MODERN ACADEMIC LIBRARIES REGULATION: THE CASE STUDY IN THE EMERGING COUNTRY

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Abstract

The modern world of libraries must be accessible, responsive, and reliable. This means that the libraries need to be user-sensitive and establish themselves as knowledge-creating hubs for academics, researchers, and students; supply-side to deliver customized products and services to add value to the users' experience of university life. The report of the Commission of Inquiry into Higher Education and Training (2017) addressed student's demands in a higher education sector in all South African universities, which resulted in multiple waves of protest. Amongst other things transformation, restructuring, and strengthening the higher education system. The objective of the article is to establish the extent of the balance between the demand and supply of tangible and intangible library materials in existing library systems and processes that meet daily library users' needs. The agile response to the library demand of the ever-changing higher education landscape has enhanced new ideas in innovative learning spaces and aligned to new services, such as virtual reference, digitizing archival material, and collection (Raju & Schoombee, 2013). Quantitative data was collected from 380 sample questionnaires, spread among the University of KwaZulu-Natal library users. The data was analyzed using descriptive and inferential statistics and multiple regression, respectively. The results suggest a user-centered approach to library plans and services. It recommends collaborations of operations.

Keywords: Demand and Supply, Collaboration and Benchmarking, Library, Operation, Plans Scheduling, Enterprise Resources Planning

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1. INTRODUCTION

The dynamic changing higher education landscape demands library systems and processes to be revisited and aligned with all patrons' tastes and preferences. The economic and operational challenges include natural disasters, the Fourth Industrial Revolution, and the corona virus disease (COVID-19). These trials change how libraries plan their operations, store and access information for all generations of users. This article discusses university library operations planning systems and the enhancing functions they must perform for higher education internal stakeholders. Slack, Brandon-Jones, Johnston, Singh, and Phihlela (2017, p. 238), planning and control are concerned with activities that seek to reconcile the demand of the market and the ability of the operation's resources to deliver on these. Such actions provide systems, procedures, and decisions that focus on

the different aspects of supply and demand. Academic libraries should play an intermediary role between traditionalists and current generations (generation Y and millennia) in higher learning libraries. The supply of hard and soft copies of texts should meet the diverse users' needs and ensure their perfect satisfaction. The university library planners have to consider how to balance their resources to accommodate diverse stakeholders. Their operation plans need to be aided by technology to ensure their materials are accessible to all users timeously by collaborating with partners using real-time data when making decisions. Mbhele (2014) backs adopting specific e-supply chain management technologies such as electronic data interchange (EDI) that support these "supply chain technologies are making a distinct difference in supply chain performance including buyer-supplier cooperation and collaboration, cost and cycle time reduction, better inventory control to manage variability and improved customer service, and overall supplier network performance" (p. 277).

The Fourth Industrial Revolution, also known as 4IR, has widened the gap in library collections' ability to satisfy different college needs. They juggle between technology-driven electronic material library supplies and traditional library resources comprised of more than a million hard materials. Library planning is still in the hands of academics; thus, library staff leaves their primary consumers and students out of the equation. The library material consumption pattern is changing swiftly under the tastes and preferences of their more innovative clients. While the traditionalists still prefer hard copies, the generation Y and millennia users demand digital materials accessible "24/7". Lundy and Ladd (2020) suggested that no matter the size or health of higher learning institutions, specific strategies could make collaborations and partnerships more effective.

The university libraries are not immune from the operations and structural changes. These changes compel local and international partners to join forces to cut operations costs and improve service to remain relevant to all its users. The article approached the university library's current challenges from a supply chain operations perspective. Its objective is to examine the aggregate planning and optimization of the library's activities and how decision-makers can balance resources through technology by matching demand and supply in an integrated and dynamic knowledge-sharing environment.

This article will answer the following research questions:

RQ1: Which internal stakeholders get involved in operations plans?

RQ2: How much could collaboration improve library processes and systems?

RQ3: How can scheduling improve library operations goals to balance supply and demand activities?

RQ4: How can the adoption of enterprise resource planning (ERP) assist in designing operations plans?

This article draws ideas from the Commission of Inquiry into Higher Education and Training (2017), Raju and Schoombee (2013), and Higher Education South Africa's (HESA, 2009) report promoting higher industry, partnerships, and collaborations. The literature is shallow in short-term planning and supply chain operations of libraries in public universities after government mergers. Previous research shows educational and strategic levels, the literature informing the article will be discussed in the next section.

The rest of the article is structured as follows. Section 2 reviews the literature. Section 3 analyses the methodology that has been used to conduct empirical research on modern libraries' operational plans. Section 4 presents the result using descriptive statistics, inferential statistics, and multiple regressions. Section 5 discusses the results. Section 6 provides the conclusion, recommendations for future research, and practical implications.

2. LITERATURE REVIEW

The conceptual framework of the article is concepts from the business excellence model and supply chain concepts at the operations level. The conceptual framework is suitable for all contexts because all needs in higher education are similar irrespective of geographical location. The operations concepts underpinning the article are library operations plan, internal and external collaborations and benchmarking, effective scheduling, enterprise resource planning (ERP), and balancing resources.

