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Johan W. de Jager¹, Muhammad Tahir Jan²

A STRUCTURAL EQUATION MODELLING APPROACH TO INVESTIGATING THE IMPACT OF ACADEMIC, ICT AND MANAGEMENT RELATED FACTORS ON CUSTOMER SATISFACTION IN HIGHER EDUCATION

This study focuses on the influence of academic factors, the role of ICT and management on customer satisfaction. The sample of 391 students from two universities in South Africa was chosen random to participate in the study. Exploratory Factor Analysis (EFA) was used followed by Confirmatory Factor Analysis (CFA), and finally Structural Equation Modelling (SEM). Management-related factors resulted with the strongest significant impact on customer satisfaction followed by academic factors.

Keywords: higher education; customer satisfaction; South Africa; students' survey; factor analysis; structural equation modelling.

Йохан В. де Ягер, Мухаммад Тахир Джан

МОДЕЛЮВАННЯ СТРУКТУРНИМИ РІВНЯННЯМИ ДЛЯ ВИЗНАЧЕННЯ ВПЛИВУ АКАДЕМІЧНИХ, УПРАВЛІНСЬКИХ ТА ІКТ-ФАКТОРІВ НА ЗАДОВОЛЕНІСТЬ КЛІЄНТІВ У СФЕРІ ВИЩОЇ ОСВІТИ

У статті досліджено вплив академічних, управлінських та ІКТ-факторів на ступінь задоволеності клієнтів послугами. Вибірка дослідження – 391 студент з двох університетів у Південно-Африканській Республіці. Для аналізу даних використано розвідувальний факторний аналіз, підтверджувальний (конфірматорний) факторний аналіз, а також моделювання структурними рівняннями. Найбільший вплив на задоволеність клієнтів у сфері вищої освіти має група управлінських факторів, на другому місці – академічні фактори.

Ключові слова: вища освіта; задоволеність клієнта; Південно-Африканська Республіка; опитування студентів; факторний аналіз; моделювання структурними рівняннями.

Рис. 2. Табл. 3. Літ. 43.

Йохан В. де Ягер, Мухаммад Тахир Джан

МОДЕЛИРОВАНИЕ СТРУКТУРНЫМИ УРАВНЕНИЯМИ ДЛЯ ОПРЕДЕЛЕНИЯ ВЛИЯНИЯ АКАДЕМИЧЕСКИХ, УПРАВЛЕНЧЕСКИХ И ИКТ-ФАКТОРОВ НА УДОВЛЕТВОРЁННОСТЬ КЛИЕНТОВ В СФЕРЕ ВЫСШЕГО ОБРАЗОВАНИЯ

В статье исследовано влияние академических, управленческих и ИКТ-факторов на степень удовлетворённости клиентов услугами. Выборка исследования – 391 студент из двух университетов в Южно-Африканской Республике. Для анализа данных были использованы разведывальный факторный анализ, подтверждающий (конфирматорный) факторный анализ и моделирование при помощи структурных уравнений. Наибольшее влияние на удовлетворённость клиентов в сфере высшего образования имеет группа управленческих факторов, на втором месте – академические факторы.

Ключевые слова: высшее образование; удовлетворённость клиента; Южно-Африканская Республика; опрос студентов; факторный анализ; моделирование структурными уравнениями.

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Introduction. Higher education institutions in South Africa as well as universities functioning on the international arena are facing various challenges. These challenges are mainly the result of rapidly changing technologies, increasing costs, accountability by accrediting associations, legislation, funding options and public reaction (Venkatraman, 2007). Higher education institutions are also challenged by the increasing competition, not only locally but also by international institutions that may compete within a country or offer online opportunities from a host country. Global competition emphasised the strategic importance of satisfaction and quality in the battle for consumer preferences and maintaining competitive advantages (Cronin and Taylor, 1992). This competition may be related to student enrolments, faculty expertise, and/or research achievements. In order to outperform competitors, various attempts have been made by higher education institutions to adopt their quality management principles. The main aim of this principle is to study culture changes, and how to best transform organisations into total quality, market driven, high performance institutions. This paper focus on the effect of selected quality dimensions and the influence it has on customer satisfaction.

