QUALITY OF MANAGEMENT AND DIGITAL LEARNING PLATFORM IN HIGHER EDUCATIONAL INSTITUTION DURING COVID-19

Siriwan Kitcharoen[1,*]

Abstract

The outbreak of COVID-19 raised significant disruption across many industries, including education, forcing organizations to modify their operations in order to stay in business. Technology has become an important tool and the rise of digital learning platforms has brought new perspectives to a range of companies. Education institutes have been forced to implement a wide range of digital platforms in order to support their learners, teachers, educators, and other staff members.

The objective of this study was to help higher educational institutions to maintain their competitive advantages during the crisis by improving understanding of the incentives and barriers in relation to employing the most cost-effective approaches to providing a quality service and quality education for all learners during the pandemic. The findings reveal that the dimensions of information, system, and service quality, were found to be significant predictors of varied levels of user satisfaction. This means that overall quality management has a significant impact on user satisfaction. Analysis and implications of the findings are discussed.

Keywords: quality management, digital learning platform, online classes, user satisfaction, user retention

1. INTRODUCTION

As indicated by the United Nations (2020), the COVID-19 pandemic has created the largest disruption of the education system, affecting nearly 1.6 billion learners in more than 190 countries, across all continents. Closure of schools and other learning spaces has impacted 94 percent of the world's student population, and up to 99 percent of students in low and lower-middle income countries.

This particular challenge has reduced opportunities for many

[1,*]Dr. Siriwan Kitcharoen obtained a Ph.D. in Computer and Engineering Management from Assumption University in 2007. Currently, she serves as an Assistant Dean of the Graduate School of Business and Advanced Technology Management of Assumption University. Email: siriwanktc@gmail.com

children, youths, and adults to continue their learning. The crisis has also threatened to extend beyond this generation and erase decades of progress, not least in support of girls and young women's educational access and retention. Some 23.8 million additional children and youths (from pre-primary to tertiary) may drop out or not have access to school next year due to the pandemic's economic impact alone (United Nation, 2020).

It is evident that the wide reach of the virus is changing the way we live, learn, and work. The full impact of the COVID-19 pandemic on education has raised significant disruption and will continue to have substantial effects beyond education. Closure of educational institutions obstructs the provision of educational services to students, stimulating innovation within the education sector. A wide range of innovative approaches for supporting education have been initiated to help ensure continuity in the education of learners, and for the teachers and educators instructing them.

As such, digital platforms have become the new normal in academia (Khalili, 2020). As indicated by Clark and Mayer (2016), online learning is described as conveying directives through the web by utilising digital gadgets such as laptops, desktops, smartphones, and tablets. It implies a certain pedagogical content knowledge (PCK), mainly related to designing and organising for better learning experiences and creating distinctive learning environments, with the help of digital technologies (Rapanta, C., Botturi, L., Goodyear, P. et al. 2020).

These changes have accelerated change in various modes of educational quality service delivery. The urgent and unexpected change due to COVID19 lockdowns caused universities to implement digital learning platforms. However, the urgent imperative to provide digital learning (World Health Organization, n.d.) has added to the stress and workload experienced by university faculty and staff who were already struggling to balance teaching, research, and service obligations, as well as to achieve a work-life balance (Houston, Meyer and Paewai 2006; Houlden and Veletsianos 2020). Teaching staff of all backgrounds and ages have been required to prepare and deliver their classes and services from home, with all the practical and technical challenges this entails, and often without proper technical support (Hodges et al. 2020).

It is clear that teachers and their associated support teams must be trained, and guidance should be prepared for this urgent crisis. More significantly, the tools and materials that teachers will use to replace their face-to-face classes must be provided. However, given the continued virulence of the virus, countries have begun plans to reopen schools, universities, and educational institutions. The massive efforts made in a short time, in response to these shocks to education systems, remind us that change is necessary, and a set of solutions must be implemented (United Nations, 2020).

2. LITERATURE REVIEW

2.1 Digital Platform

As a result of the scale of growth in platform innovation, digital platforms now play an important role in many different industries. The entire information system has changed. User interactions are changing due to the wide-spread use of digital platforms. This innovation facilitates online communities and generates value by bringing together and connecting customers, producers, and providers.

According to Mwageni (2020) digital platforms include websites and social media such as Twitter, Amazon, and Wattpad. While Laxman (2020) defined digital platforms as systems and interfaces which form a commercial network or market, facilitating business-to-business (B2B), business-to-customer (B2C) and even customer-to-customer (C2C) transactions.

Consideration of information quality from the user perspective involves understanding the process of Information Retrieval via the Internet. Universities are being challenged to provide high quality education in flexible ways. Fraser & Deane, (1997) suggest that teamwork (group work) has long been accepted as an effective learning strategy. Numerous authors also hypothesize that technology can enhance learning and develop instructional effectiveness.

Research has indicated that technology allows for the provision of more timely feedback, allows for a more individualized pace and focus in learning, incorporates interactive exercises, facilitates cooperative learning, overcomes the limits of time and space by providing asynchronous opportunities for students, provides access to up-to-date information, and allows greater opportunities for drilling and practicing (Fraser and Deane, 1999; Pailing, 2002; Sell, 1997; Vockell and Brown, 1992).

During the Covid-19 pandemic, the demand for software and social media platforms has increased dramatically. Providentially, there are a variety of learning platforms with free access, including those offering opportunities to develop computer-related or professional skills, supporting online business, application development, and language learning, as well as many others. Zoom Video Communication, Google Hangouts, Facebook, WhatsApp Video call, and Microsoft Teams, all provide teleconferencing tools which can support people in quarantine or lockdown to stay in touch with their family members, as well as providing a means to undertake online learning, attend conference meetings, or engage in work.

The unexpected crisis has forced students to stay at home and away from others as much as possible in order to help prevent the spread of COVID-19. While all students have been affected by school closures, in every crisis, lies an opportunity. Schools, universities, and other educational institutions have asked students to make good use of their

time by studying online via the various online learning platforms prepared for students. For example, Thai MOOC, SkillLane, Chula MOOC, CMU MOOC, Skooldiio, S Learning, and Space (by Chulalongkorn Business School).

2.2 Information System (IS)

Piccolo and Pigni (2018) defined an information system (IS) as a formal, sociotechnical, organizational system designed to collect, process, store, and distribute information. While Bulgacs (2013) indicated that an information system encompasses the information and communication technology (ICT) that an organization uses. Kroenke (2008) stated that an information system is the way in which people interact with this technology in support of business processes.

