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A comprehensive model for assessing the quality in higher education institutions

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Abstract

Purpose – This study aims to propose a comprehensive model for assessing the quality of academic programs in higher education institutions (HEIs) by adopting the TQM philosophy.

Design/methodology/approach – Based on a sample of 377 responses from higher education academics, experts and professionals in Sweden, partial least squares structural equation modeling (PLS-SEM) technique was used to empirically test the proposed hypotheses and validate the model.

Findings – The model reveals that the input-based factors have a stronger impact on the process-based factors; while process-based factors have less impact on the output-based factors. The input-based factors: adoption of international pedagogy standards (IPS), education infrastructure (EDI), and work/study environment (WSE) through the process-based factors quality of students (QOS) and quality of faculty staff (QFS) is found to have a significant impact on output-based factor quality of academic programs (QAP).

Research limitations/implications – This study has been conducted in Sweden. Inclusion of other countries provides opportunities for further analysis by conducting cross-comparison between different cultures in higher education, and including additional stakeholders such as policymakers, parents and students.

Practical implications – This research also contributes to practice by providing an in-depth understanding of the relationships among variables that affect the quality of academic programs in HEIs, and provides insights to internally assess the quality levels of their academic programs

Originality/value – This study contributes to the knowledge by providing a holistic view in which it integrates input, process and output perspectives in a conceptual model to assess the quality of academic programs at the higher education level.

Keywords Quality assessment, TQM, Higher education, Academic programs, Pedagogy, Universities

Paper type Research paper

1. Introduction

Higher education becomes a very competitive higher education market (Wilkins, 2020), and thus there is considerable pressure on higher education institutions (HEIs) for a substantial improvement in their process performance and their quality level. For instance, the quality in (HEIs has received tremendous attention, than ever before, from many stakeholders such as policymakers, governments, universities' senior management, students and their parents, researchers and academics and even endowment donors (Tasopoulou and Tsiotras, 2017). In this respect, the existing research focuses principally either on interaction of global university rankings with the concept of quality or with processes of quality assurance in higher education (Hauptman Komotar, 2020). Global university rankings (such as Quacquarelli Symonds University Rankings QS, Times Higher Education, Academic Ranking of World Universities [ARWU], or sometimes referred to as Shanghai Rankings) have used different methodologies to measure the performance of HEIs. The ranking methodologies differ from one ranking organization to another. For instance, the QS Rankings methodology focuses on indicators such as staff to student ratio, number of Ph.D. holders among faculty members, number of international faculty members, number of international students, number of published research per faculty member and citations per faculty member. The Times Higher Education rankings methodology focuses on similar indicators to QS, but extends its criteria

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to include other indicators such as the income of the university from research and trade. The ARWU focuses on the number of published research and the number of prestigious academic awards and prizes such as the Nobel Prize. Despite their importance, university rankings methodologies assess the performance rather than the total quality of the HEIs.

Several studies in the literature suggested various models for measuring the quality at HEIs. Yet, there is no consensus on a comprehensive approach for measuring quality at HEIs. Theoretically, the concept of quality is highly complex and difficult to measure, especially in HEIs. According to Carnerud (2018) and Weckenmann *et al.* (2015), it is very difficult to develop a universal model to measure quality. The quality of educational programs in universities and colleges is different from the quality of a product line, product units or services of profit business organizations. The core activities of HEIs are to create, transfer, augment, revise, expand and exchange the knowledge, skills and intellectuality to enhance the quality of human life. These activities require tremendous interactions (i.e. registration and admission, teaching, internship, research, academic exchange, academic partnership, collaborative projects, professional training, etc.) among all stakeholders (i.e. teachers, students, senior management personnel, governments and policymakers, industry partners, other partners, etc.) inside and outside the HEI premises. In this respect, the complexity of higher education as a service sector has generated various perspectives to measure quality in higher education. In this regard, literature has extensively discussed the concept of quality in higher education from three main perspectives: input-perspective, output-perspective and process-perspective, but it rarely does so from a holistic perspective.

The input-perspective focuses on resources, infrastructure, students' intake, academic staff, curricula and other resources of a given HEI or academic program (Beeg, 2003). Accreditation bodies usually adopt this perspective. The output-perspective focuses on the outcomes of higher education such as graduate skills, abilities, competencies and employability. This perspective is usually adapted by international HEIs ranking organizations. The process-perspective focuses on the operations such as teaching methods (Chen *et al.*, 2014), work procedures such as the examination process and rules and regulations such as requirements for registration in a particular program. This perspective is usually adopted by the HEI itself. Having said that, however, little is known about the holistic view of quality in HEIs. The input-process-output view of quality in HEIs provides a comprehensive understanding of all elements that constitute the concept of quality in higher education. Therefore, the aim of this research to propose a comprehensive model for assessing the quality of academic programs by investigating the relationships between factors that are not directly assessed by university ranking criteria.

The rest of this paper is organized in the following manner. Section 2 provides an overview of the main literature of concepts, variables and models to measure quality in higher education. Section 3 identifies the variables, hypothesis and proposed conceptual model. Section 4 presents the methods used to collect and analyze the empirical data. Section 5 demonstrates the analysis part and discussion of results. Section 6 concludes the main findings and highlights the theoretical and practical contributions.