2.1. Modern vs. traditional library operations planning

Library traditionally used to place orders for analogue materials to digital consumption of data and information, and nowadays, technology has brought a new dispensation that gives real-time access to information searched by a library user. Sourcing and delivery of library materials come in two forms: traditional and e-sourcing. Hard copies and electronic books (e-copies) have the shortest lead times delivery to traditional products (books and CDs). Planning fundamental purpose is to help the organization to realize its objectives, help management coordinate decisions, and focus on these objectives. The planning process describes the planning activities associated with operating a supply chain, which entails gathering information on customer requirements and available resources and balancing these (Waller, 2002) to determine capabilities and resource gaps and identify the action required to fill these gaps.

Aggregate planning aims to set overall output levels in the near to medium future in the face of fluctuating demand; its role is to match supply and demand for output over a specific period (Kruger, Ramphal, & Maritz, 2014). The aggregate planning goal is to satisfy the demand to maximize gains. The aggregate plan allows the supply chain to alter capacity allocations and implement supply contract changes. Naylor (2002) suggests that the in-service system modifies its service design by incorporating personal and self-service, sharing capacity with other departments within the organization, and encompassing automation to cope with changing demands.

Slack et al. (2017) note that planning and control entail scheduling, coordinating, and organizing operational activities: management plans what it

intends to do, what resources it requires, and its objectives. Concerning the university environment, the library's overall objective is to supply study material to teaching staff (academics) and students to support teaching, learning, and research. Library materials must be supplied in line with the number of students enrolled in the institution and the academic staff's requirements to enhance academic productivity. An organization's planning team identifies the constraints placed on systems and processes, the best operational strategy, the sequence of work activities, and how to execute the plan. An operational strategy is generally inseparable from the corporate strategy in the goods and services market because it focuses mainly on the service delivery system.

2.2. Effective collaborations and benchmarking

Benchmarking is the process of comparing key performance measures to those of the best performers and subsequently identifying areas for improvement (Kruger et al., 2014). Edith Cowan University states that benchmarking focuses on work and operating processes. It compares products and services to determine how well a company is performing (Scott, 2012).

The four benchmarking categories include competitive, which requires comparisons between competitors, and generic that involves comparing due processes — irrespective of industry or function. Functional benchmarking involves seeking best operational practices outside the industry, and internal benchmarking looks at best practices within the organization to compare them to current practices over time (Scott, 2012; Kruger et al., 2014). Industry benchmarking leaders in a similar industry share the challenges and success factors. Slack et al. (2017) note that this measures the performance of supply chain processes and identifies the main performance gaps. Based on their experience, Supply Chain Council members have identified more than 400 best practices around the globe.

Collaborations are the mutually beneficial relationship between two or more organizations to achieve common goals. This relationship includes a commitment to common relationship goals, a jointly developed structure and shared responsibility, mutual authority and accountability for success, and equal distribution of resources and rewards (Rachman, 2016). Library collaboration is beneficial to students, faculty, and staff (Yamaguchi & Richardson, 2018). Collaboration within the supply chain encourages organizations to jointly plan and execute tasks, mostly with supplementary success rather than remote operations. Effective collaborative planning improves supply chain performance by facilitating decisions that reflect a broad view of the supply chain and taking cognizance of interactions among the firms in the supply chain. Performance improvement includes increased inventory turns, better on-time delivery, improved responsiveness, better quality, lower purchase prices, and reduced total cost. Collaborative planning activities between supply chain partners are expected to enhance performance.

In the earlier study, Petersen, Ragatz, and Monczka (2005) found that efficient collaborative planning positively affected joint business outcomes and improved supplier alliances. Relationships between supply chain performance, collaborative planning, information quality, and linked information systems are widely assumed to exist, although there is little research that confirms linkages between these constructs. Lu (2011) suggests that collaborations are concept-based by saying, "If you cannot beat them, you join them" (p. 23). The associated parties are referred to as collaboration partners and share resources, thus, avoiding unnecessary duplication and costly outlays on service and capital-intensive equipment, information and intellectual resources, maintenance facilities, and distribution networks. Collaboration involves synergy about creating business value, which is impossible to achieve individually, and eradicates risk and uncertain negative impact on businesses because the parties share supply chain risks. The relationship entails balance in power and bilateral because involved parties have a common goal that shapes the partnership's nature and future direction and a mutual commitment throughout the collaborative process. Saunders (2015) suggests that new library data initiatives and collaboration opportunities exist through library information technology. Research administration and grant support have to collaborate to find the expertise to provide essential data management support through the research process. Data analysis is the basic need of students, academics, and researchers across the institutional domain. This process requires libraries to identify and connect all users (particularly researchers) across informal and formal functional units to share, analyze and reuse data. Such information encompasses open data, data plan management, and the "big data" research that all academic institutions should develop and deploy through new initiatives, service units, and resources that meet the disparate educational needs in various stages of study life. Open educational resources (OER) demonstrate the crucial importance of such resources in several ways: sustainable collections in libraries, affordable textbooks for students, new options for curriculum development, and avenues for digital scholarship. Challenges to faculty adoption include difficulty in finding/funding resources, the lack of resources in a particular subject area, quality and content updates (Shimray & Ramaiah, 2015). Lundy and Ladd (2020) suggest that collaboration with other institutions can help both parties and must not be seen as a strategy for weaker players to survive.

