUS score for the LMS was 60. This indicates that the LMS usability was 30%, which

reflects poor usability. The poor usability, as the investigation found out, was caused by several usability challenges, namely the existence of too many steps; the lack of clear steps and guidelines; inconsistent availability online; navigation challenges; not being suitable for the users' curricula; difficulty in recognising icons and symbols; and the LMS not being relevant. The study proceeded to investigate ways of addressing the LMS usability challenges. The study, thereafter, presented the IDSS model for improving the usability of LMS in public universities.

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Channels and Types of University Industry University – Industry Technology Transfer and Their Effectiveness: A Case of Public Universities in Uganda

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Abstract

It is widely acknowledged that University-Industrial Technology Transfer (U-ITT) is a key university priority, in addition to the mission of teaching and research. More recently, the increased recognition of universities as core actors in national innovation systems and the changing complexity of societal needs have made it imperative for various stakeholders to work together more strategically. In this vein, we set out to explore the preferred channels and types of U-ITT and their effectiveness. The study intended to answer the following question: What mechanisms do public universities in Uganda use to transfer technology to the industrial sector and how effective are they? We utilised a single case study design anchored in the interpretivist lens and purposively selected a public university that explicitly acknowledges U-ITT as one of its core functions. Data was generated through reviewing government and institutional documents as well as qualitative semi-structured face-to-face interviews and analysed using Nvivo 9. We discovered that different departments and faculties use different mechanisms to transfer technology to industry, ranging from research publications and conferences (informal) to spin-offs and patents (formal). The study concluded that U-ITT at public universities is largely through informal means, implying limited interaction with industry. We recommend that university management should ensure that U-ITT activities are fully integrated into all university academic programmes.

Keywords: *Effectiveness; Innovation; Patent; Spin-off; Technology transfer.*

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Introduction

In this study, we set out to explore the channels and types of U-ITT, in addition to establishing their effectiveness. Scholarly literature shows that institutions of higher education are starting to encourage academic staff to engage in activities that enhance and support U-ITT (Guimon, 2013). Under the U-ITT function, the university relates with the industrial partner to improve the transfer of technology to the latter. The partnership advances academic development through enriching the curriculum, providing experiential learning to students and generating real-time research ideas for staff and students. Furthermore, typical motivations to collaborate with industry in the form of technology transfer (TT) include the improvement of teaching, access to funding, reputation enhancement, and access to empirical data from industry. For firms, the motivations to collaborate with universities may include gaining access to complementary technological knowledge, tapping into a pool of skilled workers, providing training to existing or future employees, accessing the university's facilities and equipment, and accessing public funding and incentives. Industry may also seek to reduce risks by sharing the costs of research and development (R&D) and influencing the overall teaching and research agenda of universities (Guimon, 2013).

While the university benefits from the financial muscle of industry, industry benefits from the intellectual knowledge of universities through innovation (Kaweesi, 2018). Thus, agreements need to be established in a commercially timely manner that ensures the ability to commercialise with appropriate returns. Formal channels of U-ITT include collaborative research, intellectual property transactions, research mobility, academic spin-offs and university graduates joining the industry. Informal channels include research publications, conferences and networking, facility sharing, exchange of personnel, policy briefs and cooperative agreement (OECD, 2019).

Preliminary findings indicate that publications in the form of articles published in academic journals are the major means of TT (Steinmo & Rasmussen, 2018; Schneider, 2015). Unfortunately, the above studies were carried out in the developed world. No comprehensive study has been undertaken in Uganda to establish the effectiveness of U-ITT.

Objective of the Study

The main objective of this study was to identify the key mechanisms that public universities use to transfer technology to the industrial sector and to establish the effectiveness of such mechanisms.

Theoretical Review

Institutional theory

The theoretical framework that informed this study is institutional theory, which is rooted within organisational theory. There are varying theories of organisational analysis. These include the contingency, resource dependence and transaction cost theories. These theories focus primarily on material resources, examining their effects

on organisational structure. They look at organisations as "agentic actors responding to situational circumstances. Senior managers steer organisations by interpreting their contexts and taking appropriate actions" (Greenwood, Oliver, Sahlin, & Suddaby, 2008). Each of these theoretical perspectives focuses on the relationship between an organisation and its environment and examines how each organisation adapts to its environment to secure an appropriate fit (Greenwood et al., 2008).

Institutional theory emphasises that organisations are open systems, strongly influenced by their environments. However, these are not the only competitive and efficiency-based forces at work. Socially constructed belief and rule systems exercise enormous control over how organisations are structured and how they carry out their work (Scott, 2004). Resource-based features such as production and control technologies, patterns of inter-organisational exchange, and regulatory processes (Orrù et al., 1991) that exercise output control over organisations influence organisational structure, and shape internal work systems (Scott, 2004).

The institutional environment encompasses the symbolic and cultural factors affecting organisations (Scott, 2004). Institutional theory, therefore, focuses on the processes and mechanisms by which structure, schemes, rules and routines become established as authoritative guidelines for social behaviour. It emphasises how systems come into existence, how they diffuse and what role they play in supplying stability and meaning to social behaviour. It also considers how arrangements deteriorate and collapse and how their remnants shape successor structures (Scott, 2004). It emphasises that institutions are a critical component of the environment and it is interested in understanding the bases of stability of social forms and the meanings associated with them (Scott, 2004). Contemporary 'neo-institutional' approaches stress the role of cultural cognitive controls. Nonetheless, all institutional arguments cohere around the central tenet that institutions matter in accounting for social behaviour that is, "most institutional theories see local actors whether individuals, organizations or nation states as affected by institutions built up in much wider environments" (Meyer, 2008).

Literature Review

University industrial technology transfer mechanisms and their effectiveness

Universities, like companies, vary enormously in the extent to which they engage in and experiment with new mechanisms to promote the commercialisation of academic research and in the extent to which they succeed in generating additional income from third-stream activities. In studies undertaken by Tornatzky, Waugaman and Gray (2002), the World Bank (2013) and D'Este and Patel (2007), there are five approaches to U-ITT.

Formal mechanisms of U-ITT

First is the industry-sponsored contract research where a university agrees to accomplish specific research and the company pays the university. However, small company participation in university-conducted research is low in most countries (Tornatzky et al., 2002) and this represents a particular issue in development goals. This approach also has the challenge of how to share the royalties between the researcher and faculty which provides the facilities.

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The second approach to U-ITT is company-sponsored research consortia (D'Este and Patel, 2007) which perform industry-focused research in the university. This arrangement helps in securing long-term, large-scale funding for the university. It is easy to pick graduate students for future employment. However, small company participation is weak and there are uncertainties about how to commercialise technology emerging from consortia. When intellectual property (IP) comes out of the work, it is protected via patenting as copyright where all participating companies get a non-exclusive license.

Third is a consulting arrangement where faculty members work as part-time employees of the company where they are engaged. This is lucrative for the faculty members involved and is intellectually stimulating. However, these arrangements are rife with conflict of interest and commitment. The consultant lecturer has parallel obligations to his full-time employer (the university) that may conflict with industry obligations. This implies that he/she may not devote enough time to either the university or to the industry. Researcher mobility includes both permanent and temporary assignments for university researchers working in the industry. In general, researcher mobility is deemed to be of importance because these individuals will act as what is often termed as "knowledge brokers" between universities and industry actors since these individuals are knowledgeable about both the university and industry sectors (Rosli et al., 2018). As such, these individuals can be important links, which could create better relations and interactions between university and industry partners.