2. Literature review

Due to the lack of consensus in the literature on how quality in higher education is being measured or assessed, the concept of quality in higher education is used interchangeably to mean compliance, audit, control, assurance, monitoring, assessment or evaluation. This misunderstanding has allowed for borrowing various quality models and frameworks from the manufacturing sector to apply it in higher education. Consequently, this has led to misconceptions regarding the concept of quality in higher education. As a result, various universities in different countries have adopted different quality management systems in their institutions. Then, to overcome these variations in measuring the quality of HEIs at the global level, the university ranking organizations have predefined various criteria by identifying different sets of performance indicators based on several methodologies. Nevertheless, these ranking organizations have emphasized on the output/outcome perspective, but rarely addressed the input perspective and sometimes overlook the process perspective. Process perspective is a very important element that should be considered and inspired by the study of (Chen *et al.*, 2014),

2.1 Various perspectives on quality in HEIs

Literature has discussed various models for assessing quality in HEIs such as Six Sigma (Langstrand *et al.*, 2015), the European Foundation for quality management framework or EFQM (Prakash, 2018) and the SERVQUAL model (Parasuraman and Berry, 1988). Yet, there is no consensus on a globally accepted model for quality management in higher education. The reason is that most of the proposed models were borrowed from the industry (Chua, 2004), while the higher education needs service quality models (Teeroovengadum *et al.*, 2019). Besides, the specificities of higher education (as a service sector) made it hard to use such models. For instance, Six Sigma models have been criticized for their incompatibility within higher education. Jenicke *et al.* (2008, p. 458) find that "Six sigma can be applied in an academic setting but the implementation of successful, organization-wide programs such as those found in manufacturing settings will be difficult." In addition, Prakash (2018, p. 738) emphasizes that "EFQM provides short-term improvement and is less relevant for service functions such as education." Teeroovengadum *et al.* (2019) and Galeeva (2016) confirm that the SERVQUAL model does consider the peculiarity of the higher education sector.

Despite the comprehensiveness perspectives of such models, most of these models have been used by HEIs for accreditation and ranking purposes. Besides, these models have not provided insights on how to measure quality levels of academic programs in HEIs. For example, Chen *et al.* (2017) propose the importance-performance analysis (IPA) model to identify the weakest quality dimensions to improve the effectiveness of HEIs. Therefore, this study adopts the total quality management of TQM approach in HEIs. Jenicke *et al.* (2008) emphasized the effectiveness of using the TQM approach in higher education. The TQM approach covers a comprehensive perspective of quality management in HEIs for the following reasons. First, the complexity of higher education is high and hence universities are bureaucratic in nature (Srikanthan and Dalrymple, 2002, p. 215). This complexity has generated various perspectives to measure quality in higher education. These perspectives can be categorized into three main views: input-based perspective, output-based perspective and process-based perspective.

2.2 Model variables

Based on the literature, six variables were adapted to form the proposed research model depicted Figure 1. The variables were constructed from several items (i.e. quality indicators). All quality indicators were reflective, and each indicator was measured on a Likert scale from 1–5, where 1 is the lowest and 5 is the highest. These variables are:

(1) *Quality of academic programs QAP*: It is considered a dependent variable that can be measured by four indicators: graduates' employability, academic reputation of the university, innovation and curricula design. These indicators are stemmed from several studies and professional reports such Fairweather and Brown (1991) and Hanover Research (2012).

(2) *Quality of students QOS:* The quality of the student cannot be measured by student evaluation alone (Calma and Dickson-Deane, 2020). Also, Prakash (2018, p. 741)

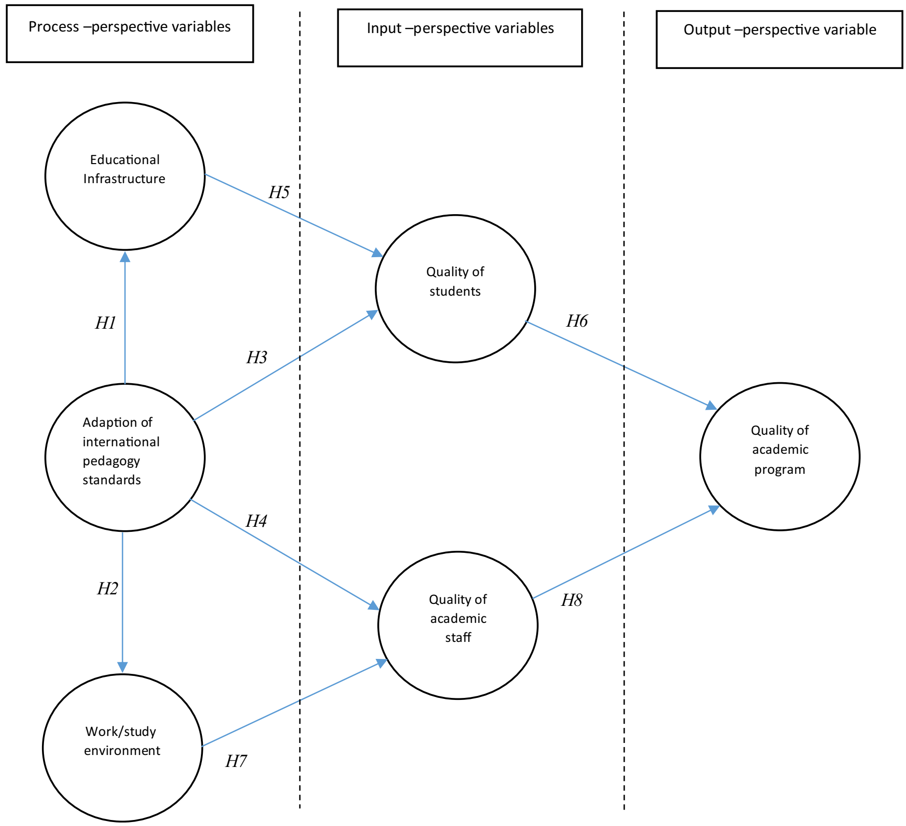

Figure 1.
Proposed model for holistic approach to predict quality of academic programs at HEIs