Literature review. Many organisations found that the old definition of quality which is "the degree of conformance to a standard" is too narrow and consequently they have started using a new definition of quality with a "customer focus". Consequently, there is considerable discussions on the notions of educational quality (Venkatraman, 2007). E. Sallis (1993) describes quality from the customer perspective as that which best satisfies and exceeds customer needs. L. Petrozzellis et al. (2006) contends that the importance of a service such as provided by higher education, is highlighted by the presence of many stakeholders and their interests, either social or economic. It, therefore, calls for a strategy of continuous improvement with regard to quality. Demand is not only in relation to quality of teaching but also to social expectations in the environment where competition is fierce.

According to L. Petrozzellis et al. (2006), universities as a particular kind of public service provider has to carefully consider evaluations expressed by students regarding quality of teaching as well as the evaluation of quality of the total student experience. Therefore, university management should develop marketing initiatives (Hay and van Gensen, 2008) in order to increase their capacity to understand the changing needs of students and to evaluate the perception of quality of teaching among others.

L. Petrozzellis et al. (2006) point out that universities, in order to satisfy different needs depending on the features of a geographic area where they are located, no longer provide a standardised service, the market requires personalised services whose main characteristics try to meet the real needs of the job market. This implies that universities have to offer the surrounding area with needed graduates. The educational career universities offer should therefore be based on the needs expressed by the job market.

Information and Communication Technology (ICT) factors. The use of ICT in service companies has been researched extensively as an element influencing satisfaction and service quality (Sharma and Baoku, 2013; Sirirak et al., 2011; Eze and Chen, 2013; Gil-Saura and Ruiz-Molina, 2009; Lin and Hsieh, 2005; Domegan, 1996). Almost two decades ago, C. Domegan (1996) indicated that improving the

quality of customer service is the key to achieving competitive advantage. A good product is necessary but not sufficient to compete at today's marketplace. Consequently organisations are actively cultivating customer service as a valuable asset in strategically differentiating their products and services. Simultaneously with this, dramatic worldwide developments have been occurring in the IT field (Sharma and Baoku, 2013; Sirirak et al., 2011). The strategic use of it as part of a firm's corporate strategy can result in a significant competitive advantage.

According to S. Sirirak et al. (2011) enhanced competition and customer expectation lead service industries to look for ways and means to achieve competitive advantage. As a result many of these service organisations adopted ICT as a means to cope with rapidly changing environment. ICT is therefore used in conjunction with the core product or service in order to provide a competitive advantage. S. Eze and H. Chen (2014) state that success of any organisation is not only enabled by the ICT use but also dependent on the organisation's ability to constantly adopt and use emerging ICT. This emerging ICT is a broad term including any new or improved ICT applications.

Aspects such as online applications, procurement and inventory systems, wireless Internet, e-mail, electronic transactions, university websites, wikis, blogs and video sharing are some of ICT applications that service industries such as universities can implement to enhance their competitive edge (Eze and Chen, 2014). Overall, service managers believe that ICT adoption is a key success factor in enhancing performance.

M. Jan and K. Abdullah (2014) state that the use of technology combined with right human resources can increase customer satisfaction. In addition, J. Karimi et al. (2001) mentioned that those companies with better ICT development are more effective in improving customer service and customer relationships and consequently customer satisfaction. It is, therefore, hypothesised here that:

H1: ICT factors have significant influences on customer satisfaction.