Horvath (2001, p. 205) opined that supply chain collaborations through e-business networks provide the competitive edge that enables all value chain participants to prevail and grow. Supply chain collaboration has become one of the expected norms for many companies worldwide (Simchi-Levi, Kaminsky, & Simchi-Levi, 2008). Collaboration encourages all supply chain players to plan, forecast, replenishment, information sharing, resource sharing, and incentive sharing. Chase, Jacobs, and Aquilano (2018) suggest that collaboration helps firms create front-end agreements, joint business plans, demand forecasting, forecast sharing, and inventory replenishment. Shimray and Ramaiah (2015) suggest that academic libraries join scholarly digital projects or involve institutional partners beyond the library or campus. Supply chain

integration integrates possible internal and external coordination across the supply chain operations, thus, assuring shared vision and value enhancement amongst participating members. Lu (2011) noted that well-integrated supply chains exhibit lower inventory requirements, high visibility, shorter lead times, low defect rate, and high-capacity utilization.

2.3. Effective scheduling

Scheduling is the technique employed in relation to the number of orders placed by type of business and the complexity of products manufactured. When an organization undertakes to schedule, it establishes the number of resources required and the sequence in which it will use them. Scheduling refers to "when" and "how much" equipment, facilities, and human activities are required. Kruger et al. (2014) suggest the importance of short-term scheduling which ensures faster delivery of customer goods through flexible systems and adds capacity. This approach offers a competitive advantage and ensures dependable deliveries and the efficient use of scarce resources when correctly executed.

2.4. Balancing library resources

Libraries must focus on the process of learning that occurs in their spaces, bringing resources, learners, and experts to easy proximity to facilitate collaborative learning (Thachill, 2008; Raju & Schoombee, 2013). The agile response to the library demand of the ever-changing higher education landscape has enhanced new ideas in innovative learning spaces and aligned to new services, such as virtual reference, digitizing archival material, and collection (Raju & Schoombee, 2013).

A large proportion of an institution's budget is allocated to salaries (Commission of Inquiry into Higher Education and Training, 2015). Budget austerity is one of the drawbacks that negatively impact library expenditure. Sometimes skeleton staff is complemented by hiring students to reduce labor costs. Post-graduate students who owe university tuition fees are employed to assist after-hours and when library staff is away. The paradigm shift in the higher education landscape requires the university's Human Resources division to recruit capable staff and improve the current workforce's skills through staff training benchmarked with the best global partners. These human resources must be in line with the financial resources available.

The Association of College and Research Libraries (ACRL) (n.d.) suggests that decreasing and/or stagnating library budgets continue to be a trend at higher educational institutions across the countries. Thus, many libraries are trying to do more with less while constantly being asked to share their services and add value to the university library community. University budgets are always dwindling while the cost of library operations is constantly increasing. Capital expenditure and operating budgets do not meet actual running costs. Commission of Inquiry into Higher Education and Training (2017) reported that complaints about a lack of institutional transformation resulted in reduced support for both staff and library collections. The financial state of the university sector (even before considering the demands for more affordable fees or free education) is not healthy and, thus, is unsustainable. University library budgets in South Africa have decreased due to inflation and institutional demands. Even though a few libraries still receive annual budget increases, they cannot afford the currently needed technologically driven operations requiring a well-developed software and hardware infrastructure. In 2014, the operating costs of libraries increased by an estimated 40% due to the combined effect of a new e-resource tax and the deprecation in Rand's value (Commission of Inquiry into Higher Education and Training, 2017). The additional operating cost comes from a higher than inflation level increase in the cost of utilities (water, electricity, cleaning, and security services). Some university libraries receive an institutional allocation of 6% or more and, with this greater buying power, can subscribe to more journals, thus, enabling them to better support their institutions' research needs and provide a more effective service to their users (Hoskins & Stilwell, 2011). University libraries' plans for future activities and increased capacity depend upon their budget allocations for subscriptions and licensing fees, which link to the number of enrolled students. These financial resource needs to be fitted correctly to the physical resources of the library.

The existence of facilities and resources in the library, such as creativity innovation and design studios, enhances collaborations with specific subjects required by new learning methods (Rachman, 2016; Zaugg & Warr, 2018). Systematic planning and dedication to effective partnerships, such as collaboration with satellite libraries, can successfully increase the university's visibility by providing easy access to these resources for the university community and beyond (Rachman, 2016; Turner, 2017).

Physical resources in the library include tangible assets such as buildings, computers, furniture, books, and journals. The introduction of e-resources enables the university to acquire the additional capacity to address the shortage of individual study cubicles by creating a research "common" for post-graduate students and/or group discussion area for undergraduate students. This extra space is necessary for coping with the increase in student numbers resulting from the fact that, in mid-December 2017, the South African Government adopted free higher education systems for students from families that earn less than R 350,000 per year (Muller, 2018), a policy that raised the demand curve.