The current COVID-19 pandemic affects the entire World and has been perceived as the biggest issue currently faced in many organizations. Thousands of people are dying; many millions more are in lockdown. This causes information systems to play a critical role in managing data and other information at the speed the situation requires. Many new types of technologies have been developed to support remote communications and sharing data like Microsoft Teams and Zoom.

Although many remote access tools have been developed in response to the demands of users, many research findings have shown that system quality is perceived as an antecedent to the implementation of success and influences the outcomes of organizational processes. As such, understanding system quality attributes can help an organization to develop strategies to effectively respond to unexpected situations.

Delone and Mclean (1992) described a number of IS success measures after reviewing 180 studies, stating that research has focused on areas such as system quality (e.g. IS interface, availability, response time), system usage, user satisfaction, individual impact, and organizational impact.

In IS research, system usage may be defined as "either the amount of effort expended interacting with an information system or, less frequently, as the number of reports or other information products generated by the information system per unit time" (Trice and Treacy, 1988, p. 33).

Delone and McLean (2002) suggest that the nature, quality, and appropriateness of the system's use are also important and not just simply measuring the time spent on system use. They consider system usage as a necessary condition under which IS/IT can affect organizational performance. Zmud (1979) also advocated three factors related to users (system usage, user satisfaction, and user performance) as measures of a system's success.

2.3 Service Quality

Coronavirus has posed a serious effect not only on human life but also on the corporate sector. By April 2020, about half of the world's population

was under lockdown, with more than 3.9 billion people in more than 90 countries or territories having been asked or ordered to stay at home by their governments (Wayback Machine, 2020).

People are forced to maintain space between themselves and other people, often referred to as social distancing or physical distancing, in attempts to prevent the spread of the disease. Some people are required to self-isolate or quarantine at home if they suspect being exposed to the disease, or have had close contact with someone known to have contracted COVID-19.

These primary interventions against the COVID-19 pandemic have become major obstructions for service delivery. Businesses in the service sector have been particularly affected, as business necessitates personal contact between consumers and service providers (Guerrieri et al., 2020). The service sector is facing many hurdles in maintaining the quality of their services and making deliveries on time. This has forced management in the service sector to implement multiple strategies to maintain and influence consumer satisfaction and loyalty, and also to provide responsive services for customers and employees.

Some researchers have argued that to make consumers satisfied, maintaining quality is a key factor (Gremler et al., 2001; and Radwin, 2000). High-quality service delivery becomes a key to success. This is the reason that many businesses have diverted their focus to issues related to service quality (Meesala & Paul, 2016).

To meet the desires and overall expectations of the consumer, Sadeh (2017) suggested maintaining an excellent service, while Miguel (2006) and Yang (2003) proposed implementation of good quality management tools and techniques which would result in increased awareness of service quality among consumers as well as providers, not only increasing the level of service provided but also enhancing business performance.

The SERVQUAL (Parasuraman, Berry & Zeithaml, 1990) is the most popular assessment tool for service quality. Its developers noted that in developing SERVQUAL, an instrument for measuring customers' perceptions of service quality, they followed well-established procedures for designing scales to measure constructs that are not directly observable. Based on the five SERVQUAL dimensions, the SERVQUAL instrument helps service providers understand student perceptions of specific services, as well as quality improvement over time. It may also help to target specific service elements which require improvement, and training opportunities for service providers. Analyzed at the item level, data drawn from the application of the SERVQUAL instrument is rich with practical implications for a service manager.

2.4 Importance-Performance Analysis

In recent years, importance-performance analysis (John, Ugur & Glen, 1994) has become a popular managerial tool used to identify the strengths and weakness of brands, products, and services.

A typical application of the technique starts with an identification of the attributes which are relevant to the choice situation investigated. The list of attributes can be developed after canvassing the relevant literature, conducting focus group interviews, and using managerial judgement. According to Barsky (1995), lower ratings are likely to play a lesser role in affecting overall perceptions, while higher importance ratings are likely to play a more critical role in determining satisfaction. The objective is to identify which attributes, or combinations, are more influential in repeat-purchase behavior and which have less impact. The information derived should prove invaluable in terms of the development of marketing strategies for the organizations that use it (Ford 1999).

Mean performance and importance scores are used as coordinates for plotting individual attributes on a two-dimensional matrix as shown in Figure 1. This matrix is used to prescribe prioritization of attributes for improvement (Slack, 1991), and can provide guidance for strategy formulation (Burns, 1986).

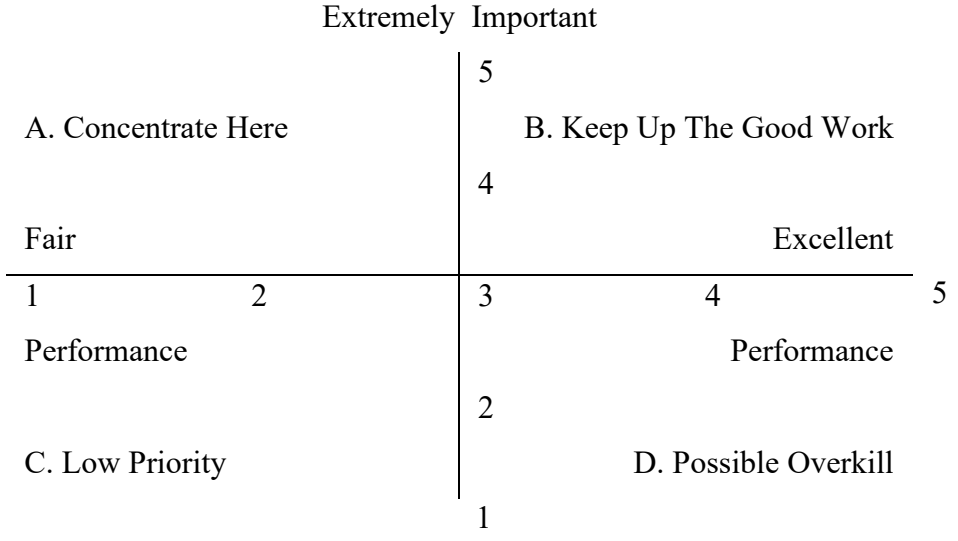

Figure 1: Two-dimensional matrix

2.5 User Satisfaction

The measurement of user satisfaction with IT applications remains of prime concern to researchers. User satisfaction measures are categorized in terms of three perspectives, namely user attitudes towards the IT application; user satisfaction in terms of information quality; and user satisfaction in terms of perceived IS effectiveness (Kim, 1989).

