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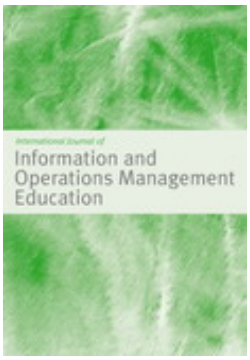

International Journal of Information and Operations Management Education

ISSN online: 1744-2311 - ISSN print: 1744-2303
https://www.inderscience.com/ijiome

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DOI: 10.1504/IJIOME.2022.10051624

Article History:
Received: 22 February 2022
Accepted: 14 September 2022
Published online: 06 March 2024

An integrated framework for the alignment of stakeholder expectations with student learning outcomes

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Abstract: In this paper, two hypothetical frameworks are proposed through the application of quality function deployment (QFD) to integrate the current institutional level and program level student learning focus areas with the relevant institutional and program specific stakeholder expectations. A generic skillset proficiency expected of all the graduating students at the institutional level by the stakeholders is considered in the first QFD application example and a program specific knowledge proficiency expected at the program level by the stakeholders is considered in the second QFD application example. Operations management major/option is considered for illustration purposes at the program level. In addition, an assurance of learning based approach rooted in continuous improvement philosophy is proposed to align the stakeholder expectations with the relevant student learning outcomes at different learning tiers.

Keywords: stakeholder expectations; student learning; quality function deployment; QFD; assurance of learning; AoL; operations management.

Reference to this paper should be made as follows: Vanteddu, G. (2024) 'An integrated framework for the alignment of stakeholder expectations with student learning outcomes', *Int. J. Information and Operations Management Education*, Vol. 7, No. 3, pp.211–233.

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This paper is a revised and expanded version of a paper entitled 'Alignment of accreditation activities at higher educational institutions for student success' presented at the Decision Sciences Institute (DSI) 2019 Annual Conference, New Orleans, LA, 23–25 November 2019; and 'An assurance of learning (AOL) based approach for meeting stakeholder expectations' presented at the Decision Sciences Institute (DSI) 2018 Annual Conference, Chicago, IL, 17–19 November 2018.

1 Introduction

With decreasing enrolments, progressive reductions in state appropriations, it is becoming imperative for tertiary education providers to become competitive and win future students based on the quality of the educational program offerings and the value of the graduating students to the society. The focus of higher educational institutions has shifted from teaching methodology assessment to student learning assessment for measuring the quality of education (Hill, 2012). Anis et al. (2014) emphasise the importance of quality education not only to indicate the ability of a higher educational institution to provide tertiary education but also to serve as an instrument for driving the nation's economic growth. In the context of increasing scrutiny, and funding reductions, Nwosu and Koller (2014) emphasise the higher educational institutions' ability to be adaptive to the dynamic environment while also being accountable.

In addition to the internal stakeholders primarily consisting of students, faculty and staff, external stakeholders such as the local communities, state and federal governing agencies, employers, accrediting bodies, alumni also expect improved educational outcomes and accountability. Baer (2017) emphasises increasing stakeholder expectations of higher educational institutions from the student, state and federal perspectives. Employers are getting more concerned about the student preparedness to succeed and thrive in the global work environment (Humphreys and Gaston, 2015). As a result of all these increased expectations, it is becoming imperative for higher educational institutions to assess and document institutional effectiveness to their stakeholders (Owsley, 2009). Improved retention and graduation rates, percentage employed within one year of graduation, earning potential, and employment readiness are some of the key performance metrics higher educational institutions typically focus upon. However, the quality of student learning as measured through the appropriate student learning outcomes and their direct or indirect alignment with the stakeholder expectations would ultimately determine the stakeholder satisfaction with the educational outcomes of a higher educational institution.

Even though there is substantial literature related to topics such as course design (O'Shea and Hurriyet, 2018), teaching strategies (Dew et al., 2016), learning outcome assessment/improvement (Ohia, 2011; Alshanqiti et al., 2020) among others, student learning assessment research that holistically considers all the aspects of designing, managing, and improving student learning outcomes at different levels of a higher education institution (for example, at institutional, program, course levels) consistent with stakeholder expectations in a single integrated framework is still lacking. Accreditation bodies such as AACSB (for business education) and university accreditation bodies such as the higher learning commission (HLC) increasingly expect

to see the evidence of student learning, which serves as an added incentive for educational institutions to seamlessly integrate stakeholder expectations with student learning outcomes to demonstrate the effectiveness of the imparted education. It is hoped that the proposed integrated framework in this research would go at least some way in achieving the alignment of stakeholder expectations with student learning outcomes.