Academic factors. Measuring student satisfaction by their experience in higher education is a common practice now days. According to J. Douglas et al. (2008), student opinions are sought on academic programmes as well as on the complete range of student activities that constitutes academic life. Academic life from the students' perspective involves experiencing a number of service offerings ranging from teaching quality and learning activities to the quality of on-campus support facilities (Blackmore et al., 2006). S. Venkatraman (2007) states that educational management should examine the key aspects of process management including learner-focused education design, education delivery, services and business operations. It should examine how key processes are innovatively designed, effectively managed and continuously improved. He furthermore claims that performance results of this element would examine student performance and improvement using key measures and indicators.

Aspects such as good teaching reputation, the right course, quality of courses input, instructional process, student academic support services, teaching and learning methodology, curriculum revision, student academic growth, quality program; continuous assessment and improvement (Douglas et al., 2006; Sayeda et al., 2010; Nguyen and Nguyen, 2010; Ardi et al., 2012; Saktival and Raju, 2006) are all impor-

tant dimensions in order to effectively manage a higher education institution. These are all components to consider in an effective service quality model.

R. Telford and R. Mason (2005) suggests a framework of quality values in higher education which may include various academic inputs such as course design, course marketing, student recruitment, induction, course delivery, course contents and assessment monitoring. M. McCuddy (2008) indicates that with students that are increasingly being viewed as clients to whom education services are provided, their research assume that student's satisfaction can be seen as an indicator of success in implementation of quality programs of which the impact of academic programs are evident. P. Sakthivel (2005) also found a relationship between various academic quality dimensions (including academic course offerings) and students' satisfaction. Based on the above literature, it is hypothesised here that:

H2: Academic factors positively influence customer satisfaction.

Management factors. To overcome the increasing challenges in higher education, quality management programs such as (TQM) are implemented to ensure that quality of education continuously improves. Total Quality Management (TQM), according to Russel and Taylor (1995) as cited by R. Ardi et al. (2012) is the management of quality through organisation. Quality improvement efforts in higher education through TQM have taken three roles: focus on the fulfilment of customers' requirements, continues improvement of efforts in higher education and building total participation of all elements in quality improvement programs (Ardi et al., 2012). Although TQM is not the focus of the study various relevant elements will be discussed here.

Various studies (Rawley, 1997; Sureshchandar et al., 2001; Sakthivel and Raju, 2006; Ardi et al., 2012; Duque and Weeks, 2010; Bayraktar et al., 2008) identify the role of top management as one of various aspects that influence quality and the relationship between its dimensions and students satisfaction. As TQM is customer-focused, committed leadership is the first core value to be addressed in an effort to implement TQM. However, there is a need for all hierarchical levels in higher education to share the same vision including all levels of management, top management, management on the faculty level as well as in departments.

S. Flummerfelt and M. Banachowski (2011) explain that the need to understand and develop leaders in higher education appears to be on the rise as the need for ongoing and enlightened management training for higher education professionals is called for. J. Burgoyne (2009) describes the need for leadership development, contending that most leadership development in higher education at present is concentrated on individual leaders and their individual development. However, what is needed is the alignment of leadership development with strategic goals and organisational changes (Petrozzellis et al., 2006). These changes may include changing needs of students in a competitive academic environment that may extend globally. This brings about various challenges that effective management may identify and in turn develop into a competitive advantage.

It is clear that management involvement at all levels in higher education plays a significant influence on how the institution is managed and maintained. This consequently influences the satisfaction levels of students. Management is therefore creating the vision, instituting relevant processes and channelizing the resources continually for the achievement of institutional excellence. Top management should be com-

mitted to provide inspirational guidance and should deploy both human and technical resources to achieve greater productivity and this will consequently influence customer satisfaction. This,

H3: Management factors influence customer satisfaction.

South African universities. Transition in South Africa occurs in the context of globalisation and economic growth, being increasingly dependent on knowledge and information. Challenges faced by higher education in South Africa are compounded through the integration of equity goals of national policy as a means of redressing inequalities of the inherited educational system that benefitted certain races more than other (Mpinganjira, 2011; Badat, 2004).