Information technology (IT) infrastructure comprises hardware, software, operating, and networking systems. The library subscription, licensing, and service providers are vital in supplying electronic library material as the demand for texts shifts from hard copies to digital material. Robust Wi-Fi connectivity is a part of the technological infrastructure that enhances online teaching and competitive library operations and services to internal and external stakeholders. IT infrastructure comprises the basis for computer technology, communications, and basic data systems, within the technical framework that guides organizational work to meet management needs (Melville, 2010).

2.5. Adoption of enterprise resource planning software in planning activities

Libraries have been quick to adopt relevant technologies to ensure efficient and effective support for the education process (Raju & Schoombee, 2013). Enterprise resource planning (ERP) is a business process management software that allows an organization to use integrated applications to manage the business and automate many back-office functions related to technology and services. It covers sales forecasting, sales, and operations planning, supplier rating systems, and performance. ERP developed in the 1990s and prompted companies to redesign their business processes to eliminate non-value-adding activities. ERP is a computer system that integrates application programs in accounting, sales, manufacturing, and other organizational functions. ERP software is also an enabling technology in a set of integrated modules that make up the core engine of internal transaction processing. ERP packages from software companies that offer all-in-one integrated business applications have slowly replaced traditional manufacturing, finance, and order-entry applications, usually designed in-house and do not lend themselves to easy integration.

Chase, Jacobs, and Aquilano (2017, p. 269) noted that ERP incorporates the entire supply chain, including sales, orders, supply replenishment, scheduling, manufacturing, and distribution. This system is designed for global operations and provides customers with the right product in the correct quantity at the right time, quality, and place. It integrates operations within an organization, emphasizing customer satisfaction, including system response speed, flexibility, and local content (Kruger et al., 2014, p. 219). Amongst the benefits of ERP packages include their ability to afford comprehensive solutions to all an organization's day-to-day needs by providing complete support to the administrative structure and the management information system (MIS). They can work with all existing databases built on different platforms, although ERP software solutions initially targeted major organizations that had to re-engineer them before installing them in their systems. This program's primary goal was to continue to increase return on investments (ROI) until its implementation within the top organizations was almost saturated. Nowadays, software companies target the bottom of the pyramid and challenge offering a more diverse set of applications while keeping costs down.

The integrated library system (ILS) was formed to deal with the functioning of a library and focuses on selection, acquisitions, cataloging, and print collection circulations. The library services platform (LSP) takes care of the print and electronic collections (Yeh & Walter, 2016). Some advantages of these systems include operational and strategic benefits, including reliability in information access, data and operation redundancy, data retrieval and reporting efficiency, and internet capability. Kruger et al. (2014) suggest that material resource planning improves how customers treat, minimizes inventory investments, and improves operational efficiency. On independent demand, the method used is economic order quantity, and others. The dependent demand techniques used are material requirement planning.

3. RESEARCH METHODOLOGY

The study employed an experimental research design. Respondents to the study were selected through purposive sampling. The findings of the study were obtained from the perceptions of 380 participants. The qualitative approach and desktop research were the alternatives that would have been employed by this article. The quantitative approach was chosen to compress the big data. The University of KwaZulu-Natal (UKZN) student population equaled to 47,103, comprised of 2655 academic staff and 98 library staff. The sample size is of 380 participants. The data was collected using primary data (researchers distributed and collected questionnaires to students in classrooms and residences, plus visited library and academic staff in their workstations) and secondary data (online journals and books).

The questionnaire was divided into biographical information and research questions on a 5-tailed Likert scale seeking to answer the research questions. The questionnaire was distributed across all colleges and within five campuses of the UKZN. The explanatory and descriptive design of the UKZN libraries provided the researchers with evidence to conclude the study's findings and recommend this emerging area of operations support of libraries. The researchers also used SPSS software to analyze data and draw up findings.

