Investigating the quality of university education: A focus on supply chain management

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Abstract. While the quality of higher education has received attention from researchers globally, its focus has been mainly on universities in 'developed country' contexts. There has been limited research on the quality of higher education in African universities, and even less that has focused on the discipline of supply chain management. In this paper, the quality of supply chain education of five universities in Kenya is investigated using a SERVPERF model. Data were collected through a structured questionnaire administered to 781 students enrolled for a supply chain management qualification. The data were analysed through confirmatory factor analysis and one-way analysis of variance. The findings are fourfold: (1) the service quality of supply chain education is at medium level in terms of the SERVPERF metrics; (2) four dimensions were identified by students as the most important aspects of service quality: course-centeredness, academic and support staff helpfulness, service excellence and learning facilities; (3) a four-factor SERVPERF model of supply chain service quality is developed and (4) service quality was significantly different across the selected universities. Although the service quality was rated at a medium level overall, the variability in quality across universities should alert educators and management to the need for a coordinated effort to improve particular aspects of students' learning experiences. The study contributes to the body of knowledge by establishing that SERVPERF is a four-factor model in the higher education sector.

Keywords: service quality; supply chain education; factor analysis; SERVPERF; analysis of variance

1. Introduction

Increased competition among universities, globalisation, and the continued waning of government funding has forced higher education institutions to offer excellent service to attract and maintain a sustainable student base (Mahmoud & Khalifa, 2015; Shabani, Okebukola & Oyewole, 2014; Yusoff, McLeay & Woodruffe-Burton, 2015). To create memorable encounters for students in higher education, universities measure service quality in their various programmes to identify problem areas and to improve (Abdullah, 2005; Yusoff et al., 2015). The

instruments used to measure service quality in higher education include SERVQUAL (Galeeva, 2016; Parasuraman, Zeithaml, & Berry, 1988), SERVPERF (Cronin & Taylor, 1992; Luke & Heyns, 2018), and HEdPERF (Abdullah, 2006; Silva, Moraes, Makiya & Cesar, 2017). Brochado (2009) compared all the three instruments and concluded that SERVPERF and HEdPERF are better placed to measure service quality in higher education because they offer excellent measurement capability, have high reliability, and explained variance. Previous studies have measured service quality institution-wide, that is, surveying the general student population to collect their perceptions on the service quality dimensions (Brochado, 2009; Abdullah, 2006; Teeroovengadum, Kamalanabhan & Seebaluck, 2016). Studies that have examined supply chain education have generally focused on research methods used (Sun & Song, 2018), supply chain skills (Lorentz, Töyli, Solakivi & Ojala, 2013), and service quality in supply chain education (Luke & Heyns, 2018). Previous studies have left a lacuna regarding the current state of service quality in supply chain education. Academics and practitioners are also unfamiliar with the service quality aspects that supply chain students value, as well as whether there are any service quality differences across universities. Therefore, academics and educationalists must measure the service quality of supply chain education regularly, especially given the pivotal role that supply chain management plays in the contemporary business environment.

Previous studies have observed that, in some cases, supply chain graduates are ill-prepared to handle current supply chain issues, based on assessments of the modules taught (Leon & Uddin, 2016). Also, there is a limited understanding of quality issues in supply chain education at the tertiary level (Sun & Song, 2018). Finally, perspectives on the quality of supply chain education from students have not been investigated adequately (Yusoff et al., 2015), although studies from single universities, covering all faculties, have been highlighted (Nadiri, Kandampully & Hussain, 2009). The current study furthers the discourse on the quality of university education by (1) focusing supply chain education in a developing country, (2) drawing a student perspective of the quality of supply chain education and (3) applying the SERVPERF model making possible for comparison with similar future studies. Therefore, the study aims at investigating student perspectives on the service quality of supply chain education in selected public universities using the SERVPERF instrument. As such, this study answers the following questions: 1) What is the level of service quality of supply chain education?, 2) What aspects of service quality do supply chain students value?, and 3) Is the service quality of supply chain education uniform across universities? This study is likely to enhance the supply chain body of knowledge regarding the quality of training; from both student and developing country perspectives.

2. Literature review

In this section literature review is conducted on service quality of supply chain education, service quality models, and related works. The literature review helps to discuss the main research concepts by presenting what is known and identify the gap that this study will help fill. The next section presents a discussion on the service quality of supply chain education.

2.1 Service quality of supply chain education

A supply chain education (SCE) can refer to systematic instruction in the area of supply chain management to meet the requirements of the business environment. It includes designing a curriculum and continuous improvement of the methods of instruction, to transfer knowledge in an excellent manner (Sun & Song, 2018). Currently, professional SCE is offered by tertiary institutions, which award diplomas and degree qualifications in Kenya (Commission of University Education (CUE), 2018). Globally, supply chain management as a discipline has developed tremendously over the last three decades owing to factors like globalisation, innovation, and advancements in technology (Akbari, 2018). The growth has also been observed in developing countries, and universities have responded by training students to handle supply chain management (SCM) related issues in the business environment. The rapid changes are still ongoing, implying that SCM professionals should be well trained, to be able to handle the increasing complexity (Sun & Song, 2018). The challenge is that, although the quality of business education has been examined (Yusoff et al., 2015), researchers have not adequately interrogated the service quality of supply chain education from the perspective of a student (Sun & Song, 2018).

The quality of education can broadly be defined as the relevance of the training to industry requirements, in terms of the employability and entrepreneurship of trainees (Mittal, Garg & Yadav, 2018; Mohamedbhai, 2014). Quality of education depends on many factors including infrastructural facilities such as the availability of furniture and adequate classroom facilities, the availability of Wi-Fi, a library equipped with relevant information and search systems, ICT-equipped classrooms (with projectors, public address systems, and other suitable teaching aids), computer labs with appropriate learning applications, and adequate provision of light (Verma & Prasad, 2017; Amini-Philips & Mukoro, 2016). Thus, adequate infrastructure is critical to the quality of education provided by tertiary institutions (Mittal, et al., 2018; Yusoff et al., 2015). Therefore, having the right educational infrastructure is likely to improve student-teacher interaction, which might result in better educational outcomes (Sun & Song, 2018). Also, academic staff in higher education institutions who conduct teaching and research as well as administration should have the right skills to promote high-quality university education (Lubwama, Onen & Kasenene, 2017).