According to Bailey and Pearson (1983) "satisfaction in a given situation is the sum of one's feelings and attitudes toward a variety of factors affecting the situation". As with system usage, a variety of measures have been proposed for the quantification and assessment of user satisfaction (Bailey and Pearson, 1983; Doll and Torkzadeh, 1988; Baroudi and Orlikowski, 1988). Ives et al. (1983) considered user satisfaction as "the extent to which users believe the information system available to them meets their information requirements" (Ives et al., 1983, p. 785). This definition suggests that users perceive the system irrespective of its technical quality, and relates to the fulfilment of user needs by the IS. Kim (1989) describes user satisfaction in terms of information quality, system effectiveness, and user attitudes. Doll and Torkzadeh (1988) considered user satisfaction in terms of system quality (system accuracy, and ease of use) and information quality.

Powers and Dickson (1973) studied the factors affecting the success of management information systems. They identified user satisfaction as one of the key factors affecting the success of management information systems. Delone and Mclean (1992) concluded that user satisfaction is widely used as a measure of IS success because reliable instruments have been developed to measure satisfaction, and other measures of IS success are problematic. However, while user satisfaction has been widely used as a surrogate for systems performance and IS success, critics have questioned its general applicability (e.g. Galletta and Lederer 1989).

2.6 User Retention

Even before COVID-19, there was already high growth and wide-spread adoption of education technology. However, whether language applications, virtual tutoring, video conferencing tools, or online learning software, there has been a significant surge in usage since the COVID-19 pandemic began.

Technology has proved a useful and necessary tool to continue providing education to students who cannot physically access their university. With this sudden shift away from the classroom, many educational digital platforms are offering their services in response to this significant demand.

Since sustainable competitive advantages are the key to business success, this is a force that enables a business to have greater focus on customer retention, while innovation also helps an organization to retain its

users, enhance their consumer experience, and increase customer LTV (lifetime value).

The core of Customer Relationship Marketing (CRM) is Customer Retention (CR). Thus, customer retention is thought to be the repeated patronage of a marketer or supplier by a customer; retention is also used interchangeably with other terms including customer loyalty.

Kandampully (1998) stated that customer satisfaction does indeed affect customer retention, achieving results in line with similar studies such as Anderson and Sullivan (1993). As such, service organizations try to enhance customer satisfaction by enhancing various service-related issues such as service quality; this in turn helps to maintain and extend customer-supplier relationships (Ravald and Grönroos, 1996).

It is necessary for organizations to focus on the potential advantages of pursuing strategies for satisfying or retaining customers, rather than on the concepts themselves. Satisfaction increases customer retention, and customer retention depends on the substance of the relationship between parties. However, not all retained customers are satisfied; they may stay with a provider only due to a lack of alternatives (Eriksson and Löfmarck Vaghult, 2000).

Eriksson and LÖfmarck Vaghult (2000) argue that not all retained customers are satisfied, stating that customers may not have achieved the kind of relationship in which they become satisfied. As such, companies must develop their products and services to meet the evolving needs of their customers, in order to retain them (Desai and Mahajan (1998).

With this sudden shift away from the traditional classroom in various parts of the world, people are wondering if the adoption of online learning will continue to persist post-pandemic. It is necessary for universities to study user retention in order to improve and seek ways to make their best even better.

3. RESEARCH METHODOLOGY

3.1 Target Populations

The target population in this study is the students of Thai Higher Educational Institutions who have participated in or experienced using the Digital Learning Platform offered by their institutions.

3.2 Sample Size and Sampling Technique

The population list or population frame was obtained by the Office of Commission on Higher Education, Ministry of Education in the year 2020. The sample population was sorted using a stratified two-stage sampling technique. Systematic sampling to maintain proportionality was also applied to the sample. Finally, sampling elements were selected from each stratum by simple random sampling (SRS).

To determine the sample size for each proportion, Yamane (1967) provides a simplified formula to

calculate sample sizes. For this research, a 95% confidence level ($Z_{\alpha/2}$ = 1.96) was required, such that the allowance for sampling error was equal to a 5 percent level of error. The appropriate sample size was thus calculated using the equation:

$$n = \frac{N}{1 + Ne^2}$$

Based on the information obtained from the Office of the Commission on Higher Education, Ministry of Education in the year 2020, the minimum required sample size for this research was calculated as 400 respondents. An adjustment in the sample size was applied for the purposes of the data analysis. The design ensures an effective ratio for the variance of an estimate under the complex sample design, to the variance of the same estimate obtained through the application of a simple random sample (SRS) of the same size.

3.3 Data Collection and the Treatment of Collected Data

A questionnaire survey was utilized to collect the required data and to determine a basic set of attributes for the Digital Platform Application which affected user satisfaction. Email-based question-naires were used in this research, with questionnaires sent to a targeted sample randomly selected from the previously selected higher educational institutions. In this type of sampling, using the selected higher educational institutions as the sample frame, all students in the group of interest were investigated.

Following data collection, the data gathered from the respondents was analyzed and summarized in a readable and easily interpretable form. The questionnaire responses were processed using SPSS to determine values for the descriptive statistics used in describing the parameters of the respondents' personal data. In addition, SPSS was used to conduct a factor analysis. An Analysis of Moment Structures (AMOS) was utilized to analyze multiple regression as it has a unique graphical interface and is specifically designed to make fitting to an SEM easier.

3.5 Hypotheses Statements

The following hypotheses were investigated:

H_a1: There is a difference between users' perceptions regarding the importance and the performance of information attributes.

H_a2: There is a difference between users' perceptions regarding the importance and the performance of system attributes.

H_a3: There is a difference between users' perceptions regarding the importance and the performance of service attributes.

H_a4 There is a relationship between user perception of information quality and user satisfaction.

H_a5 There is a relationship between user perception of system quality and user satisfaction.
H_a6 There is a relationship between user perception of service quality and user satisfaction.
H_a7 There is a relationship between user perception of overall management quality and user satisfaction with elements of the Digital Platform.
H_a8 There is a relationship between users' demographic characteristics, the overall management quality, and user satisfaction with elements of the Digital Platform.
H_a9 There is a relationship between user satisfaction and user retention.