emphasizes that "the student perspective is gaining central attention and HEIs are striving to meet students' expectations by operationalizing various levers of quality." Hence, the QOS should be reflected by other factors than student's expectations by focusing on input-based indicators. In this context, QOS is used (in the proposed model as a mediating variable) which can be reflected by four indicators, which are admission entry requirement, language entry requirement, student engagement and interpersonal skills. These indicators are stemmed from several studies such as Skolnik (2016), Steinberg (2002) and Fairweather and Brown (1991).

(3) *Quality of faculty staff/academic staff QFS*: Highly competent teachers are important input-perspective variable. Ludwikowska (2019) confirms that teacher competence is important for modernizing the study programs. Teacher competency should be maintained to achieve a high level of QFS. In the proposed model, QFS is used as a mediating variable, and it can be reflected by three indicators, which are staff qualification and competencies, staff appraisal and continues development of staff. These indicators are stemmed from Skolnik (2016).

(4) *Education infrastructure EDI*: It can indirectly affect the quality of academic programs in HEIs. For instance, the availability of large and enough buildings, classrooms (Teixeira *et al.*, 2017), labs, equipment, libraries and other student service

facilities is a fundamental element for on-campus learning and teaching (Chen *et al.*, 2014). Furthermore, more and more universities utilize digitalization in their teaching and learning and administrative processes. In this regard, digitalization (such as Wi-Fi campus connectivity, smart classrooms, e-learning platforms, massive open online courses MOOCs) has become an essential part of the education infrastructure for many HEIs around the globe (Wong *et al.*, 2019), especially after Covid-19 outbreak pandemic (Bao, 2020), in which thousands of HEIs have shifted from traditional to digital and online teaching and learning. From the TQM perspective, sustaining and maintaining the infrastructure such as libraries, labs, equipment, buildings, digitalization and classrooms requires continuous improvement of the whole education process. Therefore, EDI is used as an independent variable that consists of three indicators, which are labs and other equipment, classrooms and student service facilities and access to libraries including e-libraries and other open data sources (digitalization).

(5) *Adoption of international pedagogy standards IPS*: Tatto (2006, p. 235) emphasizes that adoption of international *pedagogy* standards and accountability helps shape the education systems to "provide those skills needed in the growing global economy." Wibisono (2018) highlights the importance of implementing the pedagogy standards ISO 21001:2018. Therefore, IPS is used as an independent variable that consists of three indicators, which are benchmarking, pedagogy standards and external audit.

(6) *Work/study environment WSE*: Students and faculty members as well as other employees should feel relaxed, healthy and safe at the workplace in the campus. In this regard, Mohammed *et al.* (2019) find that there are "undesirable levels of job-related stress, motivation, and satisfaction in some segments of higher education employees." Their study recommends HEIs to offer stress-relief programs, health fairs and health club memberships. Moreover, the quality of governance and culture values in HEIs should be addressed as high priorities (Gerged and Elheddad, 2020). Therefore, and based on Srikanthan and Dalrymple (2002), the independent variable *WSE* can consist of three indicators, which are occupational health and safety, governance and organizational culture values.

Table 1 summaries the six variables and their corresponding reflective indicators with an explanation.

2.3 Hypotheses development

Based on the above discussion, the following model is constructed, which includes six variables that are classified into three categories:

(1) *The process-perspective variables* which include EDI, IPS and WSE.

(2) *The input-perspective variables* which include QOS and QFS

(3) *The output-perspective variables* which include the dependent variable quality of academic program

As shown in Figure 1, the model has resulted in eight hypotheses (H1 to H8) to be tested to study the relationships between the variables.

International pedagogy standards such as the new management system ISO 21001:2018 contains requirements for HEIs to improve their education infrastructures such as libraries, classrooms, communication and other facilities. In this regard, Wibisono (2018) recommends that educational organizations should adopt this new standard. On the other