2.2 Service quality models

Service quality as a construct has received attention in both the manufacturing and service industries for decades. Seth, Deshmukh, and Vrat (2005) identified 19 different service quality models including SERVQUAL, technical and functional quality model, attribute service quality model, SERVPERF, ideal value model of service quality, and PCP attribute model. Among researchers and practitioners, Parasuraman, Zeithaml, and Berry (1985) presented significant guidance on how the service quality construct can be measured in firms. They decomposed service quality into five dimensions, which are tangibility, responsiveness, reliability, assurance, and empathy. They argued that service quality could be measured by finding the gap (expectations minus perceptions) between customer expectations and the perceived service delivered at the firm's facilities using the SERVQUAL

(service quality) model (Seth et al., 2005). A negative value will imply that customer expectations have been met, while a positive value indicates that they have not. Although the SERVQUAL model has had many different applications over the years (Parasuraman et al., 1985), some scholars (Mahmoud & Khalifa, 2015; Yusoff et al., 2015) have argued that the model cannot be applied in every industry. Thus, new models have been developed for application to specific industries, such as education.

The service quality of an educational institution can be measured using different metrics, including SERVQUAL, SERVPERF, and HEdPERF (Abdullah, 2005; Mahmoud & Khalifa, 2015). The selection of a model is subjective, although Rodrigues, Barkur, Varambally, and Golrooy Motlagh (2011) claim that SERVPERF metrics are better when measuring service quality in more intensive, service-orientated contexts, such as higher education institutions because they are performance-based. In agreement, Cronin and Taylor (1992) observe that, when measuring service quality in higher education institutions, the SERVPERF metrics are likely to offer reliable estimations with less bias when compared to those of SERVQUAL. However, Brochado (2009) argued that SERVPERF and HEdPERF produce almost similar results; thus, any of them can be applied to measure service quality in higher education institutions. Besides, Souca (2011) claimed that SERVQUAL measures customer satisfaction rather than service quality. Therefore, Jain and Gupta (2004) find the SERVPERF model to be psychometrically sound with greater "instrument parsimoniousness" and is therefore appropriate for adjudicating an organisation's overall service quality.

SERVPERF is a performance-based method used to measure service quality (Cronin & Taylor, 1992). They argued that service quality should be measured using an attitude scale, preferably the performance-based SERVPERF metric, which is better than that of SERVQUAL. The SERVPERF metric has 22 items that are measured using an attitude scale as opposed to that of SERVQUAL, which measures the gap between expectations and perceptions using 44 items (Cronin & Taylor, 1992; Yusoff et al., 2015). The 22 items are the indicators of the five dimensions of service quality, that is, tangibility, reliability, responsiveness, assurance, and empathy. In the performance-based SERVPERF model, service quality is measured using the following formula provided by Seth, Deshmukh, and Vrat (2005):

$$SQ = \sum_{j=1}^{k} \left(P_{ij} \right)$$

Where:
SQ = Overall service quality;
k = the number of attributes;
P_{ij} = performance perception of stimulus *(i)* , in relation to attribute *(j)*.

The relevance of using SERVPERF metrics to measure the service quality of higher education has received considerable attention from researchers, who, in most cases, have favoured SERVPERF over SERVQUAL (Rodrigues et al., 2011; Yusoff et al., 2015). Many studies have used SERVPERF to measure service quality in higher education, for example, Brochado (2009), Yusoff et al. (2015), and Mahmoud and Khalifa (2015). The users of SERVPERF favour it because it

provides results that can guide future decisions, given that it assesses perceived performance; provides the real state of service quality, as perceived by customers; uses fewer indicators compared to SERVQUAL; is likely to be less biased; explains more variance; and holds higher validity and reliability (Cronin & Taylor, 1992; Mahmoud & Khalifa, 2015; Yusoff et al., 2015). Based on the reviewed literature, this study selected the SERVPERF metric to measure the service quality of supply chain education in universities.

2.3 Related work

Several studies have considered service quality in higher education, however, searches through several databases, including SCOPUS, ScienceDirect, EBSCOHost and SABINET using the terms "quality", "supply chain" and "education" have revealed few related studies. The "quality" term was dropped and the results indicate that the majority of research relates to curriculum development and the identification of skills to incorporate in supply chain education (Mageto & Luke, 2020; Purnomo, et al., 2020; Luke & Heyns, 2019; Colicchia, et al., 2018; Lorentz, Töyli, Solakivi & Ojala, 2013; Gonzalez et al., 2008; Sauber et al., 2008). Others highlight the importance of supply chain education (Erturgut & Soysekerci, 2011), building specific skills into supply chain education (Pekkanen, et al., 2020), tools for supply chain education (Holweg & Bicheno, 2002), and educational content development for modern supply chains (Li, 2020).

Because so few studies have addressed the specific issue of the service quality of supply chain education, previous studies on the service quality of higher education, in general, were consulted to form a framework for this research. In this regard, there are numerous studies to rely on. Early works by Gustafsson & Larsson (1997) used two total quality models, namely the Total Perceived Quality Model and Quality Model in conjunction with the SERVQUAL model to describe the service quality elements in higher education. Thus, the current study serves to bridge the gap that has been left in the literature regarding the quality of supply chain education.

3. Methodology

In this study, the service quality of supply chain education is described from the perspective of the student, to help guide university academics and stakeholders in identifying areas for improvement. This section presents a discussion on research design, respondents, instrument, data collection, and statistical analysis, in that order.

Research design

The study followed a survey research design. A survey design was selected because (1) it was best suited to answer the research questions at hand, (2) it allowed the collection of data from a large sample of the student population within a short time when compared to the qualitative approach (Ponto, 2015), and (3) it was easy to convert the students' opinions and attitudes towards the quality of supply chain education they receive into numbers.