4. DATA ANALYSIS

Table 1 shows that 179 respondents of the sample size were male, while 271 respondents were female, representing 39.8% and 60.2% respectively. Most of the respondents were freshmen students, accounting for 89.1% of the sample; while 18 respondents were sophomore students, accounting for 4 % of the sample. The majority of the sample were in the 'under 25 years' age group, making up 82.7% of respondents.

The attribute importance and performance scores were ordered and classified into high or low categories; by pairing these two sets of rankings, the results for the Digital Platform Application attributes all fell into the "keep up the good work" area (quadrant II).

Table 1: Summary of Respondents' Demographic Profile

Item	Categories	Frequency	Percentage
Gender	1. Male	179	39.8
	2. Female	271	60.2
Age	1. Less than 25 years	372	82.7
	2. 25 – 30 years	62	13.8
	3. 31 – 35 years	8	1.8
	4. 36 – 40 years	1	0.2
	5. 51 years and above	7	1.6
Academic Year of Study	1. Freshmen	401	89.1
	2. Sophomore	18	4.0
	3. Junior	12	2.7
	4. Senior	19	4.2

Table 2 Mean of Digital Platform Application Attributes

Item No.	Indicators	N	Mean (Importance)	Mean (Performance)	Quadrant
1.	Timeliness	450	3.98	3.71	B
2.	Frequency	450	4.03	3.84	B
3.	Availability	450	4.08	3.78	B
4.	Accuracy	450	3.77	3.61	B
5.	Completeness	450	3.95	3.70	B
6.	Conciseness	450	4.05	3.80	B
7.	Consistency	450	3.98	3.76	B
8.	Accessibility	450	4.17	3.89	B
9.	Precision	450	3.99	3.83	B
10.	Efficiency	450	4.04	3.80	B
11.	Privacy	450	4.03	3.83	B
12.	Response time	450	3.81	3.56	B
13.	Multifunctional capabilities	450	3.95	3.66	B
14.	Robustness	450	3.96	3.66	B
15.	Ease of use	450	3.98	3.79	B
16.	Interface	450	3.90	3.78	B
17.	Reliability	450	3.90	3.68	B
18.	Responsiveness	450	4.09	3.83	B
19	Assurance	450	3.97	3.76	B
20.	Communication	450	4.10	3.97	B
21.	Empathy	450	3.87	3.78	B

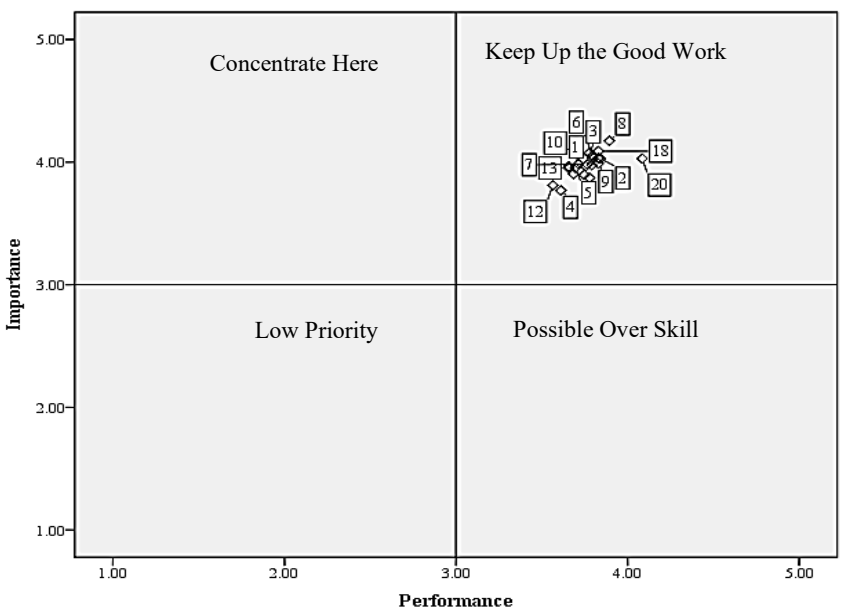

Figure 2: Importance – Performance Grids for All Items.

The vertical axis of the grid in (Figure 2) indicates the importance of the attributes from high to low, while the horizontal axis represents their perceived performance from high to low. The placement of attributes on this two-dimensional graph suggests a suitable strategy for the attribute ofinterest. Attributes in Quadrant 1 are ranked high in both importance and performance. What is needed here is to "keep up the good work". Quadrant 2 signals those attributes, which require a special marketing effort. These attributes are high in importance but rated substandard in performance. The attributes in Quadrant 3 indicate those rated low in both importance and performance. Because of their low salience, these attributes are considered low priority and hence require no additional resources. Attributes in Quadrant 4 are rated high in performance, but low in importance. This implies that overkill has occurred. Perhaps the resources committed to these attributes should be channeled elsewhere. The procedure is very pragmatic, easy to apply and interpret. More importantly, it readily identifies the strategic options for translating results into action.

The finding indicates that users were satisfied with the attributes they considered to be of high importance, and the management should work on maintaining the current performance level in these areas in order to sustain the resultant competitive advantages.

When applying the Importance-Performance Grid in this study, the quadrants of the grid provide information regarding the level of importance and performance for each key success factor. All factors were placed into quadrant 2, being rated as important with a high level of performance as shown in Table 2 and Figure 2.

As depicted in Table 3, more than half the respondents indicated a high quality of management, accounting for 60.9% of responses, followed by 25.1% for neutral, and 0.7% for low. This result clearly shows that most respondents perceived high management quality in their Higher Educational Institution during the unexpected crisis.

Table 3: The Percentage of the Overall Quality Management

Quality Level	N	Frequency	Percentage
Very High	450	60	13.3
High	450	274	60.9
Neutral	450	113	25.1
Low	450	0	0
Very low	450	3	0.7

Table 4: The Percentage of Overall Satisfaction

Satisfaction Level	N	Frequency	Percentage
Very High	450	55	12.2
High	450	253	56.2
Neutral	450	113	25.1
Low	450	24	5.3
Very low	450	5	1.1

Table 5: The Percentage of the Overall User Retention

Satisfaction Level	N	Frequency	Percentage
Very High	450	186	41.3
High	450	140	31.1
Neutral	450	86	19.1
Low	450	35	7.8
Very low	450	3	0.7

As shown in Table 4, the finding indicates that over half of the respondents gave a rating of high satisfaction regarding the use of the Digital Platform Application provided by their institution, accounting for 56.2% of respondents, followed by 25.1% neutral responses, and only 5% of respondents reporting a very low satisfaction level.