Variable	Item name (quality indicator)	Explanation	Type of quality indicator	Survey question
Quality of academic programs	Graduates 'employability	Graduates' employability indicates the level of quality of the academic program	Output	QAP1
	The academic reputation of university/International university rankings	The academic reputation of the university (i.e. international university rankings) indicates the quality level of the academic program	Process	QAP2
	Start-ups/Innovation index	University start-ups/innovation/ inventions indicates the level of quality of the academic program	Output	QAP3
	Curricula design	Circular is an essential element that indicates the quality level of the academic program	Input	QAP4
Quality of students	Admission entry requirement	Accepting only high-grade students with high academic records is necessary for ensuring learning and teaching	Input	QOS1
	Language entry requirement	Language entry exams for students such as ILETS, GMAT, GRE, TOFEL are necessary for ensuring learning and teaching	Input/ process	QOS2
	Student engagement	Student engagement is necessary for ensuring learning and teaching	Process	QOS3
	Interpersonal Skills	University education should help students acquire interpersonal skills required to practice knowledge	Output	QOS4
Quality of faculty staff/academic staff	Staff qualification	Recruitment of highly qualified staff (academic and non-academic experience) is necessary for assuring learning and teaching	Input	QFS1
	Staff appraisal	Continuous monitoring and evaluation of staff performance is necessary for ensuring learning and teaching	Process	QFS2
	Continues development of staff	Continuous development of staff (training, seminars, conference, pedagogy) is necessary for ensuring learning and teaching	Output/ process	QFS3
Education infrastructure	Laboratories and equipment	Laboratories and/or other educational equipment is essential for assuring learning and teaching	Input	EDI1
	Offices, classrooms and student service facilities	Offices, classrooms and student service facilities are essential and necessary for ensuring learning and teaching	Input	EDI2
	Digitalization, libraries including e-libraries and other open resources	Access to library including e-libraries are essential and necessary for ensuring learning and teaching	Input	EDI3
Adoption of international pedagogy standards	Benchmarking	Benchmarking with international accredited academic programs is important and relevant for learning and teaching	Process/ input	IPS1
	Pedagogy standards	Implementing various international pedagogy standards is important and relevant for learning and teaching	Process	IPS2
	External audit	Conducting external audit by an independent international accreditation body is necessary to assure learning and teaching	Output	IPS3

Table 1.
Model variables and indicators

(*continued*)

Variable	Item name (quality indicator)	Explanation	Type of quality indicator	Survey question
Work/Study environment	Occupational health and safety	It is important and relevant for ensuring teaching and learning that universities support occupational health and workplace safety for its staff and students	Input	WSE1
	Governance	It is important and relevant for learning and teaching that universities endorse effective administration system, regulations and work procedures that are transparent and accessible by all stakeholders	Process	WSE2
	Organizational culture values	It is important and relevant for learning and teaching that universities foster basic organizational values such as gender equality, diversity, integrity, respect, democracy, academic freedom, autonomy and openness	Output	WSE3

Table 1.

hand, El-Morsy *et al.* (2014) confirm that ISO 9001:2008 standards can be used as a foundation for TQM and academic accreditation in HEIs. Besides, the adoption of the ISO 14001 quality management system can ensure that the availability of study and work environment in campuses meets certain standards such as having sufficient classroom capacity, study rooms and corners, staff offices and non-curricula facilities such as sports facilities.

While the main drive of ISO 9001:2015, quality management system is the customer focus (i.e. students), as it also provides guidelines to effectively manage human resources (i.e. faculty members). Thus, implanting ISO 9001:2015 can ensure recruiting high-quality students and faculty members. It also ensures staff trading and continuous monitoring of academic and administrative processes at HEIs (Dobrzański and Roszak, 2008). Consequently, the following hypothesis can be drawn:

H1. Adoption of international pedagogy standards is positively related to the quality of education infrastructure.

H2. Adoption of international pedagogy standards is positively related to work/study environment.

H3. Adoption of international pedagogy standards is positively related to the quality of students.

H4. Adoption of international pedagogy standards is positively related to the quality of academic staff.

Students spend several years of their life at universities and spend plenty of time on campus. Sammalisto and Arvidsson (2005) highlight that universities should focus on the environmental aspects of workplace. When universities offer high-quality education infrastructure and a good study environment, it can improve students' academic performance. According to (Teixeira *et al.*, 2017), "Buildings, classrooms, laboratories, and equipment- education infrastructure-are crucial elements of learning environments in schools and universities. There is strong evidence that high-quality infrastructure facilitates better instruction, improves student outcomes, and reduces dropout rates, among other benefits." Besides, Barrett *et al.* (2016) find that education infrastructure affects students' learning and teaching. Hence, education infrastructure can affect the quality of students, who, in turn, improve the reputation of the academic programs by reducing dropout rates. Accordingly, these benefits will usually attract high-quality faculty members to teach at such universities. Consequently, the following hypothesis can be drawn:

H5. Quality of education infrastructure is positively related to the quality of students.

H6. Quality of students is positively related to the quality of academic programs.

H7. Work/study environment is positively related to the quality of academic staff.

H8. Quality of academic staff is positively related to the quality of academic programs.

3. Research methodology

Compared to covariance-based structural equation modeling CB-SEM, PLS-SEM is more appropriate for prediction and theory development (Hair *et al.*, 2011). Since the purpose of this research is to propose and predict a new holistic model for assessing the quality of academic programs at HEIs, PLS-SEM is considered an appropriate method for data analysis (Dwaikat *et al.*, 2018).

3.1 Sample size and population

Since this study has been conducted in Sweden and due to funding and time limitations, the data for this study were collected from academics, HEIs experts and professionals from academia in Sweden through an online survey. The targeted respondents were faculty members and experts engaged in the teaching and research, and were decision-makers in their respective HEIs. Sweden is home to the most prestigious academic prize in the world, which is the Noble Prize. Besides, Sweden is the home for well-known and reputable HEIs in the world. It is also home to many innovative and high-tech firms and successful start-ups. Hence, the targeted respondents can be considered suitable for the purpose and scope of this study.