Fourth is the licensing of university-developed technology. This usually occurs when research has proceeded to the point where a discreet invention has occurred. Universities transfer tangible intellectual property (IP) to companies embodied in patents, trademarks, copyrights and know-how embodied in trade secrets. However, compensation is complex because few licences are paid upfront but involve the payment of royalties based on revenues from the future sale of goods. However, there seems to be an insignificant investment in capacity on the part of the university. Cohen, Nelson and Walsh (2002) investigated the impact of patenting and licensing as pathways for the transfer of technology from universities to industry. The UK-US survey asked the responding firms to indicate the types of interactions contributing to their innovation activities. The findings indicated informal contacts as the most common, followed by recruitment at first degree or its level, publications and conferences. Formal mechanisms like patenting and licensing were found to be low down the list. Academic spin-offs are when university researchers (or graduates), through a company they own, develop and commercially exploit technologies which are often the outcomes of research conducted by these academics. This link is often deemed to have one of the biggest impacts on the industry (Norwegian University of Science and Technology, 2019; OECD, 2019).

Siegel et al. (2003b), using data on 113 USA Industrial Liaison Offices (ILOs), investigated the effect of royalty payments on faculty members and found that the high rate of turnover among licensing officers was detrimental to the establishment of long-term relationships with firms and entrepreneurs. They concluded that organisational incentives for university technology transfer appear to be an important determinant of U-ITT success. The concerns they found were insufficient business and marketing experience in the ILOs and the possible need for incentive compensation. In the subsequent papers, Link and

Siegel (2005) and Friedman and Silberman (2003) found that the "royalty distribution formula" which determines the fraction of revenue from a licensing transaction allocated to a faculty member who develops the new technology can potentially enhance technology licensing. However, the above two studies did not go into the details of evaluating the efficiency of the ILOs and did not explain the relationship between institutional factors, researcher profile, innovation and the U-ITT in the context of the engineering sciences. This gap was covered by the current study.

Finally, there is joint development and commercialisation of technology. This may involve the university taking an equity piece rather than cash. Joint commercialisation implies a much more intensive and time-extensive involvement on the part of the university in its partner's business. The faculty inventor is likely to take an equity share in the enterprise. With this arrangement, the purpose is not only to transfer technology but also to start a business.

Universities also engage in collaborative research, which is a reference to research projects carried out by university researchers. These projects can be partially or fully funded by industry and range from small- to large-scale projects. Small-scale projects often happen through contract services and academic consultancy in which firms commission universities to perform research. Long-term strategic partnerships often consist of multiple actors as stakeholders, such as university-industry research centres. Research services are often established to solve a concrete firm challenge or to create new knowledge in line with the specifications of the firm and are generally more applied than research taking place in research centres (OECD, 2019). Research shows that collaborative research is often conducted locally (D'Este and Iammarino, 2010). This especially applies to peripheral regions (Johnston & Huggins, 2016), which implies the importance of having research institutions in close geographical proximity to industry. A large database of patent applications for 35 OECD countries and China from 1992 to 2014 shows that 50% of all industrial inventive activity occurred within 30 kilometres of a university (OECD, 2019), which indicates the importance of universities for economic growth.

However, universities seem not to be linked to external entrepreneurial support structures to energise the internal mission and vision that support these activities. In addition, large segments of the university community are likely to be opposed to joint development and commercialisation of technology. For example, in one national survey in the USA, of 985 faculty members, only 26.5% of the respondents were in favour of the university taking an equity position in firms based on university research (Tornatzky et al., 2002).

Research has revealed that there is an inherent mismatch between the research orientations of firms and universities, with an excessive focus on fast commercial results by firms and on basic research by universities (Kaweesi et al., 2019; Guimon, 2013). Collaboration is costly and the returns only accrue in the medium to long run. On the contrary, firms seek short-term results and clear contributions to current business lines. In terms of outputs, firms are usually interested in delaying publications to avoid disclosing information. University researchers, in contrast, are typically motivated to publish research results as fast as possible. In this, industry is concerned about the secrecy of intellectual property (IP) rights and making a profit from them (p.3).

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However, there are several obstacles to effectiveness in U-ITT (Siegel et al., 2004). Such obstacles include cultural and informational barriers, technology transfer office staffing, compensation practices, and inadequate rewards for faculty involvement in U-ITT. Marshall (1985) proposes that the long lag between the discovery of new knowledge at the university and its use by companies could seriously impair global competitiveness. However, both Siegel's and Marshall's studies were conducted in the developed world whose contexts could be different from those in the developing world. Additionally, technological advancement in the past few years could have changed the trends in universities.

Recent studies (Genza et al., 2018) have explored how involvement in the U-ITT activities to industry by academics affects their research productivity, measured by journal publication output. These studies fall into two groups where one of them focuses on academic entrepreneurship and innovative application strategies to the management of educational institutions. This occurs in a way that can result in the reorganisation of an entire education system to meet society's changing needs sustainably.

Informal mechanisms of U-ITT

Informal links of university-industry interaction that diffuse knowledge from universities to industry include research publications that are academic writings presented in academic journals. These interactions take place through conferences, meetings and contact with former classmates employed in universities and industry (Perkmann & Walsh, 2007; OECD, 2019). These networks are recognised as important for developing and maintaining university-industry collaborations (Steinmo & Rasmussen, 2018).

Another form of informal U-ITT mechanism is facility sharing between university and industry partners, who share infrastructure such as laboratories and equipment. It is often expensive to build up a laboratory. Thus, universities often have laboratories that are used for both training students and doing industrial research. Training includes not only courses and continuing education provided by universities to firms, but also lectures held by industry employees at the university.

In a study carried out by Steinmo and Rasmussen (2018), the informal mechanism of U-ITT involves the sharing of facilities between university and industry partners as one of the main channels of U-ITT. Although several studies have been conducted on U-ITT, their respondents are mainly comprised of industry players only. Especially, their cultural contexts differ and it is doubtful whether the same findings can be generalised to the Ugandan context. Additionally, these pathways of TT mechanism have remained under-explored in academic work, often hampered by the unavailability of data (Veugelers et al., 2014, p.39). Specifically, their effectiveness has not yet received much attention from the research community.

Jensen and Thursby (2001) analysed the interaction between university Industrial Liaison Officers (ILOs), university scientists and the central university administration. They found that many scientists reported less than half of the potentially viable commercial faculty inventions to the ILOs. In their model, the principal is the university administration while the faculty and ILOs are the agents who maximise expected utility. They regard the ILO to be a dual agent, that is, an agent of the university and the faculty.

Faculty members have to decide on the stage at which to disclose their invention to the ILO – whether to do it at the embryonic stage or at laboratory scale prototype. Additionally, the ILO has to negotiate licensing agreements with firms as the agent of the administration. In relation to Jensen et al.'s (2001) study, Sierra et al. (2017) investigated the role of the ILO in the university in Mexico's U-ITT. The study looked at the interest and necessity to generate research projects with significant potential to be transferred to different users such as industry, government and society in general terms. However, both studies did not critically look at specific institutional environments. In the current study, the researchers' perceptions, experiences and characteristics were conceived to play an important role.

Siegel et al. (2003) identified several obstacles to U-ITT. These included lack of understanding regarding university, corporate or scientific norms and environments; insufficient rewards for university researchers; bureaucracy and inflexibility of university administrators; insufficient resources devoted to technology transfer by universities; poor marketing/technical/negotiation skills of technology transfer offices; the university being too aggressive in exercising intellectual property rights; faculty members/administrators having unrealistic expectations regarding the value of their technologies; and the "public domain" mentality of universities.

Many authors have attempted to rank the order of the preferred channels and types of U-ITT. The majority of the studies show that informal activities and the 'public space' functions (meetings and conferences, forums, networks, social interactions) are the most widespread forms of interaction (D'Este & Patel, 2007; Abreu et al., 2013). From the review of literature, it was observed that informal mechanisms generate about 60% of the total income obtained by the universities from external sources. At the opposite end, licensing, patenting and spin-outs are the least common forms of interactions, generating less than 3% of the total income that the universities attract from external sources. The explanations lie in the fact that people are more important than patents as a result of like-minded people getting together to address a problem.