Table 5 indicates that over half of the respondents gave a rating of strongly agree regarding retention or the intention to continue using the Digital Platform Application provided by the institution; this accounted for 72.4% of responses, followed by 19.1% reporting a neutral response, and 0.7% rating this attribute as 'strongly disagree'.

The result from the reliability analysis was 0.929, indicating satisfactory as all values of reliability exceeded the recommended value of 0.80 (Nunnally, 1978). The constructs also exhibited a high degree of reliability in terms of the alpha coefficient.

Factor Analysis

The application of the factor analysis results in three groups of variables. First, seven variables all relating to information quality were grouped together. Nine variables describing system quality were grouped together. Finally, five variables of service quality were grouped. Each group represents a set of highly interrelated variables that may reflect a more general evaluation dimension.

The KMO measure was .884 (exceeding the recommendation of .50), indicating excellence in terms of sampling adequacy, also being amenable to useful factor analysis, while the Bartlett's test of sphericity result also yielded a value of 5022.528, associated with a 0.000 level of significance, thus indicating a high

probability that there is a significant relationship between the variables and that sufficient correlations exist between the variables of interest.

As depicted on Table 6, the p-value for all information elements was .000. The difference between users' perceptions of the importance and performance of information attributes was therefore statistically significant at the 0.05 level. The null hypothesis of independence was consequently rejected.

As shown in Table 7 the results indicated strong evidence regarding the difference between users' perceptions of the importance and performance of system attributes, as the result of the p-value for all system elements was .000. There was a statistically significant difference between the means ($p < .05$) of users' perceptions regarding the importance and performance of the system attributes. Therefore, the null hypothesis of independence was rejected.

Table 6: T-test of Information Attributes

Item No.	Indicators	$\bar{x}$ (Importance)	$\bar{x}$ (Performance)	Mean Difference	t-value	Sig. (2 tailed)
1.	Timeliness	3.98	3.71	-0.27	-7.459	.000**
2.	Frequency	4.03	3.84	-0.19	-6.277	.000**
3.	Availability	4.08	3.78	-0.30	-8.175	.000**
4.	Accuracy	3.77	3.61	-0.16	-4.580	.000**
5.	Completeness	3.95	3.70	-0.26	-6.623	.000**
6.	Conciseness	4.05	3.80	-0.26	-8.449	.000**
7.	Consistency	3.98	3.76	-0.22	-7.975	.000**

Note **Significant at the 0.05 level

Table 7: T-test of System Attributes

Item No.	Indicators	$\bar{x}$ (Importance)	$\bar{x}$ (Performance)	Mean Difference	t-value	Sig. (2 tailed)
1.	Accessibility	4.17	3.89	-0.28	-7.886	.000**
2.	Precision	3.99	3.83	-0.16	-4.473	.000**
3.	Efficiency	4.04	3.80	-0.24	-7.170	.000**
4.	Privacy	4.03	3.83	-0.20	-6.151	.000**
5.	Response time	3.81	3.56	-0.25	-5.589	.000**
6.	Multifunctional capabilities	3.95	3.66	-0.29	-9.029	.000**
7.	Robustness	3.96	3.66	-0.31	-8.643	.000**
8.	Ease of use	3.98	3.79	-0.19	-5.332	.000**
9.	Interface	3.90	3.78	-0.12	-4.008	.000**

Note **Significant at the 0.05 level

Table 8: T-test of Service Attributes

Item No.	Indicators	$\bar{x}$ (Importance)	$\bar{x}$ (Performance)	Mean Difference	t-value	Sig. (2 tailed)
1.	Reliability	3.90	3.68	-0.23	-6.887	.000**
2.	Responsiveness	4.09	3.83	-0.26	-7.002	.000**
3.	Assurance	3.97	3.76	-0.21	-6.241	.000**
4.	Communication	4.10	3.97	-0.12	-3.545	.000**
5.	Empathy	3.87	3.78	-0.10	-3.143	.002**

Table 8 shows a comparison of users' perceptions regarding the importance and performance of various service aspects; the highest values of user perception were found for communication and responsiveness. This result indicates strong evidence to suggest that there is a statistically significant difference between the means ($p < .05$) for users' perceptions of the importance and performance for all service attributes. Therefore, the null hypothesis of independence was rejected.

The results shown in Table 9 and Table 10 indicate the statistical significance (P =0.000), of the association between the variables; accordingly, the null hypothesis of independence was rejected. Additionally, the correlation coefficient value (.477, P = 0.000) for the association between overall management quality and preparation was highly significant; the null hypothesis of independence was consequently rejected.

Table 9: Chi-Square-Based Measures of Association between Information Quality, System Quality, Service Quality, and User Satisfaction

	Pearson Chi-Square			Likelihood Ratio			Contingency Coefficient	
	Value	df	Asymp.Sig. (2-sided)	Value	df	Asymp.Sig. (2-sided)	Value	Apprpx. Sig.
Fac_1*Overall Satisfaction	209.812	80	.000	160.477	80	.000	.564	.000
Fac_2*Overall Satisfaction	323.720	108	.000	251.008	108	.000	.647	.000
Fac_3*Overall Satisfaction	205.619	60	.000	118.025	60	.000	.560	.000

Table 10: Chi-Square-Based Measures of Association for Overall Management Quality

	Pearson Chi-Square			Likelihood Ratio			Contingency Coefficient	
	Value	**df**	**Asymp. Sig. (2-sided)**	**Value**	**f**	**Asymp. Sig. (2-sided)**	**Value**	**Apprpx. Sig.**
Management Quality by Age	11.129	12	.518	10.515	12	.571	.155	.518
Management Quality by Gender	8.716	3	.033**	8.648	3	.034	.079	.033**
Management Quality by Academic	3.296	9	.951	3.905	9	.918	.085	.951
Management Quality by Preparation	132.872	12	.000**	98.983	12	.000**	.477	.000**

Table 11: Chi-Square-Based Measures of Association of Overall Satisfaction and User Retention

	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	356.062[a]	16	.000
Likelihood Ratio	97.484	16	.000
Linear-by-Linear Association	47.049	1	.000
N of Valid Cases	450		

Note **Significant at the 0.05 level

As depicted in Table 11, the results present χ^2 (16) = 356.062, P = 0.000, with G^2 (16 = 97.484, P = 0.000, as well as a correlation coefficient value of 0.665, (P =0.000) for the association between overall satisfaction and user retention. Accordingly, the results show that the variables are associated; the null hypothesis of independence is therefore rejected.