The Department of Higher Education (2001), following the National Plan for Higher Education (NPHE), represented an attempt to operationalize the program on higher education transformation. The National Plan for Higher education is driving policies behind changes in South African higher education environment. The NPHE made provisions for 3 institutional types: traditional universities, universities of technology and comprehensive universities offering a mixture of traditional and vocational programs (Department of Education, 2004), all competing for their market shares. This can be seen as an attempt to reconfigure the higher education system to meet the need of equity and diversity in higher education under globalisation. The non-profit sector such as public higher education in South Africa and globally, amongst other, are undergoing major changes to adjust to the demands and opportunities that amongst others globalisation have brought about. According to F. Maringa (2005) and J. Ivy (2008), expansion, increasing variety of higher institutions, growing heterogeneity of higher education products and the increasing competition among this growing industry have been the key drivers of higher education marketisation across the world. Where higher education is expanding globally and where new institutions are created to meet the growing demand and where diversity of programmes and products offered by universities are increasingly becoming heterogeneous, students face more choices and institutions are competing with one another. This leads to a situation where institutions have no choice but to apply certain marketing principles to be sustainable.

The effects of competition on higher education institutions, especially in South African context, can be seen as having far-reaching implications for these institutions. Technikons and universities have traditionally competed indirectly, whereas they now compete directly, ostensibly for the same market. Since 2004 Technikons were transformed to become Universities of Technologies. The growing role of technology and the demand for technologically literate workforce have also created the third stream of private educational institutions that not only compete for school leavers, but also on the post-graduate level. Providers of private education are meeting a specialised demand and often act highly responsively and provide credentials in the areas that the public sector does not cover (Bezuidenhout, 2013). L. Petrozellis et al. (2006) state that this increased level of competition in education has led to institutions employing marketing techniques to improve efficiency and quality of services and switching from a passive to a more active market approach (Ivy, 2008) trying to understand customer needs and evaluating quality perception to eventually satisfy customers. Universities should be aware of their own offerings and how those are perceived at a market place if they are to satisfy students' requirements. H. Hay and

G. van Gensen (2008) state that due to the challenges that higher education institutions are facing, the need arises to consider becoming more market orientated. This implies the ability of institutions to match their organisational capabilities with market needs through a more thorough understanding of the market.

In Southern African region, the current higher education environments are replicating the forces that have driven marketisation in the developed world some two decades ago. Universities are responding by employing a variety of strategies that borrow heavily from the marketing philosophy that is practised in the business sector (Maringa, 2005). L. Petrozzellis et al. (2006) wrote that customers in the form of students or the society play an active role in defining the offer, either by asking for courses through enrolment or showing disapproval by leaving the university. This implies that an institution of higher education should ensure students are satisfied with the experience they obtain (Maringa, 2005).

Study objective. The primary objective of the study is to determine the impact of different variables on customer satisfaction in higher education. More explicitly, this study has the following aims:

1. To identify the effect of ICT on customer satisfaction.
2. To ascertain the effect of academic factors on customer satisfaction.
3. To determine the effect of management on customer satisfaction.

Research methodology.

The sample framework. The total sample of 391 students at two South African universities was chosen. 55% of the sample (231) was from a university in the north of South Africa and the other (160) from a university in the South. The selection process was done after the courses of the two universities management faculties' were listed and randomly selected. The questionnaires were distributed to students in pre-determined classes, also randomly selected. The sample comprised of 41% male and 59% female students. The two student samples were tested regarding the importance of pre-identified service quality issues when selecting a specific tertiary institution.

The measuring instrument. A structured questionnaire was used as measurement instrument, it included 23 variables related to service quality at an institution of higher education. The inputs of the questionnaire were finalised after the inputs of several related questionnaires as well as the inputs of students and lecturers by means of focus groups. A five-point Likert-type scale (1 for "very important" and 5 – "not important at all") was used to measure the levels of importance with regards to these variables. The data was gathered and captured over the period of 6 months. The SPSS version 21 statistical package was applied to analyze the data.