The survey was sent by email to 1,023 respondents with a link. After two weeks, there were 253 responses collected. In total, the samples consisted of 377 responses. Following the recommended sample size guidelines by (Hair *et al.*, 2017, p. 26), at a significance level of 1% and minimum R^2 of 0.1, our sample size is adequate for the analysis using PLS-SEM. The response rate was 36.8% (i.e. 377/1023).

3.2 Instrument

A questionnaire consisted of 19 direct questions was developed based on the indicators and constructs. To improve the content validity of the instrument, the author asked colleagues at different universities and experts in academia to review the questions and check their wording and the content. As a result, few questions were revised for improved wordings. Furthermore, few additional demographic questions were introduced. As a total, the questionnaire consisted of 24 questions, of which five were demographic questions about the respondents and 19 for the indicators as shown in Table 1.

4. Findings

4.1 Data analysis and results

Data analysis has been conducted in two main parts. The first part involves the analysis of the measurement model, sometimes referred to as the outer model. The second part involves the analysis of the structural model, sometimes referred to as the inner model. The analysis procedure includes two steps. The first step is to use the PLS algorithm to calculate path estimates and parameters. The second step is to use the bootstrapping procedure to calculate the significance of the model parameters. The data have been analyzed using Smart PLS 3.2.8 (Ringle *et al.*, 2015) software package with the default setting.

4.2 Measurement model

The analysis of the outer model using the PLS algorithm shows that the reflective factor loadings have exceeded the threshold value of 0.7, which indicates an acceptable level of validity of the measurement model (Hair *et al.*, 2017). The significance of these factor loadings was verified by conducting the bootstrapping procedure to check the *T*-values. The results indicate that the *T*-values were within the acceptable values. The indicator QOS2 has been removed from the analysis because it has low factor loading. Table 2 presents the factor loading and *T*-values.

For the validity and reliability of the constructs and indicators, the results (which are presented in Table 3) show that Cronbach's alpha and composite reliability are well established. The rule of thumb is that the values have to be equal or greater than 0.7 for alpha and 0.7 for the composite reliability (Hair, *et al.*, 2009). In addition, the results also indicate that convergent validity was established. As a general rule of thumb, the convergent validity is established if the average variance extracted (AVE) is equal to or greater than 0.5 (Bagozzi and Yi, 1988). The results indicate adequate levels of convergent validity for the constructs:

Construct	Indicator	Point estimate	*T*-values
Quality of academic programs	QAP1	0.765	27.053
	QAP2	0.860	45.491
	QAP3	0.894	59.076
	QAP4	0.825	34.004
Quality of students	QOS2	0.774	25.155
	QOS3	0.883	63.044
	QOS4	0.763	26.608
Quality of faculty staff	QFS1	0.670	13.950
	QFS2	0.877	77.035
	QFS3	0.728	19.544
Education infrastructure	EDI1	0.901	73.962
	EDI2	0.919	58.188
	EDI3	0.921	101.387
Adoption of international pedagogy standards	IPS1	0.895	88.483
	IPS2	0.879	60.164
	IPS3	0.826	49.095
Work/Study environment	WSE1	0.922	103.655
	WSE2	0.933	102.474
	WSE13	0.878	65.884

Table 2. Measurement model estimation

Construct	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
QAP	0.86	0.90	0.70
QOS	0.74	0.85	0.65
QFS	0.70	0.81	0.58
EDI	0.90	0.93	0.83
IPS	0.84	0.91	0.75
WSE	0.89	0.94	0.83

Table 3. Reliability and validity analysis

quality of academic programs QAP (AVE = 0.70), quality of students QOS (AVE = 0.65), quality of faculty staff QFS (AVE = 0.58), education infrastructure EDI (AVE = 0.83), adoption of international pedagogy standards IPS (AVE = 0.75) and work/study environment WSE (AVE = 0.83).

Discriminant validity for constructs was checked by using Fornell and Larcker. The results presented in Table 4 confirm that discriminant validity is established because the square root of each construct's AVE (i.e. the values are shown in bold on the diagonal) is greater than the correlations with other latent constructs (Fornell and Larcker, 1981).

Furthermore, discriminant validity was also checked by using the Heterotrait–Monotrait HTMT ratio of correlations, a new criterion for assessing constructs' discriminant validity which was proposed by Henseler *et al.* (2015). Henseler *et al.* (2015) suggest that HTMT value ranges between 0 and 1, and a value lower than 1 indicates better discriminant validity. As presented in Table 5, HTMT values are less than 1.0, and therefore good discriminant validity is confirmed for the constructs.

The goodness-of-fit index (GoF) is also another measure of the quality of the model that needs to be checked when using PLS-SEM (Henseler and Sarstedt, 2013). GoF is measured using the standardized root mean square residual (SRMR) in which the rule of thumb suggests that the value of SRMR should not exceed 0.1. However, some more conservative views suggest an SRMR threshold value of less than or equal to 0.09. The result of GoF analysis for the model is SRMR 0.086, which indicates a justifiable mode fit.

4.3 Structure model

As shown in Figure 2 and Table 6, the coefficient of determination R^2 for EDI is 0.727, which means 72.7% of the variance in the EDI is explained by the construct IPS. Besides, the R^2 for QAP equal is 0.392, which means 39.2% is explained by the two constructs QOS and QFS. The results also show that the R^2 for QOS is 0.405, which indicates that 40.5% is explained by the two EDI and IPS. Furthermore, the R^2 for QFS is 0.419, which indicates that 41.9% is explained by the two WSE and IPS. Thus, the structural model is described as moderate because of R^2 values close to 50% (Hair *et al.*, 2011).