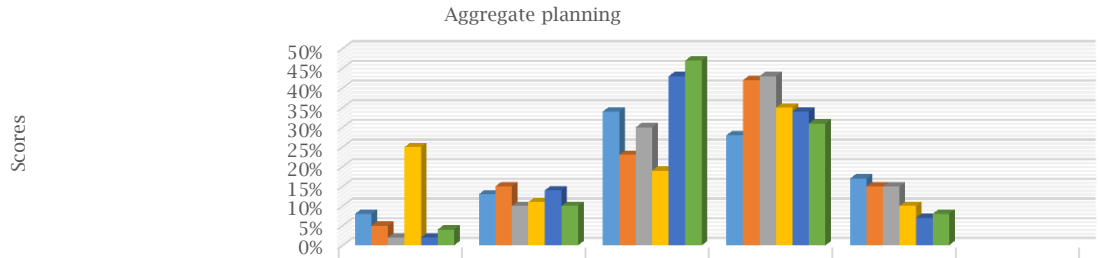
4. RESULTS

4.1. Descriptive statistics

There were 232 students, 96 academic staff, and 52 library staff from all UKZN campuses. Fifty (50) percent of the study participants were male and 50% were female. There were 276 African participants, 70 Indian, 19 white, and 15 colored. Forty-seven (47) percent of participants were aged between 16 and 25 years; 22% were aged between 26 and 35 years, and 16% fell into the age group of 36 to 45 years, while 13% of the participants were aged between 46 and 55 years, and only 2% were between 56 and 65 years. Among the study participants, 2% were registered for certificates, 2% — for diplomas, 34% — for bachelor's degrees, 12% — for honors, 18% — for master's degrees, 16% — for Ph.D. qualifications, while 16% were not registered for any qualification. Fifteen (15) percent of the participants were from the Edgewood campus, 29% — from Howard College, 11% — from Medical School, 14% — from the Pietermaritzburg campus, and 31% — from the Westville campus of UKZN.

Sixteen (16) percent of participants were from the College of Agriculture, Engineering and Science, 40% from the College of Humanities, 18% from the College of Health Sciences, and 26% from the College of Law and Management Studies. Thirty (30) academic participants had been using the library between 0–5 years, 33 — between 6–10 years, 16 — between 11–15 years, 3 — between 16–20 years, 11 — between 21–25 years, and none between more than 30 years. Eight (8) of the library staff indicated that they had been using or working in the library for less than 5 years, 12 — between 6–10 years, 3 — between 11–15 years, 6 — between 16–20 years, 10 — between 21–26 years, and 13 — for more than 26 years (26–30+ years). In terms of the student participants, 140 indicated they had been using the library for less than 5 years (0-5 years), 56 — for 6–10 years, and 16 — between 11–15 years.

Figure 1. Aggregate operation library plans



	Strongly Disagree	Disagee	Neutral	Agree	Strongly Agree
Library Plans 3.34	8%	13%	34%	28%	17%
Library materials 3.49	5%	15%	23%	42%	15%
Effective scheduling 3.58	2%	10%	30%	43%	15%
Effective Collaboration 3.33	25%	11%	19%	35%	10%
Balancing Resources 3.32	2%	14%	43%	34%	7%
Enterprise Resource Planning 3.29	4%	10%	47%	31%	8%

Figure 1 above shows the planning process in six (6) areas (library planning, demand for library materials, scheduling of library materials, collaboration with partners, balancing resources, and ERP software). While 8% of the participants strongly disagreed that, they were involved in library planning, 13% disagreed, 34% were neutral, 28% agreed, and 17% strongly agreed. A combined 45% agreed that there is limited investment in library planning processes. In meeting a demand for library materials, 5% of the participants strongly disagreed, 15% disagreed, 23% were neutral, 42% agreed, and 15% strongly agreed that library materials meet students' and academics' demands. A combined 56% agreed with this statement. Furthermore, 2% of the participants strongly disagreed that there is effective scheduling of library materials, while 10% disagreed, 30% were neutral, 43% agreed, and 15% strongly agreed with this statement. The combined percentage figure indicates that 58% of the participants agreed that library materials have effective scheduling.

From the total participants, 25% strongly disagreed that library supply chain processes and systems promote effective collaboration with partners, while 11% disagreed, 19% were neutral, 35% agreed, and 10% strongly agreed. A combined figure shows that 45% of the participants agreed that the library supply chain processes and systems effectively collaborate with partners. Only 2% of the participants strongly disagreed that the library balances its resources and communicates its plans to all supply chain partners, while 14% disagreed, 43% were neutral, 34% agreed, and 7% strongly agreed. A combined figure of 41% of the participants thus agreed that the library balances its resources and communicates its plans to all supply chain partners. Finally, 4% of the participants strongly disagreed that the library had adopted ERP software, with 10% disagreeing and 47% neutral. Thirty-one (31) percent of the participants agreed with this statement, and 8% strongly agreed. A combined figure of 39% of the participants agreed that the library had adopted ERP software to perform its planning activities.

The majority of respondents agree by 45% library operations plans involve all stakeholders. Secondly, the majority at 57% agreed that library materials meet users' needs. Thirdly, 58% agreed that UKZN libraries scheduling is effective. Fourthly, 45% believe/agreed that collaboration is effective in UKZN libraries, 41% of participants are neutral that adoption of ERP software assists in operational plans, and 47% are neutral that the library balances its operations resources. Overall, it shows that UKZN libraries are not fully employed tools that will keep all stakeholders satisfied with service and competitiveness. None of the responses is above 60%, which shows a significant level of operations improvement.

Table 1. Mean, standard deviation, and variance

Area	*N*	*Range*	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*	*Variance*
Library plans	380	4	1	5	3.34	1.140	1.299
Library materials	380	4	1	5	3.49	1.071	1.148
Effective scheduling	380	4	1	5	3.58	0.938	0.880
Effective collaboration	380	4	1	5	3.33	0.831	0.691
Balancing resources	380	4	1	5	3.32	0.854	0.729
ERP software	380	4	1	5	3.29	0.888	0.789

Table 1 above shows that most of the participants' responses were slightly higher than neutral; the mean was 3.32 and 3.58, respectively. Standard deviation ranges between 0.831 and 1.140, showing mixed feelings amongst participants.