Data analyses and results.

Respondents' profile. In the questionnaire, the section on the respondents' profile was included to obtain some basic information about them. The first step in the data analyses was to find out sample's characteristics. For this purpose the descriptive statistics were employed.

Overall, 59.3% of the females responded to the survey followed by 40.4% of males, indicating the higher influence of the female group. The figures also reveal that 31.5% of the respondents are 20 years old, whereas 21–22 years old is the second major age group with 25.1%. In terms of respondents' education, majority (170, 43.5%) are in their second year of studies followed by the fourth year students with

the total contribution of 23%. Almost 39% of the respondents fall in the educational grade of 60% to 69% in their current courses. Lastly, majority of the students (186, 47.6%) state the main reason for their study is to get better job opportunities.

Attributes of the questionnaire. Cronbach's alpha reliability coefficient and the item-to-total correlation were calculated to examine the stability and consistency of the research instrument. According to J. Nunnally (1978), the value of Cronbach's alpha closer to 1 indicates greater stability and consistency; however, the threshold value in most research studies is set at 0.60. The present research instrument resulted in strong alpha value of 0.930, indicating good consistency and stability of the present scale (Table 1).

Table 1. Reliability statistics of the questionnaire, authors'

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0.934	0.930	24

Exploratory factor analysis. The next important step was exploratory factor analysis (EFA) in order to explore the dimensions underlying the data set. For this purpose EFA was undertaken with Varimax rotation. In this process many important suggestions by J. Hair et al. (2010) were kept in mind, for example, deleting items that has the loading of below 0.4 and also deleting those items that has a cross loading below 0.35. Moreover, the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity were also examined to see the correlations between variables. In this case, KMO was 0.916 and Bartlett's Test of Sphericity was significant at $p < 0.001$, indicating that the present data was suitable for factor analysis and there is sufficient correlations between the variables.

The EFA result revealed a clean four-factor structure using the criteria of Eigenvalue greater than 1. The extracted factors accounted for 70.60% of variance. All factor loadings were higher than 0.6 on its own factor and therefore, each item loaded higher on its associated construct than on any other construct; supporting discriminant validity of measurement. The EFA results are shown in Table 2.

Further, the extract factors were given names based on higher loading of the items on each factor. While deciding suitable names for each factor another important criteria kept in mind was the original source, i.e., the meaning of the item when it was presented on the questionnaire. This process resulted in 4 names for the extracted factors. In this case, the first factor was given the name of "ICT factors" followed by "Academic factors" as factor 2. Factors 3 and 4 were given names "Management factors" and "Customer satisfaction", respectively.

Confirmatory factor analysis. After EFA, the next stage was to confirm those extracted factors. For this purpose the two-stage Structural Equation Modelling (SEM) technique was adopted, with the first stage as confirmation and the second – hypotheses testing. The confirmation stage, technically called Confirmatory Factor Analysis (CFA), was performed using AMOS software with Maximum Likelihood Estimation (MLE). All the extracted factors were tested in a single measurement model (Figure 1). The measurement model was assessed based on the fit measures recommended by different scholars (Byrne, 2010; Hair et al., 2010; Kline, 2011). For example, chi-square (χ^2), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). Further, given that the chi-square is highly sus-