Methodology

The study adopted a qualitative approach using a single case study design. During this research, Kyambogo University was selected as the case study. This is because TT at Kyambogo University is on the rise. The target population for this study consisted of the staff from two faculties: the Faculty of Engineering and the School of Vocational Studies. These faculties were selected because they are at the forefront of TT at the university. Moreover, the mission statements of both faculties are " to advance and promote knowledge and development of skills that meet the demands of the modern labour market about job creation, innovativeness and transformation of society." Furthermore, the two faculties have very vibrant and running spin-offs collaborating with industry. The graduates of the two faculties have been more job creators and innovators than job seekers and are at the forefront of implementing the government policy of skilling Uganda within the framework of the National Development Plan and Uganda Vision 2040. In selecting the samples, purposive sampling was used to select the six heads of academic departments from the two faculties. The departments of the Faculty of Engineering included Civil and Building Engineering, Mechanical and Production Engineering, and Electrical and Electronics

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Engineering. The participants were assigned the pseudonyms PP1, PP2, PP3, PP4, PP5, and PP6, with PP1 referring to Participant One and so on. The departments of the School of Vocational Studies included Family and Consumer Studies, Nutritional Science and Dietetics, and Cosmetology and Fashion. These departments offer academic programmes at diploma, bachelor's and master's levels. In selecting the samples, we assigned each participant a pseudonym to ensure confidentiality and anonymity. The purposive sampling technique was used because it was found to be ideal for the identification and selection of information-rich participants.

The data for this study was generated through face-to-face semi-structured interviews as well as document reviews. During the study, we visited the selected participants. The choice of methods was influenced by the nature of the research problem, the purpose of the study and the desire to generate detailed data. Out of the six selected respondents, we managed to interview five, as one of the participants was reported to be out of the country. In this study, the organisation of data sources, coding and searching for the data was carried out using NVivo 9. After transcribing the interview recordings, the interviewees' actual names were replaced with participants' (PP) numbers.This aimed to ensure the anonymity of the interviewees and thereafter created a project in NVivo and all the data sources were imported into the project.

Data quality control

Qualitative research seeks to produce credible knowledge of interpretations, processes and understanding, with an emphasis on uniqueness and context. There are four criteria of research trustworthiness developed by Lincoln and Guba (1985) which have been widely cited in social science research methods literature (Kalof, Dan & Dietz 2008; Bryman, 2012) to evaluate the quality of qualitative research. Credibility deals with the accuracy of data to reflect the observed social phenomena. On this aspect, we carefully selected the participants who had some administrative as well as lecturing responsibilities. We then prepared a detailed interview schedule with questions covering all the required data. During the interview process and data analysis, we followed the research procedure and methods that had been used previously.

Transferability refers to the level of applicability of the study findings to other settings. As suggested by Lincoln and Guba (1985), a rich and thick explanation of research sites and characteristics of case organisations should be provided to enhance transferability. Although qualitative research findings are specific to individuals and a small number of particular environments which could not be generalised, inferences can be drawn from our study. Dependability corresponds to the notion of reliability which promotes repeatability (Wahyuni, 2012). With regard to this, general coding was done as well as analysis of data. We also recorded and transcribed verbatim all the interviews.

Confirmability refers to the extent to which others can confirm the findings in order to ensure that the results reflect the understandings and experiences from observed participants, rather than the researcher's own preferences. This research contains detailed information about vital issues and processes relating to U-ITT. In addition to the interviews, the research contains extracts from documents to corroborate issues in the interview.

Findings

We asked the participants to explain the mechanisms used for U-ITT at Kyambogo University. The aim was to explore the perceptions of the various players on how technology is transferred to the industrial sector. The findings reveal that there are two distinctive mechanisms of TT at Kyambogo University. While some departments use structured (formal) means of U-ITT, other departments capitalise on using informal means. **Informal mechanisms of U-ITT** included research publications, staff mobility, conferences, workshops and training services.

Mechanisms of U-ITT

On the issue of the mechanism of U-ITT at Kyambogo University, PP4 said:

> One sugar industry's work processes were not proper. Our department suggested certain ideas. Uganda Communications Commission wanted some work done. It defined the objective of the work needed and they advertised. Our department applied. It was competitive. The other example of industry-sponsored contract research we have worked on is a project for the Engineering and Physical Sciences' Research Council which was accomplished in partnership with other organizations such as the Uganda Electricity Regulation Authority.

On the same issue of the U-ITT mechanism, PP3 said:

> Knowledge transfer graduate students work with knowledge institutions. The graduate students work with their supervisors to discuss and solve particular societal problems. Here we look at the method and procedure and how to solve the problem. For me as the leader at this place, I must ensure that every student has an academic inspector in the company. We visit the students four times in 10 weeks to see what they are doing in companies. I also monitor the inspectors to ensure that they do their work.

A review of the Kyambogo University Strategic Plan (2012/13–2022/23) reveals that the promotion of collaboration with the private sector in research, teaching and information management has enhanced staff participation in consultancy activities and has led to a strategic alliance in consultancy with reputable consultancy firms. This has enabled technology transfer to the following ministries: Education and Sports; Trade and Industry; and Gender, Labour and Social Development (pp. 66–68). Documents such as the Kyambogo University Master Plan (2014–2024) reveal that Research, Innovation and Knowledge Generation initiate partnerships and encourage joint academic research action through the development of a policy framework for the development of collaborative linkage. Furthermore, there has been increased financial resource generation that has increased the inflow of financial resources to the university. This has been achieved when the faculties and schools have undertaken award and non-award research activities as follows: 69 graduate research projects, and 52 staff research projects – 14 for master's and 38 for doctoral programmes. Consultancy projects have been undertaken to train the clerical and administrative staff of Uganda Revenue Authority by the School of Management and Entrepreneurship (pp. 53–54).

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PP6 gave a rich narrative that demonstrated the main mechanism of U-ITT at his department:

> We engage in industry-sponsored research. For instance, we are working with an automobile industry that deals with processes within car engines to ascertain whether it is feasible to measure the combustion processes in engines using the academic's laser-based measurement techniques. The industry partner provided the test engines and the fuel injection equipment. The technical work is done largely by master students in collaboration with their supervisors. The industry engineer provides co-supervision and several professors attend meetings to monitor project progress. Another project consists of joint research with industry participation. This project was initiated by academics in this department. The industry partnership was approached at the stage when the project proposals were already defined… This project had an academic orientation and the possibility of publishing in a peer-reviewed journal. However, because of the academic orientation of the project, industry representatives have had little involvement during the execution of the project.

The industry-sponsored research projects often rely on the general expertise of the academics from the university and the labour provided by the graduate fellows (who are usually master's degree students). That is usually the case when an idea originates from an industry rather than the university. When the project idea originates from the university and the research undertaken in university laboratories in the form of joint research, the projects tend to orient towards the long term and is usually considered to be a research project with little immediate commercial payoff.

PP5 added:

> Our department engages in contract research including a great deal of research with food processing firms and NGOs. Some companies pay the university for the consultancy to physically solve a problem. You follow the production process to solve a problem. In this case, there is a direct interaction between academic and non-academic professionals. This will in the future lead to other longer-term U-ITT mechanisms such as licensing. However, consultancy may not generate new technological knowledge but it may promote organisational innovation.

Concerning the benefit the industry gets from the university, it was found that university lecturers train industrial workers. E-kampus was a brainchild of the Department of Electronics. Later proposals were made to the government, which brought engineers from abroad to improve innovation and imposed an Education Information Management System (EIMS) which all public universities have to utilise.

The view held by one participant is different, though, when asked about the mechanisms of TT. He had this to say:

> Our staff do some work in other universities and technology-based institutions. They go to newly established universities to train the young engineers (staff) and help them organise their departments. We have a memorandum of understanding with several engineering-based institutions and this is part of the work we do there. Almost all our staff are involved in this activity. Informal social interactions can help spark dialogue and work relationships. Purposefully using university facilities for events and social engagements can facilitate such interactions.