Table 2. T-test

Area	t	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Library plans	5.813	378	0.000	0.340	0.23	0.46
Library materials supplies	8.859	379	0.000	0.487	0.38	0.59
Effective scheduling	11.995	378	0.000	0.578	0.48	0.67
Effective collaboration	7.693	375	0.000	0.330	0.25	0.41
Balancing library resources	7.188	375	0.000	0.316	0.23	0.40
ERP software	6.387	375	0.000	0.293	0.20	0.38

Table 2 above depicts that most means are more significant than 3, and thus all are significant, except for university libraries not adopting ERP software for all planning activities (M = 0.293) and short-term loans (reserve). Providing one copy of a resource book per 50 students is not working well in large classes (M = 0.340). The means differences are lower than 3, which shows that the participants do not agree. All the different questions and themes show a significant agreement among the participants. A few cases were reported under each theme. There was agreement that the university libraries involve all stakeholders (M = 0.340, SD = 1.140, t = (378) = 5.813, $p < 0.05$. Secondly, the participants agreed that library material supplies meet demand from academics and students (M = 0.487, SD = 1.071) = 8.859, $p < 0.05$.

Table 3. Reliability test Cronbach's alpha

Construct	Cronbach's alpha	Question	Percentage
Plan	0.800	6	80%

4.2. Factor analysis

Factor analysis is a process in which items are analyzed in such a way as to create a mathematical model that estimates factors or constructs domains within the pool of items. Factor analysis is a procedure used to determine the extent to which shared variance (the intercorrelation between measures) exists between variables or items within the item pool for a developing measure (Gerber & Price, 2018).

Table 4. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy Bartlett's test of sphericity	0.820
Approx. Chi^2	563.193
df	15
Sig.	0.000

The 380 responses from participants were subjected to principal components analysis (PCA) using SPSS version 27. The Kaiser Meyer-Oklin value was 0.820, exceeding the recommended value of 0.6 (Kaiser, 1970; Pallant, 2005), and the Bartlett test of sphericity (Bartlett, 1964) reached a statistical significance of 0.000 < 0.05 (Table 4).

Table 5a. Model summary

Model		R^2	Adj. R^2	Std. Error	Dublin-Watson
1	0.482	0.232	0.222	1.006	1.841

Table 5a above indicates how much of the dependent variable (library plans) variance is described by the model (including all the predictor variables or independent variables). The R^2 value in the model is 0.232, expressed as a percentage. Hence, this model explains 23% of the variance in library plans. The adjusted R^2 value considers the number of variables with the fitness model to the sample data. The value is equal to 0.222. The original value of the Durbin-Watson statistics lies between 1.5 and 2.5. The result of the analysis is 1.841.

Table 5b. ANOVA

Model	Sum of squares	df	Mean square	F	Sig.
1 Regression	112.529	5	22.506	22.060	0.000
Residual	372.067	368	1.011		
Total	484.596	373			

In Table 5b, the degrees of freedom are shown in the df column, the calculated sum of squares terms provided in the sum of squares column, and the mean square terms provided in the mean square column. The mean square error term is smaller with library plans included, indicating less deviation between the observed and fitted values. The P-value for the F-statistics is less than 0.001, providing strong evidence against the null hypothesis. The squared multiple correlation R^2 = SSM/SST = 112.529/484.596 = 0.23221199, indicating that 23.2% of the variability in the library plans as independent in Table 5c shows beta of 0.736 higher than other dependent (effective scheduling 0.243, effective collaboration 0.318, balancing resource 0.021, enterprise resources planning software 0.069 and materials supplies 0.109. The null hypothesis is rejected; library plans are independent of other dependent variables is not correct.

Table 5c. Coefficients

Model	Coefficients					
	Unstandardized coefficients		Standardized coefficients		Collinearity statistics	
	B	Std. Error	Beta	Sig.	Tolerance	VIF
Constant	0.736	0.264		0.006		
Effective scheduling	0.243	0.073	0.200	0.001	0.577	1.734
Effective collaboration	0.318	0.086	0.232	0.000	0.529	1.892
Balancing resources	0.021	0.081	0.015	0.800	0.564	1.774
ERP software	0.069	0.069	0.054	0.317	0.718	1.392
Library materials supplies	0.109	0.059	0.103	0.065	0.675	1.481

Table 5d. Residuals

Residual statistics	*Residual*				
Mahalanobis distance	0.410	25.386	4.995	3.928	371
Cook's distance	0.000	0.096	0.003	0.007	371
Centered leverage value	0.001	0.068	0.013	0.011	371