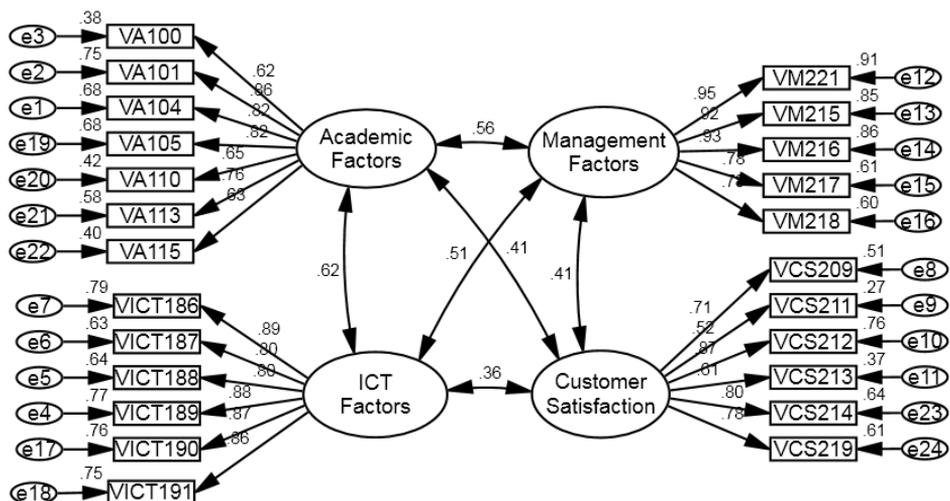
ceptible to sample size, B. Byrne (2010) and J. Hair et al. (2010) recommended using normed chi-square (χ^2/df), as is the case in the present study.

Table 2. Factor analysis results, authors'

Items (variables)	Component			
	Factor 1 ICT factors	Factor 2 Academic factors	Factor 3 Management factors	Factor 4 Customer satisfaction
VICT189	.867			
VICT186	.854			
VICT191	.827			
VICT190	.820			
VICT188	.806			
VICT187	.778			
VA101		.790		
VA115		.778		
VA105		.733		
VA113		.705		
VA104		.696		
VA110		.694		
VA100		.663		
VM216			.873	
VM221			.863	
VM218			.836	
VM215			.830	
VM217			.828	
VCS212				.836
VCS213				.758
VCS219				.742
VCS214				.737
VCS211				.721
VCS209				.693
Initial Eigenvalues	9.723	2.950	2.291	1.982
% of variance	20.325	18.049	17.285	14.951
Cumulative, %	20.325	38.374	55.659	70.609

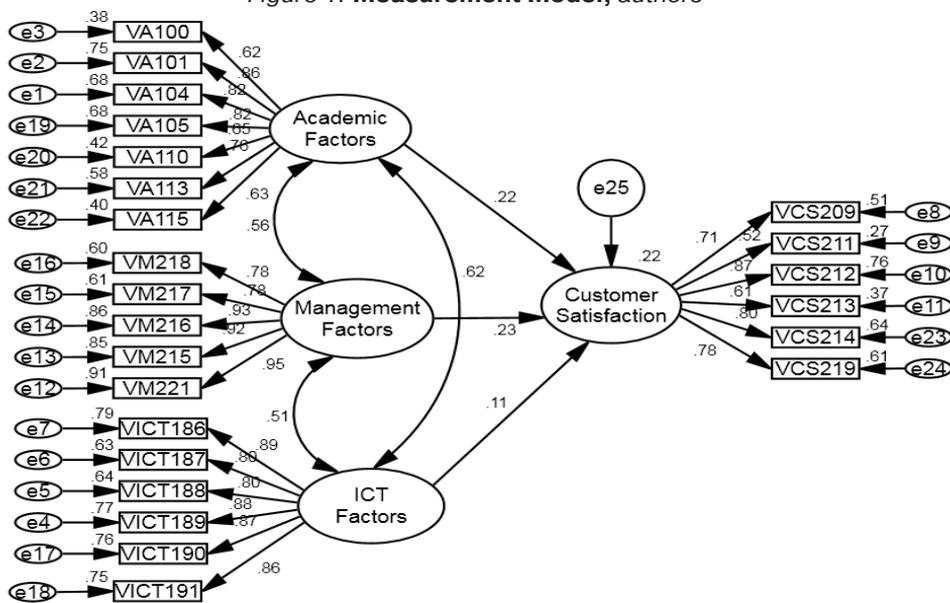
The review of the measurement model shows that all fit indices used were above the recommended threshold. In this case the normed chi-square (χ^2/df) value of 2.786 is below 5.0. Similarly, the value of CFI is also well above the threshold value of 0.90. Lastly, RMSEA with the value 0.072 that is below the threshold value of 0.08 also indicates good fit of the measurement model.