Table 4. Discriminant validity results by using Fornell and Larcker criterion

	EDI	IPS	QAP	QFS	QOS	WSE
EDI	*0.913*					
IPS	0.853	*0.867*				
QAP	0.496	0.565	*0.837*			
QFS	0.584	0.624	0.596	*0.763*		
QOS	0.605	0.619	0.552	0.695	*0.808*	
WSE	0.718	0.813	0.550	0.608	0.591	*0.911*

Table 5. Discriminant validity results by using Heterotrait–Monotrait ratio of correlations (HTMTs) criterion

	EDI	IPS	QAP	QFS	QOS	WSE
EDI	–					
IPS	0.983	–				
QAP	0.566	0.669	–			
QFS	0.757	0.834	0.777	–		
QOS	0.723	0.775	0.691	0.991	–	
WSE	0.794	0.936	0.627	0.784	0.709	–

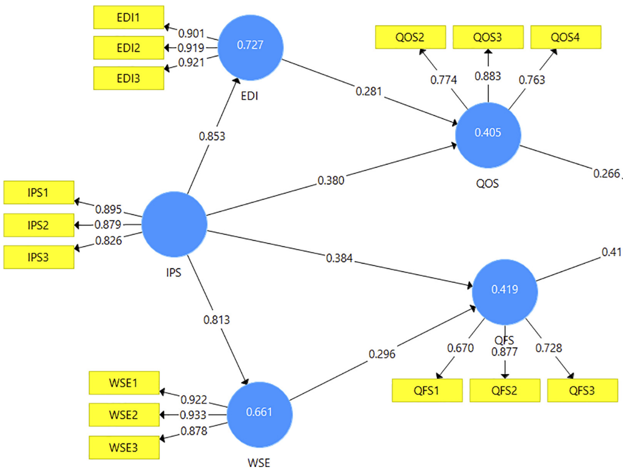

Figure 2. Path molding estimation using PLS algorithm

Construct	R square	R square adjusted
EDI	0.727	0.727
QAP	0.392	0.389
QFS	0.419	0.416
QOS	0.405	0.402
WSE	0.661	0.660

Table 6. Coefficients of determination R square values

Hypothesis	Original sample (O)	Sample mean (M)	SD (STDEV)	T-statistics (|O/STDEV|)	p-values	Conclusion
EDI → QOS	0.281	0.285	0.086	3.270	0.001	Accepted
IPS → EDI	0.853	0.852	0.018	48.226	0.000	Accepted
IPS → QFS	0.384	0.382	0.069	5.543	0.000	Accepted
IPS → QOS	0.380	0.376	0.083	4.593	0.000	Accepted
IPS → WSE	0.813	0.812	0.024	33.696	0.000	Accepted
QFS → QAP	0.411	0.412	0.057	7.221	0.000	Accepted
QOS → AP	0.266	0.266	0.062	4.309	0.000	Accepted
WSE → QFS	0.296	0.298	0.073	4.027	0.000	Accepted

Table 7. Hypotheses testing results, p-values and T-values

By observing the standardized path coefficients (β values) where the threshold value is equal to or more than 0.1 (Eggert and Serdaroglu, 2011), the analysis of the structural model shows that the QFS has a stronger influence (0.411) on QAP than on QOS (0.266). In addition, IPS has a stronger influence (0.380) on QOS than on EDI (0.281). Furthermore, IPS has also a stronger influence (0.384) on QFS than on WSE (0.296). Likewise, IPS has the stronger influence (0.384) on QOS than on EDI (0.296). It is also found that IPS has the strongest influence on EDI (0.853) and on WSE (0.813), respectively. To check the significance of these relationships among the constructs (i.e. paths), PLS bootstrapping procedure is used to calculate the T-values. Paths are considered significant if T-values are equal to or greater than 1.96 (Svensson *et al.*, 2018). Alternatively, paths are significant when all p-values are less than 0.05 at a confidence level of

95%. The results of PLS bootstrapping analysis, presented in Figure 2 and Table 7, show that all paths are significant and thus all hypotheses are accepted.

5. Conclusions

This research has explored the relationships between factor higher education institutions (HEIs by adapting a holistic model of quality assessment. The model provides a holistic understanding of input-based, process-based and output-based factors that can significantly affect the quality of academic programs at the higher education level. The results reveal that the input-based factors IPS, EDI and WSE through the process-based factors QOS and QFS are found to have a significant impact on output-based factor QAP, unlike the current literature, which has overemphasized the process-based and output-based factors such as the teaching process (Chen *et al.*, 2014). The results also reveal that the input-based factors have a stronger impact on the process-based factors, while process-based factors have less (but still significant) impact on the output-based factors. In this regard, Hale *et al.* (2020, p. 37) highlight that "Institutions are being called to discover more effective and efficient ways of preparing learners of all types and at all stages." Hence, it can be concluded that a strong emphasis on the input-perspective should be placed.

This study contributes to practice by providing an in-depth understanding of the relationships among variables that affect the quality of academic programs in HEIs and provides insights to the top management and policymakers at HEIs to adopt a comprehensive approach for assessing the quality of their academic programs. In this regard, Gerged and Elheddad (2020) emphasize that few studies focused on examining the role of policymakers in advancing education quality in Western Europe.