Respondents

The university management, lecturers, and their support staff are service providers, while the students are considered to be the customers. A study on service performance was likely to benefit from surveying the customers; as such, the respondents were students enrolled for a supply chain management qualification. This means that students targeted were at least in their second year of study. This is because first-year students take general modules and only start specialisation in the second year of study.

Instrument

The questionnaire items were adopted from the SERVPERF instrument used by Luke and Heyns (2018), which had been adapted from the Cronin and Taylor (1992) instrument. The questionnaire items focused on service performance and collected student perceptions across five dimensions, that is tangibility (four items), reliability (five items), responsiveness (four items), assurance (four items), and empathy (five items). All of the items were measured on a five-point Likert-type scale (where 1=strongly disagree and 5=strongly agree). The respondents were asked to rate the extent to which they agreed with the statements. Only perception data was collected, as was also done by Luke and Heyns (2018) in South Africa. The instrument used to collect data for this study is an industry-accepted SERVPERF model and had been utilised over the years. However, given the significance of a pilot phase in research (In, 2017), the instrument was piloted on 50 students. There was no issue identified on all the 22 items of the instrument. As such, the pilot data was included in the main research.

Data collection

A paper-based survey was conducted between May and August 2018 at five selected major universities offering supply chain-related courses. The survey was part of a wider study on supply chain skills gaps.

During data collection, lecturers were requested to allow the students some time at the end of their lectures to respond to the questionnaire. The questionnaires were distributed in the last 20-30 minutes of the lecture and collected at the end. The students were requested to volunteer to complete the questionnaire, and the objectives of the study were explained to them. A total of 2 000 questionnaires were distributed across five universities.

Statistical analysis

The number of returned valid questionnaires was 781, resulting in a 39 per cent response rate, which was comparable with other logistics surveys, as observed by Wagner and Kemmerling (2010). Nonresponse bias was tested according to the procedure provided by Armstrong and Overton (1977). Nonresponse bias was ruled out as there was no statistical difference in responses received early in the survey, and those collected in the last two weeks. To establish the level of service quality, descriptive statistics were applied, specifically the mean rating and standard deviation in SPSS version 26. An exploratory factor analysis (EFA) was conducted to identify the latent factors as well as the service quality aspects that supply chain students value. A confirmatory factor analysis (CFA) was performed in Analysis of Moment Structures (AMOS) version 26, which established a four-

factor SERVPERF model. Finally, service quality differences across the surveyed universities were tested using one way ANOVA. The results are presented in the next section.

4. Results

The five universities were labelled A, B, C, D, and E, and actual names were withheld as only a general permit to conduct research had been obtained from the Kenyan National Commission of Science, Technology and Innovation. Respondents per university were distributed as 26.6 per cent, 11 per cent, 37.4 per cent, 21.4 per cent and 3.6 per cent for A, B, C, D, and E, respectively. The majority (52.1 %) of the respondents were male. This may be indicative of the overall student distribution within the institutions surveyed. Age distribution revealed that 77.7 per cent of the respondents were 18 to 27-year olds with 7.8 per cent and 0.4 per cent of the population being in the 28-37, and above 38 years age groups, respectively. The age distribution was expected since students at this level are generally young. Among the respondents, only 25 per cent were employed with the majority being unemployed. This huge unemployment status was expected since most students only secure jobs after obtaining their qualifications. The unemployed proportion might be an indicator of vast youth unemployment in Kenya (Hall, 2017). The respondents with jobs were employed in various positions, including in logistics and supply chain management (49.3%), accounting and finance (13.4%), customer service (15%), and marketing (13.4 %); while 8.9 per cent indicated that they were self-employed.

The descriptive statistics of the SERVPERF dimensions per university, and overall, were examined, and the results presented, as shown in Table 1. The highest-ranked item overall is under the reliability dimension, "Courses are taught by highly knowledgeable teaching staff" (M=4.15; SD=0.820). This item was also highly ranked in universities A (M=4.20; SD=0.796), B (M=3.86; SD=0.939) and C (M=4.23; SD=0.803). The highest-ranked item in university D was "Library (including online) has the latest literature in your area of interest" (M=4.23; SD=0.913), and "Assignment, test and exam feedback and marks are accurately captured and recorded" (M=4.48; SD=0.814) in university E. The lowest-ranked item overall was also under the reliability dimension, "When something is promised by a certain time, it is always provided" (M=3.10; SD=1.093) signifying the variability of perceptions across universities regarding the dimension. The lowest-ranked items per university included "Assignment, test and exam feedback and marks are made available timeously" (M=2.66; SD=1.407) in university B; "The lecture venues have modern and latest equipment" (M=2.94; SD=1.135) in C; and "When students have problems, staff are polite, even if not able to help" (M=2.83; SD=1.149) in university D. The results presented so far indicate that there is service quality variability across universities. Further results presentation qualifies this claim.