Table 5b above indicates that the null hypothesis with multiple R in the population is zero (0). Therefore, the model reaches a significance of 0.000, $p < 0.005$. The ANOVA gave an F-statistics value of 22.506. The result shows a relationship between the dependent variable (library plans) and these five independent variables (library material supplies, ERP software, balancing resources, effective scheduling, and effective collaboration). This table shows 23% of variance adjusted $R^2 = 0.222$, while the second model included in the library planning systems and processes were decreased by 4; variance is estimated as (19% of variance adjusted, adjusted $R^2 = 190$) = standard error, R =1-SS/SS/(total): $R^2 = -(1-R^2/p/(np-1)$. The study shows that $R^2 = 0.232$, $R^2 = 0.222$; F = 22.060 with degree of freedom 5% at significant level p = 0.006. Two variables of the model show a significance level of $p < 0.005$; there is a positive relationship between criterion and predictor variables effective scheduling ($\beta = 0.200$, t = 3.319, p = 0.001) and effective collaboration ($\beta = 0.232$, t = 3.319, p = 0.000). From Table 5d, Cook's distance value lies between 0.000 and 0.096, indicating that the cases observed have no unjustified impact on the model result. As a precaution, when a maximum value is obtained for Cook's distance, each case will need to be sorted out through removal; for this study, no removal took place.

There is no multicollinearity problem for this study because the variance of inflation is equal to 1 or greater than 10, and tolerance value scores are above 10. Tolerance equals to 50 and higher is generally accepted. A variance inflation factor (VIF) detects multicollinearity in regression analysis. Multicollinearity occurs when a model is correlated between predictors (independent variables); its presence can adversely affect the regression results. The VIF estimates how much the regression coefficient variance is inflated due to multicollinearity in the model. The VIF range from 1 upwards. The numerical value for VIF tells the researcher (in decimal form) the percentage by which the variance (that is, the standard error squared) is inflated for each coefficient. For example, a VIF of 1.9 signals that a particular coefficient's variance is 90% bigger than what one would expect if there were no multicollinearity — if there were no correlation with other predictors. In this study, the VIF ranges from 1.4 to 1.8, respectively.

A rule-of-thumb for interpreting the VIF is 1 = not correlated; between 1 and 5 = moderately correlated; more significant than 5 = highly correlated. The Durbin-Watson test measures correlation (also called serial correlation) in residuals from the regression analysis. The Durbin-Watson rule-of-thumb is that test statistic values from 1.5 to 2.5 are relatively normal. The values outside of this range could be cause for concern. Field (2009) suggests that values under 1 or more than 3 are a definite cause for concern. The normality and linearity plot of regression shows that shared variances are not disturbed. This result follows a normal distribution. The line points are the expected values that equal the diagonal line, suggesting no deviations from normality.

5. DISCUSSION OF RESULTS

The plan sets out processes that balance aggregate supply and demand to develop a course for action that best addresses sourcing, production, and delivery requirements (Huan, Sheoran, & Wang, 2004). Planning is thus a process that alters the expected resources needed under expected demand conditions. It balances out the aggregate demand over the planning horizon (Poluha, 2007). Neal, Domagalski, and Yan (2020, p. 66) note that collaborations cut across the core responsibilities of academic libraries; thus, partners must find new ways of working to support teaching and learning and research and scholarship. To satisfy all library users' needs equally, benchmarking is necessary with global library partners from developed country's universities. For example, the Norwegians University of Bergen in a well-developed country and Uganda's Makerere University in a developing country celebrate 30 years of research collaboration. The collaboration includes research, scientific competence building, teaching, student exchanges, infrastructure, and related administrative affairs regarding human resources, university governance, and library services (Musinguzi, 2021).

The integrated Keck Science Department is shared between three colleges — Claremont McKenna Scripps and Pitzer in California. The department is housed in the state-of-art building that is physical, located at the institution's intersection. Massachusetts, United States, Babson College, Wellesley College, and Franklin W. Olin College of Engineering are different institutions in their mission, entrepreneurship liberal arts, and engineering under one roof.

Lundy and Ladd (2020) suggest that no matter the size or the health of higher learning institutions, specific strategies can make collaborations and partnerships more effective. Technology has simplified collaboration no longer limited to institution proximity. In Pennsylvania, 10 liberal art colleges, including Gettysburg, Haverford, Franklin and Marshall, and Swarthmore, are collaborating in faculty development, study abroad, and compliance and risk management.

Nowadays, firms use ERP to cover sales forecasting, sales, and operations planning, supplier rating systems, and performance. Scheduling does not plan jobs as they pass through the operations systems. Instead, it assigns personnel, equipment, material, and other resources at each stage. The main goal of ERP is to optimize operational performance by reducing the time the order spends within the system, achieving acceptable inventory levels, decreasing the customers' waiting time, and ensuring efficient use of resources (Slack et al., 2017). Operational efficiency is the essential means in each operation within the chain because it reduces the cost of conducting business and increases throughput time. Operational efficiency means speeding up the flow of materials down the chain and the flow of information back up

the chain. Information is the lifeblood of supply chain management. Appropriate information enhances coordinated activities within the chain, and operations managers make informed decisions.