This study contributes to the body of knowledge of TQM by extending the current debate and discussion on how we measure quality in higher education by providing a holistic or comprehensive view in which it integrates input, process and output perspectives in a conceptual model to assess the quality of academic programs at the higher education level. By reviewing the main literature in the field, a theoretical model is proposed. The model is empirically tested by employing PLS-SEM technique, using data collected from 377 responses from experts, researchers, policymakers and university administrators. This research also contributes to practice by addressing key factors that affect academic programs and their interconnections. Consequently, decision-makers at HEIs can benefit from this study by identifying the most and least influential factors that affect the quality of their academic programs, and act correspondingly.

This study has few limitations, and hence some suggestions for further future research. These limitations are related to "practical limits on the collection of data" (Barrett *et al.*, 2016, p. 22). Data were collected from Sweden, and therefore inclusion of other countries may provide opportunities for cross-comparison between different cultures in higher education. Hence, it would be possible to identify constructs or factors, which might be added to extend the model. This may also require conducting multiple case studies. It is also suggested to extend the sample by including several additional stakeholders such as policymakers, parents and students.

References

Bagozzi, R.P. and Yi, Y. (1988), "On the evaluation of structural equation models", *Journal of the Academy of Marketing Science*, Vol. 16 No. 1, pp. 74-94.

Bao, W. (2020), "COVID -19 and online teaching in higher education: a case study of Peking University", *Human Behavior and Emerging Technologies*, Vol. 2 No. 2, pp. 113-115.

Barrett, P., Davies, F., Zhang, Y. and Barrett, L. (2016), "The holistic impact of classroom spaces on learning in specific subjects", *Environment and Behavior*, Vol. 49 No. 4, pp. 425-451.

Beeg, R. (2003), *The Dialogue between Higher Education Research and Practice*, Kluwer academic publishers, New York, NY.

Calma, A. and Dickson-Deane, C. (2020), "The student as customer and quality in higher education", *International Journal of Educational Management*, Vol. 34 No. 8, pp. 1221-1235, doi: 10.1108/ijem-03-2019-0093.

Carnerud, D. (2018), "25 years of quality management research – outlines and trends Daniel", *International Journal of Quality and Reliability Management*, Vol. 35 No. 1, pp. 208-231.

Chen, C.-Y., Chen, P.-C. and Chen, P.-Y. (2014), "Teaching quality in higher education: an introductory review on a process-oriented teaching-quality model", *Total Quality Management and Business Excellence*, Vol. 25 Nos 1-2, pp. 36-56.

Chen, I.-S., Chen, J.K. and Padró, F.F. (2017), "Critical quality indicators of higher education", *Total Quality Management and Business Excellence*, Taylor & Francis, Vol. 28 Nos 1-2, pp. 130-146.

Chua, C. (2004), "Perception of quality in higher education", *Proceedings of the Australian Universities Quality Forum*, Australian Universities Quality Agency, Melbourne.

Dobrzański, L.A. and Roszak, M.T. (2008), "Implementation and functioning of quality management in the research centre", *Journal of Achievements in Materials and Manufacturing Engineering*, Vol. 30 No. 2, pp. 197-203.

Dwaikat, N.Y., Money, A.H., Behashti, H.M. and Salehi-Sangari, E. (2018), "How does information sharing affect first-tier suppliers' flexibility? Evidence from the automotive industry in Sweden", *Production Planning and Control*, Vol. 29 No. 4, doi: 10.1080/09537287.2017.1420261.

Eggert, A. and Serdaroglu, M. (2011), "Exploring the impact of sales Technology on salesperson performance: a task-base d approach", *Journal of Marketing Theory and Practice*, Routledge, Vol. 19 No. 2, pp. 169-186.

El-Morsy, A., Shafeek, H., Alshehri, A. and Gutub, S.A. (2014), "Implementation of quality management system by utilizing ISO 9001:2008 model in the emerging faculties", *Life Science Journal*, Vol. 11 No. 8, pp. 119-125.

Fairweather, J.S. and Brown, D.F. (1991), "Dimensions of academic program quality", *The Review of Higher Education*, Vol. 14 No. 2, pp. 155-176.

Fornell, C. and Larcker, D.F. (1981), "Evaluating structural equation models with unobservable variables and measurement error", *Journal of Marketing Research*, Vol. 18 No. 1, pp. 39-50.

Galeeva, R.B. (2016), "SERVQUAL application and adaptation for educational service quality assessments in Russian higher education", *Quality Assurance in Education*, Vol. 24 No. 3, pp. 329-348.

Gerged, A. and Elheddad, M. (2020), "How can national governance affect education quality in Western Europe?", *International Journal of Sustainability in Higher Education*, Vol. 21 No. 3, pp. 413-426.

Hale, A., Archambault, L. and Wenrick, L. (2020), "Lessons from within: redesigning higher education", *Development and Learning in Organizations*, Vol. 34 No. 2, pp. 37-40.

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. and Tatham, R. (2009), *Multivariate Data Analysis: A Global Perspective*, 7th ed., Prentice Hall, Upper Saddle River.

Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011), "PLS-SEM: indeed a silver bullet", *The Journal of Marketing Theory and Practice*, Vol. 19 No. 2, pp. 139-151.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling (PSL-SEM)*, 2nd ed., SAGE Publications, Thousand Oaks, CA.