Table 1: SERVPERF dimensions - Descriptive statistics and reliability

SERVPERF scale items	Overall Mean	Std. Deviation	A Mean	Std. Deviation	B Mean	Std. Deviation	C Mean	Std. Deviation	D Mean	Std. Deviation	E Mean	Std. Deviation
Tangibility												
The lecture venues have modern and latest equipment	3.12	1.104	3.23	1.079	2.87	1.200	2.94	1.135	3.34	.961	3.95	.722
The appearance of the physical facilities is attractive	3.31	1.080	3.39	1.013	3.25	1.057	3.02	1.106	3.71	.993	3.77	.922
The course material is up to date and relevant	3.90	.988	3.91	.911	3.46	1.172	3.86	1.047	4.17	.803	4.09	.750
Library (including online) has the latest literature in your area of interest	3.78	1.122	3.81	1.048	3.26	1.225	3.65	1.174	4.23	.913	3.59	.908
Reliability												
When something is promised by a certain time, it is always provided	3.10	1.093	3.16	1.004	2.94	1.141	3.03	1.182	3.13	1.001	3.73	.935
When students have problems, staff are polite, even if not able to help	3.13	1.148	3.09	1.091	3.04	1.131	3.32	1.167	2.83	1.149	3.68	.894
Courses are taught by highly knowledgeable teaching staff	4.15	.820	4.20	.796	3.86	.939	4.23	.803	4.09	.805	4.32	.646
The teaching staff respects lecture and exam schedules	4.08	.913	4.04	.897	3.66	1.009	4.20	.878	4.10	.908	4.38	.669
Assignment, test and exam feedback and marks are accurately captured and recorded	3.71	1.127	3.64	1.124	3.10	1.203	3.86	1.030	3.74	1.165	4.48	.814
Responsiveness												
Students are informed of schedules and changes in schedules in advance	3.75	1.023	3.74	1.015	3.32	1.132	3.81	1.030	3.82	.942	4.18	.733
Service hours of learning facilities accommodate all students	3.74	1.028	3.70	1.048	3.51	1.142	3.80	.992	3.74	1.025	4.09	.750
Assignment, test and exam feedback and marks are made available timeously	3.52	1.136	3.48	1.085	2.66	1.407	3.58	1.048	3.80	1.025	4.09	.750
Administrative staff are quick to respond to student requests	3.19	1.161	3.24	1.134	2.78	1.207	3.32	1.134	3.05	1.199	3.59	.854
Assurance												
The behaviour of teaching staff instils confidence in you	3.76	.967	3.74	.965	3.58	.885	3.78	.967	3.80	1.028	4.05	.740
Students are able to trust the administrative staff	3.54	1.022	3.55	.979	3.23	1.108	3.63	.988	3.48	1.085	3.81	.814
Administrative staff is friendly and polite	3.46	1.065	3.52	1.043	3.22	1.105	3.64	1.001	3.16	1.118	3.76	.944
Teaching staff is dependable	3.83	.949	3.83	.958	3.48	1.108	3.92	.883	3.84	.940	3.86	.910
Empathy												
Teaching staff are approachable to assist with coursework queries	3.93	.940	3.89	.937	3.65	1.076	3.99	.912	3.99	.922	4.27	.703
Staff members give students individual attention when needed	3.66	1.038	3.62	1.041	3.49	1.152	3.76	.989	3.56	1.066	4.14	.774
Staff has students' best interest as a major objective	3.65	1.006	3.59	1.025	3.41	1.165	3.80	.933	3.54	1.004	4.05	.785
Staff understands the specific needs of students	3.52	1.058	3.52	1.005	3.29	1.143	3.63	1.041	3.38	1.098	4.00	.873
The department's operating hours are convenient to students	3.88	.938	3.88	.934	3.67	.957	3.91	.943	3.88	.927	4.23	.813

Source: Research data

The five SERVPERF dimensions, as identified in the literature, were ranked based on the mean statistic. Overall, empathy (M=3.73) was ranked highest, as well as in universities A, B, and C and second in D and E. In contrast, tangibility (M=3.53) was ranked lowest overall, as well as in universities C and E. Reliability was ranked third by universities A, B, and C. The findings imply that the responsiveness dimension required attention in universities A and B; tangibility needed attention in C and E; while assurance required attention in D, although it was also ranked second overall and in A, B and C. The dimension rank statistics are shown in Table 2. The overall service quality score was calculated based on the full SERVPERF model items and presented in Table 2. The findings indicate that, in general, the service quality of supply chain education in universities is moderate, with students from the only surveyed private university revealing higher service quality levels. The findings further indicate that the service quality of supply chain education at university B is relatively lower than that of its peers, and this may call for attention from the management.

Table 2: Mean statistic and rank per dimension

SERVPERF scale items	Overall		A		B		C		D		E	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
Empathy	3.73	1	3.701	1	3.514	1	3.815	1	3.669	2	4.136	2
Assurance	3.65	2	3.661	2	3.377	2	3.741	2	3.572	5	3.869	4
Reliability	3.64	3	3.628	3	3.333	3	3.721	3	3.584	4	4.142	1
Responsiveness	3.55	4	3.540	5	3.056	5	3.631	4	3.607	3	3.988	3
Tangibility	3.53	5	3.590	4	3.210	4	3.370	5	3.870	1	3.850	5
Service quality score	3.62		3.620		3.300		3.660		3.660		4.000	

Source: Research data

The reliability of the SERVPERF items was examined using the Cronbach's alpha per dimension resulting in, tangibility (0.805), reliability (0.724), responsiveness (0.792), and empathy (0.866) all being above the minimum acceptable value of 0.6. Assurance was 0.528, indicating low internal consistency in this dimension. All the dimensions had significant and moderate positive correlations, signifying that the scales measured service quality in the same direction. These are shown in Table 3.

Table 3 Correlations

Dimensions	Tangibility	Reliability	Responsiveness	Assurance	Empathy
Tangibility	1				
Reliability	.580**	1			
Responsiveness	.567**	.703**	1		
Assurance	.432**	.521**	.550**	1	
Empathy	.512**	.658**	.685**	.575**	1

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

Service quality model development

The theoretical model underpinning this study is the SERVPERF as presented by Cronin and Taylor (1992). To understand the current data better and to gain more insights, factor analysis was performed to identify the pattern structure of the items. Factor analysis was conducted on all of the 22 SERVPERF metrics using principal component analysis and an equamax rotation technique by suppressing all indicators with a less than 0.5 factor-loading. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.944, and Bartlett's test of sphericity was statistically significant (p-value < 0.001), revealing that the data was suitable for factor analysis. Four factors were extracted, based on Eigenvalues greater than 1.