When asked about the mechanisms departments use to transfer technology to the industrial sector, PP5 responded:

> Kyambogo University with partner universities in Kenya and Nigeria organise annual conferences in which knowledge created in the partner universities is disseminated to the intended beneficiaries. This annual international interdisciplinary research conference (IIRC) draws close to 350 participants and each time, over 200 oral papers are presented. This year, my department shared information and findings on the following: Design and Fabrication of Automatic Garbage Collector. This project was designed to initiate the efficient working of systems that remove the garbage from the drain system each time any solid waste appears and throws it into the waste bin to avoid blockage.

PP1 revealed:

> ...The project we presented at the University of Eldoret conference concerned the characteristics of spot welding electrodes with annual recess designs. The researchers in my department investigated the characteristics of resistance welding electrodes with annual recess design for supplying an electric current to metallic materials for welding two workpieces together. The engineers from my department shared on how electrical and heat-resistant material containing ceramic cement mixed with clay. The study showed that conventional spot welding tools produce joints that are stronger on the edges but weaker in the centre of the nuggets which presumably experience high voltage concentration.

PP2 stated:

> We investigated the properties of *Oxytenanthera abyssinica* bamboo for its potential use as emergency shelter construction materials to respond to the shelter needs of the South Sudanese refugees in Uganda. The results showed that *Oxytenanthera abyssinica* bamboo characteristics strengthen properties that are superior to ordinary wood. Our ideas were shared with participants at the 6th IIRC held at the University of Eldoret last September. I can say that our findings generated a lot of debate among the participants at the conference, many of whom were coming from the industrial sector.

The findings demonstrate that the technology available in Kyambogo University can be used by industry to improve the methods of production and the quality of what is being produced. A key implication of this argument is that industries require a strong contingent of highly qualified research scientists and engineers recruited from universities to develop the ability to assess and absorb scientific knowledge. These highly trained scientists and engineers bring to the firm not only a strong knowledge base and research skills, but also a network of formal and informal academic contacts acquired during their training. However, the university has continued to largely carry out basic research as opposed to applied research. The implication of this is that TT cannot be promoted because research is being undertaken in ways which are not relevant to the industry.

Effectiveness of channels and types of U-ITT

Traditionally, the industrial sector seeks partnerships with universities as a means of identifying and training future employees. Industries also play a role in defining student research projects that focus on problems of direct interest to industry and this, in turn, increases the propensity of firms to introduce new products on the market. According

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to one participant, the most important link to the university is through recruitment of skilled graduates. The implication of this is that firms get educated and trained workers. This enables the competitiveness and innovative capacity of industries. The continued emphasis on traditional outputs for academic work, such as publication, has meant that collaborative industrial R&D is not valued unless it adds to their income.

Participants were asked to articulate the main benefits of TT. PP2 elucidated:

> There are quite many benefits that the department gets from industry, including money, training students and acquisition of equipment. For instance, industries give us equipment for our practical use. However, we as a department have also contributed immensely to the productive sector. For example, when our students visited Nsambya Hospital, they found the X-ray was disused. It was repaired by our students. More so, students from this department recently repaired, cleaned and fixed some medical equipment at Lira Regional Referral Hospital in Apac District. This was in the departments of Theatre, Laboratory, Radiology, Air Conditioners and Refrigerators, which had fallen into disuse. The team worked on an autoclave, anaesthesia machine, patient monitors, an oxygen concentrator, an operating lamp, theatre beds, trollies, a diathermy machine and a nebulizer. The beds are now electrical, which saves time during surgery.

The implication of this is that the TT channels at the university are shifting from being informal to formal, where tangible benefits are acquired. This is of great use to both the university and industry.

Discussion

The findings demonstrate that Kyambogo University has made efforts to foster U-ITT with industry through participation in public shows and conferences. With such ventures, Kyambogo University's staff share knowledge with the non- academic public and contribute to public debate. The Kyambogo University staff members sometimes carry out regulated experimental development through a contract with specific industries. The idea is to satisfy the requirement of a particular industry that will have defined the work to be done and finances its variable costs, and the outcome will belong to the industry. The results derived from such a project are usually for the industry that contracts the services of the faculty.

Rewarding scientists at the departmental level is done through conferences sponsored by the university, where the best presenters are given some money by the university. However, even though some measures are being applied to bring the industry closer to the university, there is still no evidence of an aggressive marketing strategy which would include inviting firms to evaluate the technology and look at the equipment being possessed by the university's laboratories. It is a fact that industries usually pursue the university and often engage the researchers themselves.This corroborates the findings of Kaweesi (2019) and Guimon (2013), who revealed a mismatch between the research orientation of the university and that of industry.

This necessitates the presence of enough competencies in user commercialisation and intensive interactions with the technology source. Information asymmetries between the knowledge producer and user can be an obstacle to its effective exploitation and, thus, substantial effort may be necessary to transform such knowledge into products and services

(Fontes, 2005). The transformation process involves devising applications for new scientific concepts and tuning technologies and prototypes into viable products or services. It also entails an uncertainty-reducing element, which is crucial from the adopter's viewpoint. The transformation process involves the integration of knowledge coming from different areas, both scientific and functional. In this regard, personal mobility, shared contexts, and integration of knowledge trial-and-error experiments are key elements.

The absence of an intellectual property rights management (IPRM) policy at some public universities has led to the loss of revenue by the universities. For example, the government did not pay anything to Kyambogo University for the takeover of its innovations. The same scenario happened at Makerere University when the government took over the Kiira car innovation. However, because Makerere University had an IPRM policy, it managed through court to win back a 5% royalty from the government on its innovation.

Continued interactions between universities and industry provide university researchers with a better understanding of the different norms, values and frames of reference that apply to the industrial and academic sectors. The experience of collaboration leads to greater convergence in attitudes, making it easier to arrive at a common understanding of the different aspects of the collaboration process. In this case, interaction has a positive influence on the propensity of universities to enter into collaborations with firms. This is because it increases the probability that each partner gains useful insights in the process. While universities gain in terms of money, equipment, exposure, knowledge and skills from the continued interactions with the industries, the latter acquire knowledge, skills and new innovations from the universities. In other words, academics and industry representatives may have different mindsets, but their differences should not interfere with their capability to interact.

One of the major barriers to U-ITT is that many large-scale industries are multinational corporations (MNCs) with branches across the world. Such industries may not take an interest in local technologies. Instead they import technologies from their mother countries. Action is needed to establish legal conditions to encourage and enable Indigenous researchers to be more innovative. In the same vein, action is required to establish IPRM policies to prioritise the protection of local inventions. The client defines the research to be carried out. Therefore, contract-research involves simultaneous production and transfer of technology to satisfy the needs of the client.

A key finding of this study is that many of the academic start-ups at KyU are based on the researcher's technology. Although entrepreneurial training is spread across all departments of the Faculties of Engineering and Vocational Studies and in other faculties of Kyambogo University, there is a challenge to encouraging academics to turn their business plans into start-up ventures. The creation and support of new ventures remain a marginal activity. This can be reversed by changing the mindset of the university stakeholders from teaching as the main activity of the institution to research and commercialisation. One of the main challenges faced by academic start-ups is that these infant industries come up as a result of technology generated in universities. In addition, many of them tend to leave the university premises where they would benefit from state-of-the-art facilities, free accommodation in the incubator and expert staff. They opt to toil in the world of

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competition. The implication of this is that young industries lose the verification of the technical feasibility of their concepts. The above finding corroborates the earlier findings of Rogers et al. (2001), Mendoza and Sanchez (2018) and Rogers and Steffensen (1999), who presented five channels through which technology transfer occurs from university to industry. One of them is through spin-offs. The spin-offs are the technology-based companies whose initiative is generated by university personnel to transfer technology through the market, knowledge or research results with high added value and economic potential. With such a company, the technology is transferred from a patent company. Such a company is formed by individuals who were former employees of the parent university.