Hanover Research (2012), *Best Practices in*, Academic Program Review, WA, DC.

Hauptman Komotar, M. (2020), "Discourses on quality and quality assurance in higher education from the perspective of global university rankings", *Quality Assurance in Education*, Vol. 28 No. 1, pp. 78-88.

Henseler, J. and Sarstedt, M. (2013), "Goodness-of-fit indices for partial least squares path modeling", *Computational Statistics*, Vol. 28 No. 2, pp. 565-580.

Henseler, J., Ringle, C.M. and Sarstedt, M. (2015), "A new criterion for assessing discriminant validity in variance-based structural equation modeling", *Journal of the Academy of Marketing Science*, Vol. 43 No. 1, pp. 115-135.

Jenicke, L.O., Kumar, A. and Holmes, M.C. (2008), "A framework for applying six sigma improvement methodology in an academic environment", *The TQM Journal*, Vol. 20 No. 5, pp. 453-462.

Langstrand, J., Cronemyr, P. and Poksinska, B. (2015), "Practise what you preach: quality of education in education on quality", *Total Quality Management and Business Excellence*, Vol. 26 Nos 11-2, pp. 1202-1212.

Ludwikowska, K. (2019), "Teacher competence inventory: an empirical study on future-oriented competences of the teaching profession in higher education in India", *Education and Training*, Vol. 61 No. 9, pp. 1123-1137.

Mohammed, D., Chan, E., Ahmad, R., Dusic, A., Boglarsky, C., Blessinger, P. and Zeine, R. (2019), "Health implications of job-related stress, motivation and satisfaction in higher education faculty and administrators", *Journal of Applied Research in Higher Education*. doi: 10.1108/JARHE-04-2018-0056.

Parasuraman, A.Z. and Berry, L.L. (1988), "Servqual: a multiple-item scale for measuring customer perceptions of service quality", *Journal of Retailing*, Vol. 64 No. 1, pp. 12-40.

Prakash, G. (2018), "Quality in higher education institutions: insights from the literature", *The TQM Journal*, Vol. 30 No. 6, pp. 732-748.

Ringle, C.M., Wende, S. and Becker, J.-M. (2015), "SmartPLS 3", Hamburg, available at: http://www.smartpls.com.

Sammalisto, K. and Arvidsson, K. (2005), "Environmental management in Swedish higher education: directives, driving forces, hindrances, environmental aspects and environmental co-ordinators in Swedish universities", *International Journal of Sustainability in Higher Education*, Vol. 6 No. 1, pp. 18-35.

Skolnik, M.L. (2016), "How do quality assurance systems accommodate the differences between academic and applied higher education ?", *Higher Education*, Springer Netherlands, Vol. 71 No. 3, pp. 361-378.

Srikanthan, G. and Dalrymple, J. (2002), "Developing a holistic model for quality in higher education", *Quality in Higher Education*, Vol. 8 No. 3, pp. 215-224.

Steinberg, M. (2002), "Involve Me and I will understand': academic quality in experiential programs Abroad", *Frontiers: The Interdisciplinary Journal of Study Abroa*, (Special Issue), pp. 207-229.

Svensson, G., Ferro, C., Høgevold, N., Padin, C., Carlos Sosa Varela, J. and Sarstedt, M. (2018), "Framing the triple bottom line approach: direct and mediation effects between economic, social and environmental elements", *Journal of Cleaner Production*, Elsevier, Vol. 197, pp. 972-991.

Tasopoulou, K. and Tsiotras, G. (2017), "Benchmarking towards excellence in higher education", *Benchmarking: An International Journal*, Vol. 24 No. 3, pp. 352-367.

Tatto, M.T. (2006), "Education reform and the global regulation of teachers' education, development and work: a cross-cultural analysis", *International Journal of Educational Research*, Vol. 45 Nos 4-5, pp. 231-241.

Teeroovengadum, V., Nunkoo, R., Gronroos, C., Kamalanabhan, T.J. and Seebaluck, A.K. (2019), "Higher education service quality, student satisfaction and loyalty: validating the HESQUAL scale and testing an improved structural model", *Quality Assurance in Education*, Vol. 27 No. 4, pp. 427-445.

Teixeira, J., Amoroso, J. and Gresham, J. (2017), "Why education infrastructure matters for learning", available at: https://blogs.worldbank.org/education/why-education-infrastructure-matters-learning.

Weckenmann, A., Akkasoglu, G. and Werner, T. (2015), "Quality management – history and trend", *The TQM Journal*, Vol. 27 No. 3, pp. 281-293.

Wibisono, E. (2018), "The new management system ISO 21001:2018: what and why educational organizations should adopt it", *Proceeding of 11th International Seminar on Industrial Engineering and Management*, Vol. 53, pp. 66-73.

Wilkins, S. (2020), "The positioning and competitive strategies of higher education institutions in the United Arab Emirates", *International Journal of Educational Management*, Vol. 34 No. 1, pp. 139-153.

Wong, J., Baars, M., Davis, D., Van Der Zee, T., Houben, G.J. and Paas, F. (2019), "Supporting self-regulated learning in online learning environments and MOOCs: a systematic review", *International Journal of Human-Computer Interaction*, Taylor & Francis, Vol. 35 Nos 4-5, pp. 356-373.

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