The overall variance explained by the four factors was 62.303 per cent, revealing that the data explained more than 50 per cent of the variance (the factors extracted are shown in Table 4). The reliability of all of the four extracted factors was tested, resulting in Cronbach's alpha (α) values for factors 1, 2, 3, and 4 as 0.802, 0.761, 0.821, and 0.895, all well above the threshold value of 0.6 (Cronin & Taylor, 1992; Pallant, 2010), as illustrated in Table 4. The values reveal high internal consistency and uni-dimensionality of the latent variables. Three indicators; "When students have problems, staff are polite, even if not able to help"; "The behaviour of teaching staff instils confidence in you"; and "The department's operating hours are convenient to students", were excluded from further analysis due to cross-loading problems. This exclusion did not prejudice the results. The overall scale reliability for all of the 19 retained indicators resulted in α = 0.931, indicating uni-dimensionality of the scale. The indicator loadings were generally strong, ranging from 0.503 to 0.830. The extracted factors 1, 2, 3, and 4 were interpreted based on the indicators loading onto them, and previous literature (Mahmoud & Khalifa, 2015; Yusoff et al., 2015) as facilities, course-centeredness, service excellence, and academic and support staff helpfulness respectively. The interpretation helped to identify the factors that students value regarding service quality in higher education.

Table 4: Rotated Component Matrix

		Factor loading	Eigenvalue	% of variance explained	Reliability (α)
	Factor 1 *Facilities*		9.835	18.616	0.802
T1	The lecture venues have modern and latest equipment	.820			
T2	The appearance of the physical facilities is attractive	.830			
T4	Library (including online) has the latest literature in your area of interest	.648			
RL1	When something is promised by a certain time, it is always provided	.538			
	Factor 2 *Course centeredness*		1.524	15.042	0.761
T3	The course material is up to date and relevant	.600			

RL3	Courses are taught by highly knowledgeable teaching staff	.685			
RL4	The teaching staff respects lecture and exam schedules	.701			
E1	Teaching staff are approachable to assist with coursework queries	.602			
	Factor 3 *Service excellence*		1.327	14.637	0.821
RL5	Assignment, test and exam feedback and marks are accurately captured and recorded	.690			
RS1	Students are informed of schedules and changes in schedules in advance	.536			
RS2	Service hours of learning facilities accommodate all students	.555			
RS3	Assignment, test and exam feedback and marks are made available timeously	.692			
RS4	Administrative staff are quick to respond to student requests	.621			
	Factor 4 *Academic and support staff helpfulness*		1.021	14.007	0.895
A2	Students are able to trust the administrative staff	.602			
A3	Administrative staff is friendly and polite	.672			
A4	Teaching staff is dependable	.503			
E2	Staff members give students individual attention when needed	.706			
E3	Staff has students' best interest as a major objective	.744			
E4	Staff understands the specific needs of students	.742			

Source: Research data

A confirmatory factor analysis (CFA) was run using the analysis of moment structures (AMOS) 26 to statistically test the linkages between the four latent variables and indicators based on the SERVPERF model structure (Byrne, 2010). The Chi-Square value was statistically significant, and the value X^2/degree of freedom (df) was larger than 5, signifying that the data was not fit for the specified model. To improve the model, three low loading indicators were eliminated stepwise while monitoring improvements of the model fit indices. Elimination of the three indicators did not prejudice the theoretical underpinning of the model. Modification indexes were examined and used to improve model fit. The final model parameters and fit indexes are shown in Table 5, and the final structural model in Figure 1. All the model estimates were statistically significant as the critical ratios (CR) were greater than 1.96, as illustrated in the model parameters in Table 5. The model Chi-square value was statistically significant, implying that the data was not fit for the specified model. Other fit indexes, that is, the goodness-

of-fit index (GFI), normed-fit index (NFI), and comparative-fit index (CFI), were, however, all above 0.9, indicating that the specified model was fit for the data (Mahmoud & Khalifa, 2015; Schreiber, Nora, Stage, Barlow & King, 2006). The root mean square error of approximation (RMSEA) value of 0.08 indicated that the final model was fit, as advised by Schreiber et al. (2006), though marginally.

Table 5: CFA four-factor model parameters and fit statistics

| Observed variable		Latent variable	Estimate	S.E.	C.R.	P
SSQT4	<---	Facilities	1,000			
SSQT2	<---	Facilities	1,433	,098	14,545	***
SSQT1	<---	Facilities	1,533	,105	14,634	***
SSQE1	<---	Course	1,000			
SSQRL4	<---	Course	,990	,064	15,521	***
SSQRL3	<---	Course	,886	,057	15,530	***
SSQT3	<---	Course	,852	,063	13,435	***
SSQRS4	<---	Service	1,000			
SSQRS3	<---	Service	1,027	,052	19,811	***
SSQRS2	<---	Service	,742	,047	15,943	***
SSQRL5	<---	Service	,873	,051	17,159	***
SSQE4	<---	Helpfulness	1,000			
SSQE3	<---	Helpfulness	,988	,039	25,292	***
SSQE2	<---	Helpfulness	,925	,040	23,021	***
SSQA3	<---	Helpfulness	,886	,043	20,448	***
SSQA2	<---	Helpfulness	,882	,041	21,370	***
Chi-square		561.893, df=95; p<0.05				
GFI		0.913>0.9				
NFI		0.910>0.9				
CFI		0.924>0.9				