Table 12 Regression Results for Digital Platform Attributes and Users' Satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	502[a]	.252	.251	.67932	.252	151.085	1	448	.000
2	536[b]	.288	.284	.66376	.035	22.255	1	447	.000
3	547[c]	.299	.294	.65921	.011	7.184	1	446	.008

a. Predictors: (Constant), Fac_Inf
b. Predictors: (Constant), Fac_Inf, Fac_Ser
c. Predictors: (Constant), Fac_Inf, Fac_Ser, Fac_Sys

Table 12 displays the results concerning the overall model fit, as well as the stepwise estimate of the regression model. In the first step of the stepwise estimation, the Multiple R is the same as the bivariate correlation (.502), the correlation coefficient squared (R^2) is .252 and the standard error of the estimate is .67932.

Entering the third independent variable into the regression equation gives the results shown in Table 12. As predicted, the value of R^2 increased to .299. Moreover, the adjusted R^2 increased to .294, while the standard error of the estimate decreased to .65921. This indicates that the third independent variable made a substantial contribution to the fit of the overall model.

Table 13 Regression Coefficients

Model		Unstandardized Coefficients			t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	1.743	.165		10.576	.000			
	Fac_Inf	.076	.006	.502	12.292	.000	.502	.502	.502
2	(Constant)	1.397	.177		7.895	.000			
	Fac_Inf	.048	.008	.316	5.630	.000	.502	.257	.225
	Fac_Ser	.057	.012	.265	4.718	.000	.487	.218	.188
3	(Constant)	1.240	.185		6.695	.000			
	Fac_Inf	.032	.010	.214	3.173	.002	.502	.149	.126
	Fac_Ser	.043	.013	.201	3.315	.001	.487	.155	.131
	Fac_Sys	.024	.009	.187	2.680	.008	.501	.126	.106

As shown in Table 13, the result of the regression coefficient (*b*) for model 1 displays the predicted value for users' satisfaction, indicated by the intercept (1.743) plus the regression coefficient (.076) for the information quality variable, and the beta value of 0.502. The *t* value is 12.292, indicating statistical significance at the 0.000 level.

The additional system quality variable brought a third statistically significant predictor of user satisfaction into the equation. The regression weight of .024 is complemented by a beta weight of .187. The final model regression model with three independent variables (information, system, and service) explained almost 30 percent of the variance in users' satisfaction. Also, the standard error of the estimate reduced to .65921. The three regression coefficients were all significant at the .05 level.

Structural Equation Modeling (SEM)

Confirmatory factor analysis (CFA) is carried out to investigate the relationship between sets of observed and latent variables, within the framework of SEM, representing the measurement model.

As depicted in Table 14, tests of the hypothesized model yielded a χ^2 value of 3.645, with 6 degrees of freedom and a probability of greater than 0.0001 ($p > .0001$), thereby suggesting that the data fits the hypothesized model very well and the model is correct, with the probability of getting a discrepancy as large as 3.645 being 0.608. This test statistic indicates that, the hypothesis bearing

Table 14 Summary of Models CMIN (Chi-square Minimum Discrepancy)

Model	NPAR	CMIN	DF	P	CMIN/DF
Estimated parameters	15	3.645	6	0.725	0.608
No. of Information	21	.000	0		

Table 15 Summary of Models (RMR, GFI, NFI, CFI, TLI, and RMSEA)

Indices	Value
Standardized Root Mean Square Residual (SRMR)	.078
Goodness-of-fit (GFI)	.997
Normed Fit Index (NFI)	.997
Comparative Fit Index (CFI)	1.000
Tucker-Lewis Index (TLI)	1.004
Root Mean Square Error of Approximation (RMSEA)	.000 *P* value = .967 *Bound of* .000 and .045

on SC relations, as summarized in the model, represents a likely event and the model fits perfectly in the population (Joreskog & Sorbom, 1993).

As shown in Table 15, the SRMR value of .078, the GFI value of .997, the NFI value of .997, the CFI value of 1.000, and the TLI value of 1.004, all indicate a very well-fitting model; this can be interpreted as an indicator of good fit (Browne & Cudeck ,1993).

It can be concluded that the hypothesized model improves fit by 99% compared to the null model. By convention, CFI = 1.000 indicates that 100% of the covariation in the data can be reproduced by the given model and the hypothesized model represented a perfect fit to the data.

The RMSEA value found for hypothesized model was .000, with a 95% confidence interval ranging from .000 to .045 and the *p* value for the test of closeness of fit equal to 0.967. Interpretation of the confidence interval indicates that we can be 97% confident that the true RMSEA value in the population will fall within the bounds of .000 and .045, representing a perfect degree of precision, given that the RMSEA point estimate is .05, the upper bound of the 95% interval is .000, which is less that the value suggested by Browne and Cudeck (1993), and the probability value associated with this test for a close fit is >.50 (p = .967). Thus, it can be concluded that the initially hypothesized model fits the data very well.

In reference to this section of the AMOS text output, presented in Table 16 and Figure 2, all structural paths among the exogenous and endogenous latent variables were found to be significant with an absolute value less than 0.05.

As depicted in Figure 3, the structural equation model (SEM) was established with different structures of the mean and covariance, and was constructed in accordance with the exogenous latent variable number. The hypothesized model was examined based on the estimation technique according to the structure given in Table 16. The results of the model fit indices based on a sample size 450, indicate the significance of

Table 16 Maximum Likelihood Estimates: Regression Weights for Model

Factor loading			Estimate	S.E.	C.R.	P
overall_mgt	<---	Fac_Inf	0.053	0.01	5.23	***
overall_mgt	<---	Fac_Ser	0.062	0.013	4.88	***
overall_mgt	<---	Fac_Sys	0.023	0.009	2.697	0.007
User_Reten	<---	overall_sat	0.446	0.126	3.538	***
overall_sat	<---	overall_mgt	0.974	0.068	14.33	***
overall_mgt	<---	overall_sat	-0.331	0.088	-3.783	***