Critics of the commercialisation of university inventions (Dalmaco et al., 2018; Rasmussen et al., 2014; Mendoza et al., 2018) claim that too much reliance on commercial orientation endangers the university as an independent knowledge producer. They assert that the primary function of the university is to teach and do research which should be published in academic journals and that patenting is never a primary role of the university.

Regarding the effectiveness of U-ITT mechanisms, the findings reveal that it is more important for an industry to work or collaborate with universities than on publications or conferences. A formal collaborative arrangement between the two institutions is associated with highly innovative industries that have developed R&D units. However, Kyambogo University attaches greater importance to all U-ITT mechanisms than industrial partners do. Often, U-ITT researchers and professionals at Kyambogo University do not use formal tools for the valuation of the technologies developed in the university, yet companies have good knowledge about market opportunities. This implies that Kyambogo University finds it difficult to negotiate and set prices for its inventions. The university's engagement with industry poses great challenges as tension exists between the third mission (entrepreneurship) and the missions of teaching and research.

University lecturers do not view it as one of their roles to take on more entrepreneurial initiatives on behalf of their institutions. This corroborates the findings of Cloete et al. (2011), who found an inherent mismatch between the research orientations of firms and universities, with an excessive focus on fast commercial results in firms and on basic research in universities. Bogoro (2015) agrees with Guimon (2013) when he says that in most African countries, partnerships between local industries and universities are not very common. Hence, the transformation of research results into products/technologies is usually left to the individual who, without the necessary institutional framework and experience, only allows the idea to collect dust in a little-known journal.

Institutional theory explores how political institutions influence organisational behaviour and outcomes. The government's inertia in enhancing technology transfer between universities and industry has affected collaborative arrangements between the two entities.That is why the transfer is largely informal in the form of conferences, individual professor agreements and networking with industry. Institutional theory is relevant to U-ITT in three aspects: institutional environment; institutional actors; and institutional arrangements. Formal and informal structures such as university policies, strategic plans, laws and networks facilitate or hinder U-ITT. Institutional theory, for instance, suggests that the effectiveness of U-ITT channels depends on the alignment between institutional arrangements and the needs of university-industry collaboration. At Kyambogo University,

the faculties/school offices intended to propel collaborations are weak. The licensing and patenting arrangements are poor, yet intellectual property management policy has not been approved by the highest policymaking body of the university. Only training, educational programmes, and research collaborative arrangements have been embedded in all curricula of the various programmes.

Furthermore, given that contract research is carried out on an individual/group basis without being coordinated by academic units, it contradicts the findings of Clark (1998), whose pathways to organisational transformation advocated a strengthened steering core. This is where organisational survival requires faster decision-making processes, flexibility and attention to the increasing diversity in demand. This implies that the steering core comprises the central administration and the academic departments that provide managerial and academic balance at the university.

Although university scientists are required to disclose their inventions to TTOs, the case is quite different at Kyambogo University, where a large percentage of university inventions are informal. This is largely because the IPRM is not well developed at the university. However, the university is devising mechanisms to compensate researchers when their research findings go public. Notable among these mechanisms is the licensing of royalties. This agrees with Abreu et al.,'s (2009) survey that cited intermediaries that facilitate and manage contractual and relational interactions of U-ITT. In the PACEC/CBR survey, only 13% of the academics chose the TTO route. Similar to the UK's position, Bruneel et al. (2009) observe that it was not until 2008 that many UK universities started to invest in professional systems for technology transfer.

Conclusions

This study investigated the channels and types of U-ITT and their effectiveness at the Kyambogo University faculties of Engineering and Vocational Studies. From the findings of this study, a number of conclusions were drawn. It emerged that the two faculties largely transfer technology to the industrial sector through informal means. These include conferences, workshops, research contracts with the industrial sector and spin-off creation. This implies that technological transfers are diversified, with each department pursuing a different mechanism. The implication of this is that there are low levels of professionalism in the departmental management of U-ITT. Regarding the diversity in U-ITT management among departments in the faculties, TTOs are staffed with researchers who have an academic background with no experience in commercialising technology for the market. As such, U-ITT is not effectively and efficiently transferred to industry. More importantly, the activities of the informal mechanisms are not recorded by the university, an indication that the interface between the university researchers and industries is not well documented. However, spin-off creation in departments where it is practised enables academic researchers to interact and share their technology with industries using structured mechanisms. Although the mechanisms of U-ITT are not well managed, they are non-existent in some departments. The majority of the academics in the faculties lack the culture and disposition to link up with the industrial sector.

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Recommendations

The study, therefore, makes the following recommendations:

It was found that the staff of Kyambogo University involved in marketing the inventions have expertise in engineering and not marketing. The researchers, therefore, recommend that there is need for experts who understand the marketing process as well as turning new ideas (inventions) into products (innovations).

The study also found that there is minimum interdisciplinary research at the university. Therefore, stimulating interactions within universities across teams of researchers with complementary expertise should be encouraged, regardless of their disciplinary affiliation. Additionally, interdisciplinary research programmes that include industry partners should be encouraged at the university.

It was further found that most of the interactions between Kyambogo University and industry is through informal means. In this regard, the study recommends that the university should take advantage of its position as a public institution to leverage public spaces for open-ended debates on local economic, social and technological challenges. This can be done through organising and hosting events that bring together academics and industrial representatives, along with other relevant stakeholders. Informal social interactions should not be phased out completely because they can also help spark dialogue and work relationships. Purposefully using university facilities for events and social engagements can facilitate such interactions. The private sector should be encouraged to work with universities in the enhancement of U-ITT.

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Validating the Measures of Path-Goal Leadership Theory in the Context of Academic Staff at Kyambogo University, Uganda

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Abstract

The study validated the measures of the path-goal leadership theory in the context of full-time academic staff at Kyambogo University. Based on House's conceptualisation (1971), the path-goal leadership theory was studied in terms of directive, supportive, participative and achievement-oriented leadership. In this cross-sectional study that involved a sample of 201 from among full-time academic staff at Kyambogo University, data was collected using a self-administered questionnaire. Descriptive statistics and structural equation modelling (SEM) using Smart PLS for partial least square structural equation modelling (PLS-SEM) were used to determine the presence of the four constructs of the path-goal leadership theory, namely directive, supportive, participative and achievement-oriented leadership behaviour. Descriptive results indicated that the above four constructs of the path-goal leadership theory were highly practised by managers at Kyambogo University. PLS-SEM showed that the indicators that were used to measure the above four types of leadership behaviour were appropriate measures. The study concluded that the indicators assessed in this article to measure the four leadership behaviours within the path-goal leadership theory, namely participative, supportive, directive and achievement-oriented leadership, are valid and reliable. It was recommended that researchers use the indicators assessed in this article to measure the four leadership behaviours within the path-goal leadership theory

Keywords: *Directive; Supportive; Participative; Achievement-oriented; Leadership behaviours.*

Introduction

The path-goal leadership theory (House, 1971) is based on the expectancy theory of motivation (Vroom, 1964) in which employees believe they will be able to attain a set target by their employer, that they will be rewarded when the target is met, and that the reward will be valued. Leaders achieve followers' motivation by articulating goals, clarifying the path, removing obstacles, and providing the much-needed support to enable the attainment of the goal for both the organisation and the individual employee (Steinmann et al., 2018). The path-goal theory assumes that a leader selects the most suitable leadership behaviours based on subordinates' abilities and contextual circumstances, as well as incentive elements to be able to influence subordinates towards the achievement of the goals (Fred, 2011). The path-goal theory first appeared in leadership literature in the early 1970s in the work of Evans (1970), which explained what motivates followers (employees). Building on Evan's work, House (1971) came up with the path-goal theory in which he describes how leaders can assist followers in reaching their goals by selecting behaviours that are best suited to the demands of the followers and the circumstances in which they work. According to House and Dessler (1974) and House and Mitchell (1974), the purpose of the path-goal leadership theory is to improve follower performance and motivation by focusing on followers' needs. As such, leaders motivate followers by increasing the number and variety of payoffs they obtain from their work. According to House (1971), the path-goal leadership theory aims to clarify how leaders might assist their followers in achieving their goals. Therefore, the theory classifies leadership behaviours into four categories – participative, supporting, directive and achievement-oriented.