Source: Research data
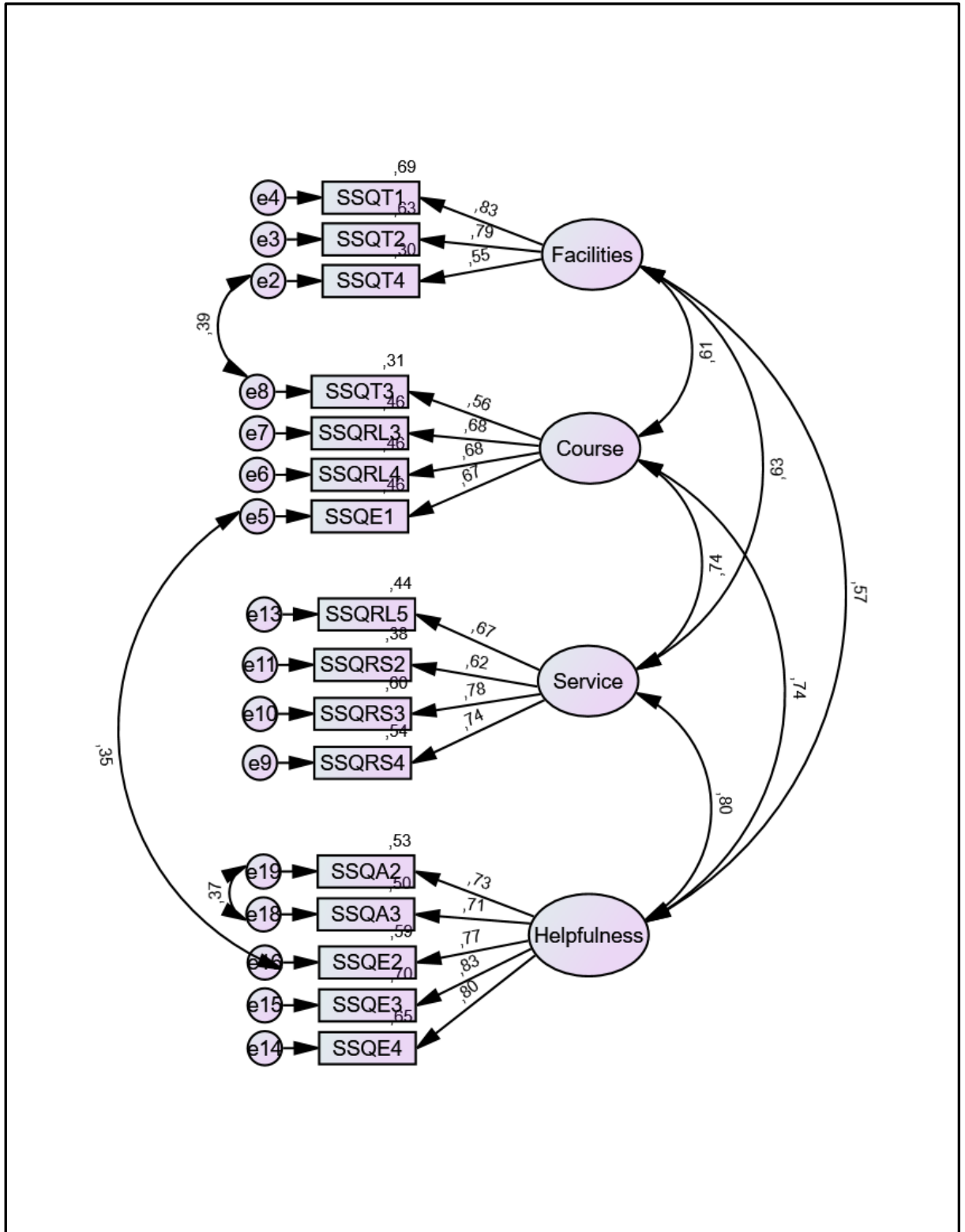
Figure 1: Supply chain education service quality model
Source: research data

The four-factor model obtained, as well as the reduced number of indicators from the original 22, was found to be consistent with previous studies that have

investigated service quality in higher education using the SERVPERF model (Mahmoud & Khalifa, 2015). By implication, the complexity of the model varies from one higher educational context to another.

Correlations between the four extracted factors were tested. All the correlations were statistically significant, positive, and substantive, as presented in Table 6. The correlations are indicative of the interrelationships between the extracted factors, implying that to achieve expected service quality levels, the four factors should be addressed jointly.

Table 6: Dimension correlations

Factor extracted	Facilities	Course centeredness	service excellence	Academic and support staff helpfulness
Facilities	1			
Course centeredness	.569**	1		
Service excellence	.603**	.634**	1	
Academic and support staff helpfulness	.571**	.642**	.720**	1

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

The difference in student perceptions on the SERVPERF scale between the various universities was tested using one-way ANOVA. The results revealed a statistically significant difference in all of the four extracted factors, that is, Facilities ($F_{4,748} =10.874$, $\rho<0.05$), Course centeredness ($F_{4,746} =7.233$, $\rho<0.05$), service excellence ($F_{4,753} =11.686$, $\rho<0.05$) and academic and support staff helpfulness ($F_{4,750} =5.138$, $\rho<0.05$). The post hoc tests were conducted using the Tukey test to reveal the specific groups that had significant differences. The test results were examined for each of the four factors. Under facilities, specific differences were observed between all the universities, except between university A and E ($\rho=0.602$), university B and C ($\rho=0.546$), C and E (0.065), and D and E ($\rho=1.00$). The specific differences are illustrated in the post hoc test Table B in the Appendix.

Table 5: Results of the one-way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Facilities	Between Groups	31.264	4	7.816	10.874	.000
	Within Groups	537.625	748	.719		
Course centeredness	Between Groups	13.653	4	3.413	7.233	.000
	Within Groups	352.036	746	.472		
Service excellence	Between Groups	31.025	4	7.756	11.686	.000
	Within Groups	497.116	749	.664		
Academic and support staff helpfulness	Between Groups	13.854	4	3.464	5.138	.000
	Within Groups	502.917	746	.674		

Source: Research data

The specific significant differences were identified from the post hoc tests for each of the factors. For facilities, University A was significantly different from B and C; B was significantly different from D and E; and C was significantly different from D and E, as illustrated in Table A (Appendix).

The extracted factors were ranked using the mean statistic. Course-centeredness is ranked top, while Facilities were ranked lowest. This might imply that service quality issues related to *facilities* require immediate attention to improve the teaching and learning of supply chain management in universities. To better understand the meaning of the responses, as shown in Table 7; the service quality levels were categorised as: low (<3.0), medium (≥3.0<4.0), and high (≥4.0), according to Rodrigues et al. (2011). As such, the overall service quality of supply chain education is at medium (Mean = 3.637) level.

Table 7: Factor rankings

Extracted factors	Mean	Std. Deviation
Course-centeredness	4.0223	.69827
Academic and support staff helpfulness	3.6105	.83008
Service excellence	3.5846	.83749
Facilities	3.3303	.86977

Source: Research data

5.0 Discussion

The objectives of this study were: firstly, to determine the level of service quality of supply chain education in universities; secondly, to establish service quality factors that supply chain students consider important in universities and model the factors based on the SERVPERF model; thirdly, to establish whether there were service quality differences across the selected universities. Each of the objectives is discussed in the following paragraphs.