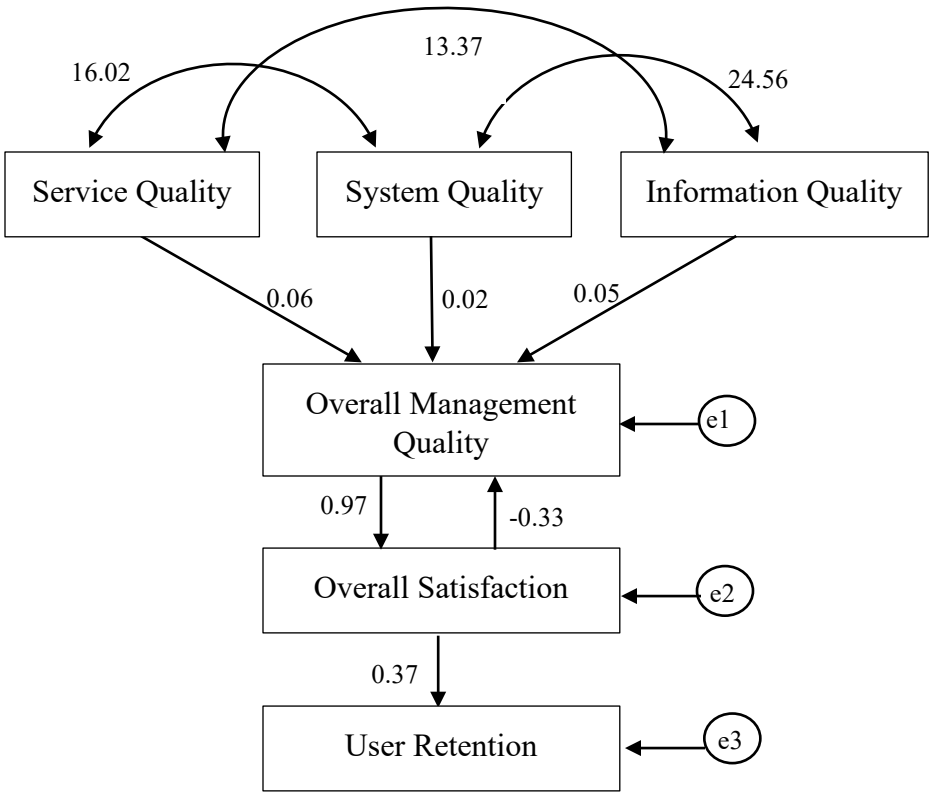

Figure 3 Structural Equation Model for Digital Platform ApplicationsAttributes, Management Quality and Users' Satisfaction

all structural paths among the exogenous and endogenous latent variables, accounting for 0.53, 0.23, 0.62, 0.974, 0.368 and -.331; these were found to be significant with an absolute value less than 0.05, while the covariance between the factors accounted for 24.560, 16.022, and 13.374, all of which are significantly different from zero at the 0.001 level.

Since the hypothesized mode was estimated through SEM on various distributional conditions and sample sizes, standard errors and the bias of mode fit indices were also applied in this research. The result shows that the hypothesized model fits all model fit indices very well. The model fits perfectly in the population and fits the data well based on the results of the RMSEA, CFI, and TLI fit function. All observed variable factors are good predictors for the hypothesized model as shown in the results depicted by the MLE regression weights.

5. CONCLUSION

To develop the current challenging experience into an opportunity, universities are required to prepare their professionals for the

potential challenges they may face, and to provide solutions in response to the crisis. Digital transformation in the context of higher education institutions can be regarded as the summation of all digital processes required to accomplish the transformation process that provides higher education institutions with the opportunity to positively and optimally apply digital technologies (Kopp et al., 2019). Universities must be up to the task of strategic preparation, trust establishment, and thinking in processes, in order to provide educational equality.

As previously mentioned, the direction for this research was to explore the moderator variables that may affect the magnitude of the relationship between overall quality management and user satisfaction. However, such relationships may exist in both directions, overall quality management may act as evidence for increasing the level of user satisfaction, while user satisfaction may provide positive feedback towards quality management.

Given this fact, the unexpected event also offers an opportunity for the educational institution to envision a new model of education, for example how to secure systems for examination from home, a flexible time management and learning model, new solutions to improve autonomy, and empowering teachers to develop more advanced digital learning solutions. It is therefore important for the educational institutions to maximize performance standards by creating a positive force in education. Multiple forms of communication, including video conferencing, synchronous and asynchronous communication, along with social media tools, should be utilized in online learning. Clear guidance and instructions are essential for learners while teachers are away. This can help learners to become more self-directed.

However, at present the COVID-19 pandemic remains unsolved, and online learning approaches are still being chosen as a means of teaching and learning. It is necessary for educational institutions to support their learners in developing the skills for distance learning, preparing them to be lifelong online learners.

REFERENCES

Baroudi, J.J. and Orlikowski, W.J. (1988), A short-form measure of user information satisfaction: a psychometric evaluation and notes on use, *Journal of Management Information Systems,* Vol. 4 No. 4, pp. 44-59.

Barsky, J.D. (1995), *World-Class Customer Satisfaction*, Irwin Publishing, Chicago, IL.,.

Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In Bollen, K.A. & Long, J.S. [Eds.] *Testing structural equation models*. Newbury Park, CA: Sage, 136–162.

Bulgacs, Simon (2013). The first phase of creating a standardised international technological implementation framework/ software application. *Int. J.*

Business and Systems Research. 7 (3): 250.

Burns, A.C. (1986) Generating Marketing Strategy Priorities Based on Relative Competitive Position, *Journal of Consumer Marketing,* 3(3), pp. 49-56.

Chelsom J.V., Clewer G.R. (1995) Integrated quality management: redefining 'total' in TQM. In: Kanji G.K. (eds) *Total Quality Management*. Springer, Dordrecht.

Clark, R.C. and Mayer, R.E. (2016), *e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning*, 4th ed., Wiley, London.

Delone, W.H., McLean, E.R. (2002), Information systems success revisited, *Proceedings of the 35th International Conference on System Sciences (HICSS-35'02),* Hilton Waikoloa Village, Island of Hawaii, HI, IEEE Computer Society, 7-10 January.

Delone, W.H. and McLean, E.R. (1992), Information systems success: the quest for the dependent variable, *Information Systems Research*, Vol. 3 No. 1, pp. 60-95.

Desai, K.K. and Mahajan, V. (1998), Strategic role of affect-based attitudes in the acquisition, development and retention of customers, *Journal of Business Research*, Vol. 42, July, pp. 309-24.

Doll, W., Torkzadeh, G. (1988), Developing a multidimensional measure of system use in an organizational context, *Information & Management*, Vol. 33 pp.171-85

Eriksson, K. and Löfmarck Vaghult, A. (2000), Customer retention, purchasing behavior and relationship substance in professional services, *Industrial Marketing Management*, Vol. 29 No. 4, pp. 363-72.