Participative leadership behaviours describe leaders' appreciation of subordinates' suggestions and opinions, as well as encouraging employees at all levels of the organisation to share ideas towards the achievement of organisational goals, problem-solving, and other organisational issues that may directly affect them. Therefore, participative leadership allows for the sharing of responsibilities among subordinates (Olowoselu et al., 2019). Supportive leadership behaviours denote a leader who shows emotional support for subordinates, shows concern for their personal needs and well-being, acts in a warm and approachable manner, and pays close attention to the comfort and needs of followers (Farhan, 2018). Directive leadership behaviour defines a leader who assigns tasks to subordinates, explains the ways to complete the tasks, schedules tasks for subordinates, establishes clear guidelines and policies, and states clearly what is expected of subordinates in terms of performance (Steinmann et al., 2018). On the other hand, achievement-oriented leadership behaviours characterise a leader who sets tough but reasonable goals for followers, sets high standards for followers, and continually looks for ways to better followers (Nzeneri, 2020). On their part, Oyetunji et al. (2019) contend that leadership behaviours are a prerequisite for successful employee performance, especially in the 21st Century business environment, given that it inspires employee behaviours and attitudes, thus playing a central role in improving employees' interest in the organisation. Further, Asena (2020) opines that leadership behaviours play a pivotal role in determining workers' performance in the organisation by influencing thinking and actions.

However, the leadership behaviours of Kyambogo University administrators leave much to be desired. For instance, a study by Kato et al. (2023) reports that Kyambogo

University leadership lacked a unifying vision, inclusivity, collegiality and coherence. Okello (2019) points out the existence of non-inclusiveness and leaders exhibiting incoherent leadership skills, which led to inefficient service delivery. Further, Kasule (2019) calls for Kyambogo University leaders to address concerns in governance at both unit and institutional levels through the establishment of representative committee structures, transparency in decision-making, genuine consultation processes and open channels of multi-directional communication. Nevertheless, Namubiru et al. (2017) note that power-sharing has been a challenge since the establishment of Kyambogo University, with power being held by those in higher leadership positions at the expense of the majority, who also have a stake in the institution. Similarly, Tumuhimbise (2017) reveals that the management of Kyambogo University failed to properly perform their administrative duties and tasks, which hurt the university's overall performance. The above contextual and empirical evidence seems to suggest that the Kyambogo University managers seem low on the scores for leadership behaviours of the path-goal theory. Therefore, this study aimed to validate the measures of the path-goal leadership theory and proffer the indicators that can be used to measure participative, supportive, directive and achievement-oriented leadership behaviour in the context of academic staff at Kyambogo University. The study specifically tested whether leaders at Kyambogo University engaged in (i) participative leadership, (ii) supportive leadership, (iii) directive leadership and (iv) achievement-oriented leadership behaviours. It also proffered indicators that can measure the four leadership behaviours.

Literature Review

The path-goal theory proposes four behavioural leadership styles, namely participative, supportive, directive, and achievement-oriented. Participative leadership involves delegating authority to subordinates, engaging them in decision-making, and seeking their input. By doing so, leaders empower subordinates to contribute to decisions that impact their work and well-being within the organisation (Usadolo, 2020). Scholars (Arnold et al., 2002; Batubara et al., 2020; Ochieng et al., 2023) have measured participative leadership behaviour. For instance, Arnold et al. (2002) developed a scale with indicators such as encouraging idea sharing, listening to suggestions, using collective input for decision-making, and giving all members a chance to voice their opinions. Batubara et al. (2020) used indicators like coordinating work, involving employees in activities, accepting suggestions, and providing solutions to employee problems. Ochieng et al. (2023) used indicators like consulting employees when facing problems, seeking suggestions on assignments, and involving employees in decision-making. Although these studies demonstrate the measurement of participative leadership, some of the indicators measured were different, suggesting the lack of a standardised tool to measure this construct. This highlights the need to validate the indicators used in the current measurement scale.

Supportive leadership refers to a leader's ability to be approachable, demonstrate concern for subordinates' well-being, and attend to their needs (Farhan, 2018). Scholars (McGilton, 2010; Prihandaka et al., 2022; Uman et al., 2024; Mutonyi et al., 2021a) have measured supportive leadership in their investigation. For instance, supportive leadership refers to a leader's ability to be approachable, demonstrate concern for subordinates' well-being, and attend to their needs (Farhan, 2018). For instance, Uman et al. (2024) developed

a scale with indicators such as providing support and feedback, involving subordinates in decision-making, and encouraging professional development. Prihandaka et al. (2022) created a scale with indicators like providing assistance to improve performance, encouraging others to produce better work, and maintaining positive relationships. McGilton (2010) developed a supportive leadership scale with indicators like recognising the abilities of subordinates, meeting their needs, understanding their concerns, and providing subordinates' feedback. Mutonyi et al. (2021a) measured supportive leadership based on indicators like showing concern for employees' well-being, creating a pleasant work environment, and enabling idea generation and promotion. These studies demonstrate that scholars have varied indicators to measure supportive leadership, although some were similar. This highlighted the importance of a standardised tool to measure this construct, hence this measurement scale.

Methodology

Research design and sample

The study adopted a cross-sectional research design that enabled the gathering of data from study participants at a particular point in time to provide a snapshot of the current conditions regarding the studied variable (Wang & Cheng, 2020). While data was collected from a sample of 201 full-time academic staff of Kyambogo University out of a population of 415 based on the table for sample size determination provided by Krejcie and Morgan (1970), the results presented were based on data from 175 academic staff after data processing that eliminated missing data and outliers. Simple random sampling was used to collect information from respondents since it provided equal opportunities for all academic staff members to participate in the study. This made it feasible to collect the data needed to generalise the study's conclusions.

Instrument

The data collection instrument was a self-administered questionnaire developed based on an earlier instrument developed by House (1996), which operationalised the path-goal leadership theory in terms of participative, supportive, directive and achievement-oriented leadership. The indicators were adopted from the comprehensive indicators developed by Yan-Li and Hassan (2018). The indicators for participative leadership were superiors consulting with subordinates; listening to ideas and suggestions receptively; seeking suggestions on assignment execution; considering suggestions even when disagreeing; promoting open and honest self-expression; involving staff in administrative activities; and using subordinates' suggestions in decision-making. The indicators for supportive leadership were superiors maintaining friendly and supportive working relationships; fostering a pleasant work environment; enhancing personal feelings; providing help when needed; being thoughtful; offering encouragement; being reliable; understanding the perspectives of others; and inspiring staff. Directive leadership was measured using indicators relating to superiors clearly communicating their expectations; providing guidance on role performance; requiring adherence to standard rules and regulations; explaining expected performance levels; giving clear job expectations; and setting achievable goals to accomplish. Achievement-oriented leadership behaviours utilised

indicators like superiors letting subordinates know that they expect them to perform at a high level; setting challenging goals for subordinates; encouraging subordinates' continuous improvement; showing confidence in their abilities; and consistently setting goals that push subordinates to achieve more. The indicators of different dimensions were scaled using the five-point Likert scale, with one as the minimum (worst-case scenario) and five as the maximum (best-case scenario). The anchors used were 1=Strongly disagreed (SD), 2= Disagreed (D), 3= Not sure (NS), 4=Agreed (A), and 5 = Strongly agreed (SA).