The measurement of the service quality of higher education is essential in identifying the areas or dimensions that students are not satisfied with, to take corrective action. Yusoff et al. (2015) established that service quality is a significant determinant of customer satisfaction in higher education. Overall, the service quality of supply chain education is rated at a medium level. This finding agrees with other studies that have investigated service quality in higher education, although the contexts differ, given that some originate from developed countries (Rodrigues et al., 2011; Galeeva, 2016). Whilst service quality relating to the *course centeredness* was high, signifying that the content and instructional methodologies were up to date, universities should improve *facilities*. Facilities may include adequate and conducive lecture venues, modernised libraries as well as the availability of recreational facilities. The finding that universities are struggling with inadequate facilities, that are key to offering high-quality education, supports Munene's (2016) observation that many public universities do not have adequate facilities.

Underlying dimensions of service quality from the perspective of a student were identified as 1) *course-centeredness*, 2) *academic and support staff helpfulness*, 3) *service excellence*, and 4) *facilities*. This finding supported the observations of Sultan and Yin Wong (2012) who identified academic, administration, and facilities as core aspects of service quality in higher education as well as Mahmoud and Khalifa (2015), who identified faculty individualised attention, support staff helpfulness, and support staff empathy as critical factors for students. However, the current model is more enriched having identified four factors including course-related materials, general service excellence, and staff helpfulness when compared to Sultan and Yin Wong (2012) and Mahmoud and Khalifa (2015) models. Course-centeredness refers to the service quality elements that relate to supply chain modules; such as the relevance of the learning materials as well as the quality of the teaching staff in this area. The extraction of *course-centeredness* as one of the factors of service quality supports Abdullah's (2005) study, in which course content was also identified as a service quality aspect in higher education. The students rated this factor highly, implying that highly qualified staff teach the supply chain courses and that the course materials are up to date. The finding supported the claim by Purgailis and Zaksa (2012), that study content is a significant consideration when assessing the service quality of higher education. Academic and support staff helpfulness was identified as a measure of service quality in supply chain education. Staff helpfulness generally refers to the readiness to understand the individual student's needs and meeting them. In support of this study's findings, Yusoff et al. (2015) identified staff helpfulness as one of the critical factors that influence student helpfulness perceptions. The contributions of staff to service quality was also expressed by Mahmoud and Khalif (2015), who categorised it as faculty individualised attention, and support staff helpfulness and empathy, which they termed as the main dimensions of service quality in higher education. Besides, the finding on the excellence of academic staff as a measure of quality in higher education supports Atwebembeire, Musaazi, Ssentamu & Malunda (2018) study that established a positive link between academic staff excellence and quality of university education. The students rated the service excellence aspect as being of average quality, implying that it requires attention from management. Issues affecting service excellence might include not keeping to schedules of service hours; administrative staff not responding adequately to student requests; as well as late feedback and low accuracy, especially in tests and assignments. Finally, the *facilities* aspect of service quality was the lowest rated, possibly echoing the various reports on higher education issues, as observed by Munene (2016). Facilities may relate to inadequate library resources, including online access, unattractive lecture rooms, a lack of appropriate furniture, low lighting, and a lack of equipment like projectors. Inadequate facilities affect service quality negatively, as also claimed by Brochado (2009) and Yusoff et al. (2015).

In addition to identifying the factors that students value, a four-factor supply chain education service quality model was developed. The model is based on 16 indicators, which were clustered into *facilities (3 indicators), course centredness (4 indicators), service excellence (4 indicators), and academic and support staff helpfulness (5 indicators)* as opposed to the 22 in Cronin and Taylor (1992) study. The indicators identified are likely to be the most relevant measures of the service

quality of supply chain education. The resultant model is expected to encourage research on this area given that the SERVPERF model applied in developed countries (for example, Cronin and Taylor model) may not be used or fit directly in another context, more especially in a developing country context.

The differences in service quality between the universities were established using a one-way ANOVA test. There were statistically significant differences in service quality between the universities, as tested for each of the factors that students value. The test factors were course-centeredness, academic and support staff helpfulness, service excellence, and facilities. The differences indicate that universities deliver varying levels of service quality to supply chain students. By implication, there is little uniformity in terms of the quality of course materials, learning facilities, staff helpfulness, or commitment to service excellence. However, it is also essential to observe that there could be other factors that were not surveyed in this study, which could have contributed to the differences; for example, class sizes, the appearance of facilities, and the general perceptions of support staff readiness (Brochado, 2009). It is worth highlighting that universities can improve overall service quality by addressing the four factors identified jointly, as opposed to individually.

6. Conclusion, implications and future research

The measurement of service quality is important to higher education managers as it has a direct influence on student satisfaction as well as on performance (Yusoff et al., 2015). In this study, the service quality level of supply chain education from the perspective of a student is considered to be medium. This could imply that the students are generally indifferent to the service they receive from the universities. This finding should inform management that supply chain students might not be impressed with the overall service quality, especially in areas related to learning facilities, service assurance, and empathy. The areas mentioned above are recommended as focus areas for university management to improve students' perceptions of service quality.

The generic five dimensions of service quality, as expounded by Cronin and Taylor (1992), might not be directly applicable to every context. As such, supply chain students identified four factors or dimensions that influence their perceptions of service quality, that is, course-centeredness, staff helpfulness, service excellence, and facilities. Therefore, supply chain education managers could be guided more specifically on areas or factors that students value and on which they can consequently focus to improve student perceptions of service quality. The differences might imply that supply chain students experience a highly varied service quality environment across different universities. Supply chain education managers are called upon to coordinate efforts to improve the learning experience of students, especially in terms of facilities and commitment to service.