Saunders (2015) opined that those larger organizations must pay specific attention to synchronizing systems and processes. The team leader should possess the necessary mix of technical, people, and agility skills, a mix of qualities that are proving difficult to obtain (Chopra & Meidl, 2016). Firms have invested resources to develop a core differential advantage in one or other of these areas, but rarely in all of them, thereby separating the processes used to plan for and manage customer demand from those required to supply the resources and operational dexterity to meet that demand. Demand-focused firms tend to create value by emphasizing effectiveness in serving customers' needs at the expense of efficiency, while supply-focused firms tend to create value by emphasizing efficiency at the expense of effectiveness (Christopher, 2005; Christopher & Gattorna, 2005; Jüttner, Christopher, & Baker, 2007). However, the traditional isolation of demand and supply processes often results in enduring mismatches between demand, such as shortages of products that users want in the marketplace and surpluses of unwanted products. Demand management application consists of tools for capturing and assessing strategic and operational demands to provide a single location for managing demand information. Demand management provides an easy way for the user to submit ideas and for demand managers to assess before promoting them to demands. Demand management creates a platform for a business to plan and to create stakeholders and assessment categories. It also allows them to create and manage demand. Lysons and Farrington (2016) suggest that demand management helps an organization balance internal and exclusive internal customers with supply capabilities.

Esper, Ellinger, Stank, Flint, and Moon (2010), identified the disconnect between demand creation and supply fulfillment as the "great divide" whereby firms are often trapped in a pattern of reacting to the whims of the marketplace because they have failed to develop a proactively and strategically designed and appropriately integrated operations capacity. Demand and supply can be integrated by successfully managing the supply chain to create customer value and requires extensive integration between demand-focused and supply-focused activities, based on a foundation of customer value creation through superior implementation of the knowledge management process. Process and systems management enables firms better to understand customer requirements for bundles of goods and services and to prioritize and ensure fulfillment based on a shared generation, dissemination, interpretation, and application of real-time customer demand, as well as ongoing supply capacity constraints (Esper et al., 2010). Effective scheduling enables effective utilization, improving the management process and enhancing final products or services (Pearlman, 2015, p. 12). Work schedules are used in operations management, where some planning is required to ensure customer demand is met. Slack et al. (2017, p. 251) noted that rapid-response service operations in which customer arrivals cannot be predicted could not schedule the operation in a short period but simply respond to the demands placed upon them. Chopra and Meidl (2016) noted that effective supply chain management controls assets and products, information, and fund flows to grow the total supply chain surplus.

The challenge that faces the UKZN libraries is that diverse users are not effectively sharing the information and ideas that can be translated into operational planning that can feed into entire supply chain partners to affirm long-term goals. Supply chain collaboration is defined as a long-term relationship through which participants generally cooperate, share information, and work together to plan and even modify their business practices to improve joint performance (Whipple, Lynch, & Nyaga, 2010). South African Student Congress (SASCO) as cited in the Commission of Inquiry into Higher Education and Training (2017) suggested that dismantling of the old market system could lead to collaboration between students and institutions rather than coemptions (Commission of Inquiry into Higher Education and Training, 2017).

Demand management includes forecasting demand, synchronizing demand and supply, increasing flexibility, reducing demand variability through standardizing and controlling inventory. The supply chain is critical, significantly when partners around the globe form the supply chain. Demand planning should be aligned closely with materials resource planning (MRP) and the just-in-time (JIT) approach (Lysons & Farrington, 2016).

6. CONCLUSION

The electronic supply chain systems enhance decision-making that improves materials flow time, reduces cost, and makes informed decisions to match demand and supply-based real-time data. The study indicates that there is no involvement from internal stakeholders within university libraries in their planning. Communication is a critical element that allows all parties to understand each other's expectations on both ends of the transaction. A firm must know how to satisfy its customers and offer goods and services according to their expectations. Therefore, the service providers, publishers, students, academics, and library teams must create a platform to meet and discuss customer products and services. All stakeholders need to contribute equally to the system's formation to benefit all concerned parties. This article recommends that the library systems and processes cater to the needs of all generations and colleges who visit the library. Universities face cuts in the supplies and services budget necessary for supporting library operations. Global networking opportunities exist with partners in developing countries, such as learning from Scandinavian libraries that pioneered the automation of operation systems through competitive benchmarking and products, services, and processes. The Fourth Industrial Revolution is gradually phasing out boundaries between suppliers, firms, and users and further reducing barriers between investors and the market due to new technology (Xu, David, & Kim, 2018).

The article concludes that the automation of processes and benchmarking is the solution that UKZN, in particular, could employ to bridge the gap and meet the demands of the library's operations despite financial challenges. The library's suppliers must improve supply chain systems to support diverse university library demands, and regular

meetings with customers are essential. Library materials usage records assist in how soft or hard material is borrowed from the shelves weekly or monthly during peak and off-peak season, test, and examination periods. The article is limited to one university; hence, results cannot be generalized. It recommends a joint user approach through collaboration operations with partners. Future researchers can investigate how automation and e-resources have improved library capacity challenges and ease the burden of material shortages to meet libraries' diverse demands from faculties without compromising user-focused library operations.

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