The rest of the manuscript is organised as follows. In Section 2, literature review is presented and in Section 3, an integrated research framework with illustrative examples is proposed for the alignment of stakeholder expectations with the institutional and program level focus areas. In Section 4, an assurance of learning (AoL) based framework is presented and last but not the least conclusions and future research directions are presented in Section 5.

2 Literature review

At the apex of a higher educational institution, university mission, vision and the relevant institutional learning focus areas need to be informed by the appropriate internal and external stakeholder inputs. In the absence of such alignment and one-to-one connectivity, it may not be possible for a higher learning institution to develop programs and processes that truly reflect the stakeholder expectations and it will also deprive the universities to continuously improve their educational offerings. In this context, appropriate student learning outcomes' development and assessment is gaining increasing importance across the academic landscape. Global trends in higher education have shifted from teacher-centred models to learning-based models that emphasise students' knowledge and skills (Tam, 2014).

To meet and exceed the identified stakeholder expectations in a satisfactory way, a higher educational institution needs to identify the relevant student learning outcomes at the institutional and program levels, develop the appropriate student learning outcomes at the course level, undertake appropriate course design/assessment activities, and put in place an AoL based framework to continuously monitor and improve student learning assessment activities. Even though the existing literature touches upon different individual aspects at depth, research literature that connects all these aspects in a single model/framework seems to be lacking. In the remainder of this section, an effort has been made to briefly present prominent streams of research relevant to student learning. Importance of stakeholder expectations in an academic setting, alignment of student learning outcomes at different tiers, course learning outcomes/assessment, application of new learning methods and student engagement are some of the important research streams briefly reviewed below.

Increasing pressure from the internal and external stakeholders on educational outcomes is creating an academic environment, wherein it is becoming imperative for tertiary education providers to demonstrate the graduate worthiness based on the quality of education they have received. Ikenberry (2015) refers to changing student needs and preferences, pressure from stakeholders to improve persistence and graduation rates, critical and less forgiving public attitude, academic competition, mostly flat or decreasing postsecondary enrolments and more importantly the faltering economic model that sustained the higher education in previous decades as some of the major changes affecting the higher educational arena. According to McClellan (2016), student learning assessment provides a way for higher educational institutions to demonstrate

accountability to government, accreditors and public, while at the same time also helps institutions to improve teaching and learning processes and consequently student achievement. Circa et al. (2021) in their research highlight the importance of stakeholder expectations for universities for their survival and for gaining social legitimacy. Particularly in the context of accounting study programs, authors emphasise the need to adjust the study programs taking into consideration stakeholder requirements and expectations. The QFD based model proposed in Sub-section 3.2 for the alignment of program specific stakeholder expectations with the program learning focus areas is similar in spirit to the research presented in Circa et al. (2021) but the research scope is relatively broader, which also includes institutional learning focus areas. Shams (2017) emphasises understanding the significance of stakeholder relationships in the context of applying the total quality management principles in higher education systems. For the alignment of stakeholder expectations with the student learning goals of a higher educational institution, it is essential to understand and prioritise stakeholder expectations and their relevance to student learning focus areas at different levels (institutional level, program level, etc.). At the more granular level, student learning focus areas at a particular level need to be linked to the specific learning outcomes such as the institutional learning outcomes (ILO), program learning outcomes (PLO), and course learning outcomes (CLO).