Structural Equation Modelling. The next stage after CFA was to test the fitness of the full-fledged structural model and hypotheses. Figure 2 summarises the results of full structural model. This model yielded consistency of the hypothesised causal relationship with the data (normed Chi-square = 2.786; CFI = 0.931; RMSEA = 0.072). All these fit indices satisfied their critical thresholds; the results, therefore, indicated a good fit of the hypothesised structural model. This structural model was tested based on the measurement model previously validated from CFA.



Chi-Square 685.435
 Normed Chi-Square 2.786
 CFI .931
 RMSEA .072

Figure 1. Measurement Model, authors'



Chi-Square 685.435
 Normed Chi-Square 2.786
 CFI .931
 RMSEA .072

Figure 2. Hypothesised Structural Model, authors'

The parameter estimates of the hypothesised model were free from offending values. The review of the structural model indicates that two hypotheses can be supported statistically, i.e. the causal link from "Academic Factors" to "Customer Satisfaction" and also the causal link from "Management Factors" to "Customer Satisfaction". The standardised regression weights of the aforementioned significant links were: 0.217 and 0.230 respectively. It is important to note that the first link (Academic Factors → Customer Satisfaction) was significant at $p < 0.01$, whereas, the second link (Management → Customer Satisfaction) was significant at $p < 0.001$. Another important note here is that both these hypotheses were supported not only statistically ($p < 0.05$) but also practically ($\beta > 0.20$). Moreover, "ICT factors" also resulted in a positive, but insignificant impact on customer satisfaction; thus, this particular hypothesis cannot be supported. The complete results of hypotheses testing are presented in Table 3.

Table 3. Estimates of the Hypothesised Model, authors'

Structural path	Hypothesised Relationship	Std. Reg. Weight	S. E.	C. R.	P
Academic factors → Customer satisfaction	H1 ^s	.217	.052	2.77	.006*
Management factors → Customer satisfaction	H2 ^s	.230	.035	3.39	***
ICT factors → Customer satisfaction	H3 ^{ns}	.109	.041	1.51	.131
Statistics		Suggested		Obtained	
Chi-square significance		≥ 0.05		0.000	
Normed chi-square (CMIN/df)		≤ 5.00		2.786	
Comparative fit index (CFI)		≥ 0.90		0.931	
Root mean error square of approximation (RMSEA)		≤ 0.08		0.072	

^s supported; ^{ns} not supported; *** $p < 0.001$; * $p < 0.05$.

Conclusions and directions for further research. In this paper, an attempt has been made to empirically test 3 important factors, as emerged from literature, with their impact on customer satisfaction (students' satisfaction) related to higher education. These 3 factors, namely, "Management factors", "Academic factors" and "ICT factors" were grouped together in a structural model, which was then tested using complex statistical technique, specifically structural equation modelling, in order to find answer for two important questions: Whether the proposed model results in a good fit; Which of the aforementioned factors has stronger impact on the overall satisfaction? The answer to both these questions has significant implications. For instance, in case of the first question universities in South Africa may adopt the model proposed and tested in the present study to enhance satisfaction of their students. Similarly, in case of the second question policy makers may devote their resources to that particular factor in order to enhance the overall satisfaction level. Our study revealed that "Management" is the most important factor impacting customer satisfaction followed by "Academic factors". Perhaps, institutions of higher education in South Africa should focus more on these two factors, as the respondents consider it imperative to their satisfaction with a university.

Future researchers may use this model and test it in other levels of education, likes primary or secondary ones. Further, it is also suggested to add more variables like: Location, image of a university, marketing activity into the same model to offer a more comprehensive model for higher educational institutions. Lastly, a promising attempt would be to test for moderation using certain demographic variables such as gender and age.

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