Ford, J.B., Joseph, M., Joseph, B. (1999), Importance-performance analysis as a strategic tool for service marketers: the case of service quality perceptions of business students in New Zealand and the USA, *The Journal of Services Marketing*, Vol. 13 No.2, pp.171-86.

Fraser, S. and Deane, E. (1999), Educating tomorrow's scientists: IT as a tool, not an educator, *Teaching in Higher Education*, Vol. 4, pp. 91-107.

Fraser, S. and Dean, E. (1997) Why learning? *Australian Universities Review,* 1, 25-31.

Galletta, D.F., Lederer, A.L. (1989), Some cautions on the measurement of user information satisfaction, *Decision Sciences*, Vol. 20 pp.419-38.

Gremler, D. D., Gwinner, K. P., & Brown, S. W. (2001). Generating positive word-of-mouth communication through customer-employee relationships. *International Journal of Service Industry Management*, 12(1), 44-59.

Guerrieri, V., Lorenzoni, G., Straub, L., & Werning, I. (2020). *Macroeconomic Implications of*

COVID-19: Can Negative Supply Shocks Cause Demand Shortages? (No. w26918). National Bureau of Economic Research.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review*, 27 March.

Hossein Khalili (2020). Online interprofessional education during and post the COVID-19 pandemic: a commentary, *Journal of Interprofessional Care*.

Houlden, S., & Veletsianos, G. (2020). Coronavirus pushes universities to switch to online classes – but are they ready? *The Conversation*, 12 March.

Houston, D., Meyer, L. H., & Paewai, S. (2006). Academic staff workloads and job satisfaction: expectations and values in academe. *Journal of Higher Education Policy and Management*, 28(1), 17–30.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.

Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), Structural equation modeling: Concepts, issues and application (pp. 77-99). Thousand Oaks, CA: Sage.

Ives, B., Olson, H. and Baroudi, J. (1983), The measurement of user information satisfaction, *Communications of the ACM*, Vol. 26 No. 10, pp. 785-93.

John C. Keyt, Ugur Yavas and Glen Riecken, Importance-Performance Analysis: A Case Study in Restaurant Positioning, *International Journal of Retail & Distribution Management*, Vol. 22 No. 5, 1994, pp. 35-40 © MCB University Press, 0959-0552.

Kandampully, J. (1998) Service Quality to Service Loyalty: A Relationship Which Goes beyond Customer Services. *Total Quality Management*, 9, 431-443.

Kim, K.K. (1989), User satisfaction: a synthesis of three different perspectives, *Journal of Information Systems*, Vol. 12 No.Fall, pp.1-12.

Kopp, M., Gröblinger, O., & Adams, S. (2019, March 11–13). Five common assumptions that prevent digital transformation at higher education institutions. *INTED2019 Proceedings* (pp. 1448–1457). Kroenke, D M. (2008). Experiencing MIS. Prentice-Hall, Upper Saddle River, NJ.

Kroenke, D M. (2008). *Experiencing MIS.* Prentice-Hall, Upper Saddle River, NJ.

Lekha Kunju Pillai Laxman (2020) *Handbok of Research on Innovation and Development of E-Commerce and E-Business in ASEAN: Legal and Regulatory Challenges in Facilitating a Sustainable ASEAN E-Commerce Sector*, (pp.23).

Hershey, PA: IGI Global.

Meesala, A., & Paul, J. (2018). Service quality, consumer satisfaction and loyalty in hospitals: Thinking for the future. *Journal of Retailing and Consumer Services*, 40(2), 261-269

Miguel, P. (2006), Quality management through a National Quality Award Framework, *The TQM Magazine*, 18(6), 626-637.

Pailing, M (2002). E-learning: Is it really the best thing since sliced bread? *Industrial and commercial Training*, 34(4), 151-155.

Parasuraman, A., Valarie A. Zeithaml, and Leonard L. Berry, SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality, *Journal of Retailing,* Vol.64, No.1 (Spring), 1990, pp.12-40.

Piccoli, Gabriele; Pigni, Federico. *Information systems for managers: with cases* (Edition 4.0 ed.). Press. p. 28. ISBN 978-1-943153-50-3. Retrieved 25 November 2018.

Powers, R.F and Dickson, G.W., MIS Project Management: Myths, Opinions and Reality, *California Management Review*, Vol.15(3), 1973, 147-156.

Radwin, L. (2000). Oncology patients' perceptions of quality nursing care. *Research in nursing & health*, 23(3), 179-190.

Rapanta, C., Botturi, L., Goodyear, P. et al. *Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity*. Postdigit Sci Educ (2020).

Ravald, A. and Gronroos, C. (1996) The Value Concept and Relationship Marketing. *European Journal of Marketing*, 30, 19-30.

Rhodes Elias Mwageni (2020) *The Use of Digital Devices in Marketing Library Products in an Inclusively Engaged Academic Library* (pp.25-44). Teofilo Kisanji University, Tanzania:IGI Global

Sadeh, E. (2017). Interrelationships among quality enablers, service quality, patients' satisfaction and loyalty in hospitals. *The TQM Journal*, 29(1), 101-117.

Sell, G. (1997), Challenges in using technology for the improvement if undergraduate education, in Gillespie, K.H. (Ed.), *Teaching Excellence: Toward the Best in the Academy*, POD Network, Ames, IA.

Slack, N. (1991) The Importance-Performance Matrix as a Determinant of Improvement Priority, *International Journal of Operations & Production Management*, 14(1), pp. 59-75.

Trice, A.W., Treacy, M.E. (1988), Utilization as a dependent variable in MIS research, *Data Base*, No.Fall/Winter, pp.33-41.

Tucker, L.R., & Lewis, C.(1973). A reliability coefficient for maxi-mum likelihood factor analysis. *Psychometrika*, 38, 1-10.

United Nations (2020). *Policy Brief: Education during COVID-19 and*

beyond.

Vockell, E. L., & Brown, W. (1992). *The computer in the social studies curriculum.* Santa Cruz, CA: Mitchell/McGraw-Hill.

Wayback Machine (2020), love Coronavirus: Half of humanity now on lockdown as 90 countries call for confinement Archived 19 May 2020 at the Wayback Machine Alasdair Sandford.

Yang, C. (2003), The establishment of a TQM system for the health care industry, *The TQM Magazine*, 15(2), 93-98.

Zmud, R.W. (1979), Individual differences and MIS success: a review of the empirical literature, *Management Science*, Vol.25 No.10, pp 966-79.