Ethical Considerations

The researchers followed all appropriate ethical standards for conducting the study, including seeking free and informed consent, obtaining non-coercive disclaimers, respecting anonymity, confidentiality and privacy, as well as exhibiting honesty. To ensure free and informed consent, the investigators informed the study participants of the study's relevance so that they would voluntarily participate in it. For the non-coercive disclaimer, the researchers explained to the academic staff that no penalties were to be extended to those who refused to participate in the study and as such they were free not to participate. To ensure respect for anonymity, the investigators ensured that the identities of the study subjects were not linked to the personal responses of the study participants and this was done by not allowing the participants to indicate names or personal information on the questionnaire. To maintain confidentiality, the researchers explained to the study participants that they had the liberty to provide or withhold private information as much as they wished during the study. Further, the researchers confirmed to the study participants that they would not share private information with a third party without their consent. Additionally, to preserve privacy, the researchers let the study participants choose when, how much, and under what broad conditions they would provide private information. Further, the researchers acknowledged the sources of information used in the study and tried as much as possible to be honest in reporting the study findings. To ensure voluntary participation in the study by the participants, the researchers clearly explained the relevance of the investigation to the study participants. Further, this helped the study participants to understand the benefits of taking part in this study.

Data Analysis

Data was analysed using partial least square structural equation modelling (PLS-SEM), specifically the SmartPLS 3 software, due to its ability to produce higher-order constructs and estimate complex models with many latent variables (Sarstedt et al., 2020). Partial least square structural equation modelling (PLS-SEM) was carried out to develop the model showing appropriate indicators for the different dimensions of the path-goal leadership theory.

Results

Background characteristics of the lecturers

The background information on the study participants involves respondents' sex, marital status, academic rank, time spent teaching at the university, and highest academic qualification. Regarding the respondents' sex, the results showed that 69% were male, with females being 31%. Data on the marital status of the respondents revealed that 85.9% were married, 11.5% were single and 2.6% were cohabiting. Results related to academic rank indicated that 41% were assistant lecturers, 39.1% were lecturers, 13.5% were senior lecturers, 3.2% were associate professors, graduate fellows accounted for 2.9%, and professors were 1.3%. The results regarding the period spent teaching at the university revealed that 73.7% of the teaching staff had spent over 5 years and above teaching at the university, 17.9% had taught for 3 to 4 years, 5.8% had taught for 1 to 2 years, and 2.6% had taught for less than a year. Results regarding the highest academic qualification indicated that 49.4% of the academic staff had master's degrees, 48% held PhDs, and 1.3% had bachelor's degrees and post-graduate diplomas. Thus, the results were generalisable to academic staff with different academic qualifications at the university.

Measurement models

The measurement models included descriptive results in terms of means, validity tests, namely average variance extracted (AVE), and heterotrait-monotrait (HTMT) ratio of discriminant validity, as well as reliabilities in terms of composite reliability (CR) and Cronbach's alpha. Further, they included collinearity values in terms of value inflation factor (VIF) values. The results are set out in Tables 1 and 2.

Table 1: Descriptive results, AVE and heterotrait-monotrait (HTMT) discriminant validity assessment

Measures	Means	AVE		AO	DL	PL	SL
AO	3.84	0.610		0.432			
DL	3.97	0.617		0.768	0.769		
PL	3.61	0.514		0.794	0.465	0.900	
SL	3.76	0.554		0.458	0.629	0.908	0.703

Abbreviation: AO= Achievement-oriented, DL= Directive Leadership, PL= Participative Leadership, SL= Supportive Leadership, AVE= Average Variance Extracted

The descriptive results in Table 1 indicate that the scores for the path-goal leadership theory in terms of achievement-oriented leadership (mean=3.84), directive leadership (mean=3.97), participative leadership (mean=3.61), and supportive leadership (mean=3.76) were high. The AVE value for convergent validity revealed the different constructs that assessed the path-goal leadership behaviours and all the AVE values were above 0.5, which is the threshold level (Alarcón et al., 2015). The heterotrait-monotrait (HTMT) ratio of correlation measured discriminant validity to determine whether the constructs were independent and hence each construct/dimension independently measured the path-goal

leadership theory. The results also demonstrate that the heterotrait-monotrait ratio of correlations (HTMT) conditions was met because all the constructs of the theory did not exceed 0.90, which is the highest limit (Henseler et al., 2015). Therefore, the discriminant validity of all the constructs that measure the path-goal was confirmed (Hair Jr et al., 2020). This suggested that achievement-oriented leadership, directive leadership, participative leadership and supportive leadership independently measured the path-goal leadership theory.

Table 2: Reliability and collinearity

Constructs	(α)	CR	VIF
Achievement-oriented	0.838	0.886	2.037
Directive	0.875	0.906	1.854
Participative	0.838	0.880	2.441
Supportive	0.899	0.918	1.542

The reliability results in Table 2 show that for both Cronbach's alpha (α) and composite reliability (CR), the values were above the minimum of 0.70, implying that the indicators of the measures of variables were reliable. In testing reliability, composite reliability was preferred, the reason being that Cronbach's alpha had limitations of assuming that all indicator traits are the same in the study population, thus lowering the reliability values. Further, Cronbach's alpha is sensitive to the number of items on the scale and typically underestimates the reliability of internal consistency (Hair Jr. et al., 2021). However, composite reliability is liberal because it considers the external characteristics of the indicator variables (Dash & Paul, 2021). On the other hand, the collinearity (VIF) test revealed the non-existence of a high correlation (collinearity) between the constructs that measured the path-goal leadership theory because the values were less than 5, which is the maximum (Kim, 2019). The VIF values implied that the constructs that measured the path-goal leadership theory were independent and hence measured the theory independently.

Structural model for path-goal leadership theory

The structural equation modelling was done to determine the measures of path-goal leadership theory. The results are indicated in Figure 1.
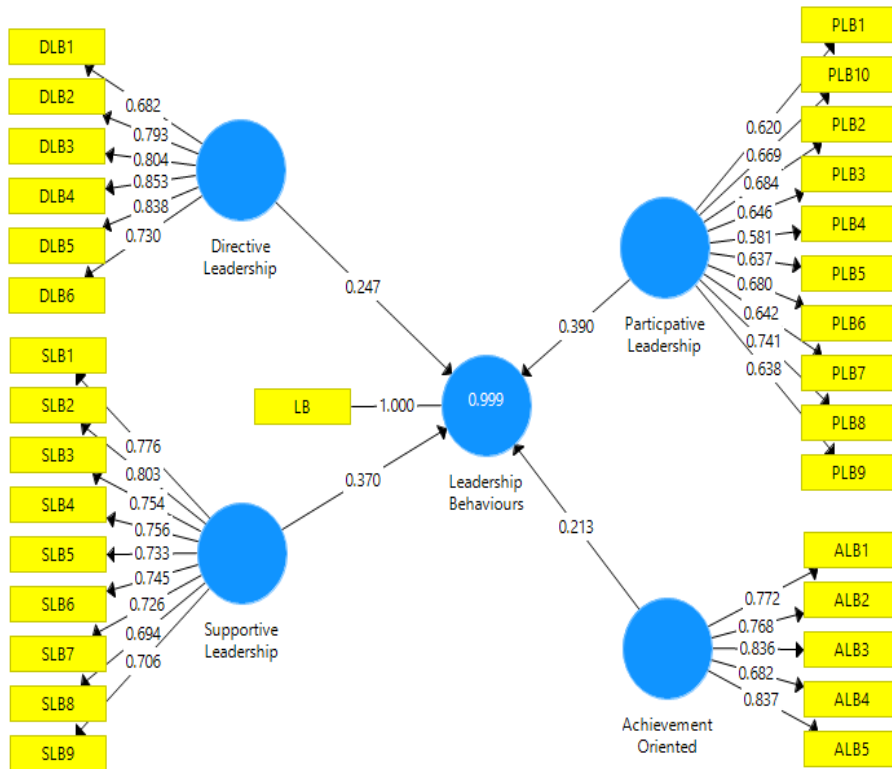
Figure 1:   Structural model for path-goal leadership theory

The results in Figure 1 show the four constructs that measured the path-goal leadership theory, namely directive, supportive, participative and achievement-oriented leadership behaviours. The factor loading shows that for directive leadership behaviour, all the six items that measured this construct loaded above the minimum validity value of 0.5, as recommended by Hair Jr. et al (2021). For supportive leadership behaviour, all nine items measuring the same loaded highly. For participative leadership behaviour, all the 10 items that measured this construct loaded highly. The same goes for achievement-oriented leadership behaviour, where all the five items measuring it loaded highly. Thus, all the items were retained for all the dimensions in the model and, as such, were valid measures of the respective constructs that measured the path-goal leadership theory.