This study's contribution to the body of supply chain skills knowledge can be seen as four-fold. First, the service quality of supply chain education has been established using the SERVPERF tool. Second, four aspects of service quality considered as essential to students were identified; third, a modified SEVPERF

model of supply chain education service quality has been developed; and fourth, service quality was found to be different from one institution to the other, based on the four extracted factors that students value, calling for a coordinated approach in the management of supply chain education in Kenya.

The current research findings might be limited to the selected context; however, given the convincing inferential statistics obtained, it can be generalised to all universities in Kenya. Based on the findings of this study there are opportunities for further research, for example, (1) advancing theory on quality of supply chain education through a comparative analysis of students' perceptions from other contexts among the developing countries; (2) application of different research methodologies and instruments such as HEdPERF, and comparing results across universities and countries; and (3) replications of the study in future to monitor changes in service quality of supply chain education in the same context. This will measure whether managerial decisions are taken in the universities to improve the service quality of supply chain education.

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Appendix

Table A: Multiple Comparisons
Tukey HSD

Dependent Variable	(I) Name of University	(J) Name of University	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Facilities	A	B	.31119*	.11093	.041	.0078	.6145
		C	.23540*	.07775	.021	.0228	.4480
		D	-.22137	.08978	.100	-.4669	.0241
		E	-.36481	.19029	.309	-.8852	.1555
	B	A	-.31119*	.11093	.041	-.6145	-.0078
		C	-.07578	.10616	.953	-.3661	.2145
		D	-.53256*	.11526	.000	-.8477	-.2174
		E	-.67600*	.20356	.008	-1.2326	-.1194
	C	A	-.23540*	.07775	.021	-.4480	-.0228
		B	.07578	.10616	.953	-.2145	.3661
		D	-.45677*	.08381	.000	-.6860	-.2276
		E	-.60021*	.18755	.012	-1.1131	-.0874
	D	A	.22137	.08978	.100	-.0241	.4669
		B	.53256*	.11526	.000	.2174	.8477
		C	.45677*	.08381	.000	.2276	.6860
		E	-.14344	.19285	.946	-.6708	.3839
	E	A	.36481	.19029	.309	-.1555	.8852
		B	.67600*	.20356	.008	.1194	1.2326
		C	.60021*	.18755	.012	.0874	1.1131
		D	.14344	.19285	.946	-.3839	.6708
Course centeredness	A	B	.34522*	.08989	.001	.0994	.5910
		C	-.05945	.06309	.880	-.2320	.1131
		D	-.09327	.07262	.701	-.2919	.1053
		E	-.27586	.15747	.403	-.7065	.1547
	B	A	-.34522*	.08989	.001	-.5910	-.0994
		C	-.40466*	.08609	.000	-.6401	-.1693
		D	-.43849*	.09330	.000	-.6936	-.1834
		E	-.62108*	.16801	.002	-1.0805	-.1617
	C	A	.05945	.06309	.880	-.1131	.2320
		B	.40466*	.08609	.000	.1693	.6401
		D	-.03383	.06786	.988	-.2194	.1517
		E	-.21642	.15533	.632	-.6412	.2083
	D	A	.09327	.07262	.701	-.1053	.2919
		B	.43849*	.09330	.000	.1834	.6936
		C	.03383	.06786	.988	-.1517	.2194
		E	-.18259	.15944	.782	-.6186	.2534
	E	A	.27586	.15747	.403	-.1547	.7065
		B	.62108*	.16801	.002	.1617	1.0805
		C	.21642	.15533	.632	-.2083	.6412
		D	.18259	.15944	.782	-.2534	.6186
Service excellence	A	B	.50379*	.10707	.000	.2110	.7966
		C	-.11183	.07471	.565	-.3161	.0925
		D	-.07152	.08583	.920	-.3062	.1632
		E	-.54877*	.18675	.028	-1.0594	-.0381
	B	A	-.50379*	.10707	.000	-.7966	-.2110
		C	-.61562*	.10250	.000	-.8959	-.3353
		D	-.57531*	.11086	.000	-.8785	-.2722
		E	-1.05256*	.19950	.000	-1.5981	-.5070
	C	A	.11183	.07471	.565	-.0925	.3161
		B	.61562*	.10250	.000	.3353	.8959
		D	.04031	.08006	.987	-.1786	.2592
		E	-.43693	.18417	.124	-.9405	.0667
	D	A	.07152	.08583	.920	-.1632	.3062
		B	.57531*	.11086	.000	.2722	.8785
		C	-.04031	.08006	.987	-.2592	.1786
		E	-.47725	.18895	.086	-.9939	.0394
	E	A	.54877*	.18675	.028	.0381	1.0594
		B	1.05256*	.19950	.000	.5070	1.5981
		C	.43693	.18417	.124	-.0667	.9405
		D	.47725	.18895	.086	-.0394	.9939
	A	B	.25662	.10736	.119	-.0370	.5502
		C	-.12032	.07536	.500	-.3264	.0857

Academic and support staff helpfulness			Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
		D	.10725	.08671	.730	-.1298	.3443
		E	-.34617	.18817	.351	-.8607	.1684
	B	A	-.25662	.10736	.119	-.5502	.0370
		C	-.37693*	.10293	.002	-.6584	-.0955
		D	-.14936	.11151	.667	-.4543	.1556
		E	-.60279*	.20081	.023	-1.1519	-.0537
	C	A	.12032	.07536	.500	-.0857	.3264
		B	.37693*	.10293	.002	.0955	.6584
		D	.22757*	.08116	.041	.0056	.4495
		E	-.22586	.18568	.742	-.7336	.2819
	D	A	-.10725	.08671	.730	-.3443	.1298
		B	.14936	.11151	.667	-.1556	.4543
		C	-.22757*	.08116	.041	-.4495	-.0056
		E	-.45342	.19057	.122	-.9745	.0677
	E	A	.34617	.18817	.351	-.1684	.8607
		B	.60279*	.20081	.023	.0537	1.1519
		C	.22586	.18568	.742	-.2819	.7336
		D	.45342	.19057	.122	-.0677	.9745

*. The mean difference is significant at the 0.05 level.

Source: Research data