Discussion

The results show that the four constructs of directive, supportive, participative and achievement-oriented leadership were appropriate measures of the path-goal leadership theory. For instance, for participative leadership, it was affirmed that the indicators measured the construct in a manner consistent with that of previous scholars. The analysis, for example, indicated that superiors consulted with subordinates (Ochieng et al., 2023); listened to ideas and suggestions receptively (Arnold et al., 2002); sought suggestions on assignment execution (Arnold et al., 2002; Batubara et al., 2020; Ochieng et

al., 2023); considered suggestions even when disagreeing; promoted open and honest self-expression; involved staff in administrative activities; and used subordinates' suggestions in decision-making (Arnold et al., 2002; Batubara et al., 2020; Ochieng et al., 2023). With the current study's findings being consistent with the previous measurement scales, it can be affirmed that the indicators studied are valid measures of participative leadership.

Secondly, for supportive leadership, it was confirmed that the indicators that measured the construct were consistent with those of the previous researchers. The analysis, for example, indicated that superiors had concern for subordinates' well-being; understood their concerns; provided feedback; involved the subordinates in decision-making; encouraged subordinates' professional development (Farhan, 2018; Uman et al., 2024); urged subordinates to produce better work; and maintained positive relationships (Prihandaka et al., 2022). In line with McGilton (2010) and Mutonyi et al (2021a), it was further noted that superiors assisted subordinates in improving their performance; recognised subordinates' abilities; met their needs; created a pleasant work environment; and enabled idea generation and promotion. With the findings being consistent with the previous measurement scales, it can be affirmed that the indicators studied are valid measures of supportive leadership.

Thirdly, for directive leadership behaviours, it was established that the items that measured the construct were consistent with the findings of earlier researchers. In tandem with Yan-Li and Hassan's (2018) earlier findings, this study found that superiors provided clear expectations to subordinates; established standard rules and regulations; provided explanations of performance expectations; and set goals. Superiors also provided instructions that motivate work; scheduled work responsibilities; set specific guidelines; set key performance indicators (Oketch & Karyeija, 2022); and provided clear instructions and performance standards. Furthermore, they communicated clear performance expectations; and generated, promoted and realised new ideas based on clear instructions and performance standards (Mwaisaka et al., 2019b; Mutonyi et al., 2021b). With the findings being consistent with the previous measurement scales, it can be confirmed that the indicators studied are valid measures of directive leadership.

Finally, for achievement-oriented leadership, it was confirmed that the items that measured the construct were consistent with those of previous scholars. Some of the items included clear goal-setting; giving feedback; having in place a reward system; and leaders setting challenging goals, encouraging employees, setting specific and clear goals, and designing performance strategies (Lumbasi et al., 2015; Yan-Li & Hassan, 2018). In line with Rana et al.'s (2019), the current study established that superiors let subordinates know what is expected by setting challenging goals (Rana et al., 2019). With the findings agreeing with the previous measurement scales, it can be confirmed that the indicators studied are valid measures of achievement-oriented leadership.

Conclusion

The study concluded that indicators assessed in this article to measure the four leadership behaviours within the path-goal leadership theory, namely participative leadership, supportive leadership, directive leadership and achievement-oriented leadership, are valid

and reliable. For participative leadership, the indicators are encouraging idea sharing; listening to suggestions; using collective input for decision-making; giving all members a chance to voice their opinions; involving employees in activities; accepting suggestions; and providing solutions to employee problems; consulting employees when facing problems; seeking suggestions on assignments; and involving employees in decision-making. For supportive leadership, the indicators are: providing support and feedback; involving subordinates in decision-making; encouraging professional development; providing assistance to improve performance; encouraging others to produce better work; maintaining positive relationships; recognising the abilities of subordinates; meeting their needs; understanding their concerns; providing subordinates feedback; showing concern for their well-being; creating a pleasant work environment; and enabling idea generation and promotion.

For directive leadership, the measures are providing clear expectations to subordinates; establishing standard rules and regulations; providing explanations of performance expectations; and setting goals by superiors. It further involves leaders scheduling work responsibilities; setting specific guidelines; setting key performance indicators; providing clear instructions for tasks; scheduling tasks; and setting performance standards. In addition, leaders are expected to provide clear instructions and performance standards; communicate clear performance expectations; and generate, promote and realise new ideas based on clear instructions and performance standards. Last but not least, for achievement-oriented leadership, the indicators are clear goal-setting, feedback, and a reward system. It also involves supervisors defining clear goals for employees to achieve and giving employees feedback on the achievement of goals. In addition, it is expected that the supervisor will reward the employees after the latter have accomplished tasks, and that the former will set challenging goals for high performance. Also, leaders are expected to set challenging goals; give feedback for continuous improvement in job performance; encourage team members to perform their duties and tasks to the best of their abilities; and set specific and clear goals, aligning performance with company strategy; and design job performance strategies and reward systems for employees. Further, indicators include letting subordinates know what is expected of them; setting goals for subordinates that are quite challenging; encouraging subordinates' continual improvement in their performance; showing confidence in their ability to meet most of the job objectives; and consistently setting challenging goals for subordinates to attain.

Recommendations

The study recommends that researchers use the indicators assessed in this article to measure the four leadership behaviours within the path-goal leadership theory, namely participative leadership, supportive leadership, directive leadership and achievement-oriented leadership. These indicators have been tested and validated, providing a robust framework for scholars to investigate the theory in various contexts. By using these indicators, researchers can confidently explore how these leadership behaviours influence different behavioural variables.

For participative leadership behaviour, the indicators include leaders encouraging ideas sharing; listening to suggestions; using collective input for decision-making; and giving all members a chance to voice their opinions. Scholars should consider that participative leadership is indicated by leaders involving employees; accepting suggestions; providing solutions to employees' problems; consulting employees when facing problems; seeking suggestions on assignments; and involving employees in decision-making.

Concerning supportive leadership behaviour, the indicators are that the leader provides support and feedback; involves subordinates in decision-making; encourages subordinates' professional development; provides assistance to improve performance; encourages others to produce better work; and maintains positive relationships. Other indicators of supportive leadership include leaders recognising the abilities of subordinates; meeting subordinates' needs; understanding subordinates' concerns; providing subordinates with feedback; being concerned about the well-being of subordinates; creating a pleasant work environment; and enabling idea generation and promotion.

To measure directive leadership behaviour, there is a need to consider indicators of the leader: providing clear expectations to subordinates; establishing standard rules and regulations; providing explanations of performance expectations; providing instructions that motivate work; scheduling work responsibilities; setting specific guidelines; and communicating key performance indicators. Other indicators of directive leadership include: providing clear instructions for tasks; scheduling tasks; setting performance standards; providing clear instructions and performance standards; communicating clear performance expectations; and generating, promoting and realising new ideas based on clear instructions and performance standards.

Finally, the indicators of achievement-oriented behaviour for the superiors include: establishing high expectations for their followers; holding followers to high standards; seeking methods to improve their followers; defining clear goals for subordinates to achieve; giving subordinates feedback on the achievement of goals; rewarding subordinates after the successful accomplishment of assigned tasks; and setting challenging goals for high performance. Further, indicators of achievement-oriented leadership include setting challenging goals, giving feedback for continuous improvement; letting subordinates know what is expected of them; setting goals for subordinates that are quite challenging; encouraging subordinates' continual improvement; showing confidence in their ability to meet most of the job objectives; and consistently set challenging goals for subordinates to attain.

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