Lack of alignment of the ILOs with the PLOs and the CLOs in the lower tiers of a higher educational institution is another issue that hinders accurate data collection and the adoption of appropriate corrective actions for closing the loop to provide AoL at all the learning tiers in a higher educational institution. Rhodes (2012) emphasises the importance of directly connecting the student learning measures to curriculum and co-curriculum as opposed to simply collecting readily available data and reporting on a limited set of institutional and programmatic student learning measures. PLOs typically developed at the college level by taking into account program specific accreditation requirements such as AACSB, ABET guidelines et cetera., though typically will have a broad association with the ILOs at the institutional level, they more often than not lack a one-to-one relationship thereby making it difficult to measure the progress uniformly at different learning tiers. Accurate data collection and assessment of learning outcomes at different levels would go a long way in achieving the necessary alignment with the stakeholder expectations. According to Ohia (2011), assessment is essential in documenting the evidence for demonstrating institutional effectiveness. The research presented in this paper has conceptual similarities to the FAMOUS assessment approach (Ohia, 2011) but specifically advocates for the direct inclusion of stakeholder expectations of student learning at different educational tiers through quality function deployment (QFD). McGourty et al. (1998) in their research provide an overview of a comprehensive assessment program aligned with ABET engineering criteria 2000, for measuring, developing and improving student learning outcomes. Using rank correlations, Sandmaung and Ba Khang (2013) in their research made an attempt to understand and develop quality assurance indicators for higher educational institutions in Thailand by considering student, teaching /managerial staff, and employer quality expectations. Their analyses revealed that the most significant stakeholder expectations did not find a place in the Office of Higher Education Commission (OHEC) list and several measures used by OHEC were not perceived to be important by the stakeholders. By directly aligning stakeholder expectations at institutional and program levels of a higher educational institution through QFD this research avoids the pitfalls highlighted

by Sandmaung and Ba Khang (2013) in their research. In a similar context, to identify curricular deficiencies and possible solutions, Sealy et al. (2013) in their research used survey and focus group discussion approaches to explore stakeholders' views regarding the performance of pharmacy graduates after joining the workforce. In the context of stakeholder needs and expectations alignment, Vitale et al. (2020) in their research propose a systematic framework extending the traditional constructive alignment model to facilitate curriculum development, implementation and assurance decision making.

Once the student learning outcomes at the institutional and program levels are determined they need to be mapped on to the relevant CLO through appropriate curricular mappings. In this context, Alshanqiti et al. (2020) in their research investigate effective curricular mapping rules and propose a rule-based algorithm for student learning outcome-course mappings. Alshanqiti et al. (2020) in their research focus on the key aspect of student learning outcome-course mappings at the granular level whereas the integrated framework proposed in this research is relatively much broader in scope and strategic in nature. Abate et al. (2003) in their research emphasise the importance of the well-defined student learning outcomes, relevant educational plans for the achievement of the student learning outcomes, and the appropriate learning outcome assessment strategies. Scheffel et al. (2014) in their research propose a framework of quality indicators to standardise the evaluation and for measuring the impact of learning analytics tools on educational practices. Dew et al. (2016) present a theoretical framework to achieve learning outcomes and academic skills at the unit level and to understand their contribution to course and graduate learning outcomes, whereas research presented in this paper follows a top down approach linking ILO, PLO and CLO in that order while taking into consideration appropriate stakeholder expectations relevant to student learning. Hubball and Burt (2007) in their research recommend the integration of institutional and programmatic strategies for the enhancement of the implementation of the program-level learning outcomes in undergraduate curriculum. The proposed integrated framework, which advocates for the alignment of institutional, program and course level learning outcomes to some extent, addresses the recommendation of Hubball and Burt (2007).

In the context of improving student learning, research is abundant in the areas of the application of new learning methods, course design, enhancing engagement and the usage of new technologies. To just give a few examples, Francis and Shannon (2013) based on their case study based research advocate the use of blended learning and assessment in engineering (architectural), design and architecture courses for improved student satisfaction. In the context of rapidly changing industry and labour market demands, O'Shea and Hurriyet (2018) emphasise the importance of continuous innovation in curriculum design and practice in their research. Sustaining student engagement is another aspect, which may be beneficial in improving student learning. Lawrence et al. (2019) through their research indicate that using nudging templates/principles increases student engagement in their courses. Also, Panigrahi et al. (2021) in their research investigate the role of student engagement on perceived learning effectiveness in the context of e-learning. In a related context, McDonald et al. (2020) research optimally effective teaching methods for improving the tech-savvy generation student learning. The use of interactive response systems such as clickers is shown to positively influence overall course performance and the comprehension of subject matter knowledge (Yazici, 2016). Even though course design (O'Shea and Hurriyet, 2018), student engagement (Panigrahi et al., 2021) et cetera., are important aspects in the context of student learning

at the granular level, they are not considered explicitly in this research to be consistent with the strategic focus emphasised in the proposed integrated framework.

Even though the importance of the stakeholder expectations has been broadly recognised in the literature, prioritising those expectations for the development of actionable steps has not attracted much attention. By proposing a QFD model to prioritise the student learning focus areas at the institutional and program levels based on the stakeholder expectations this research makes a small contribution in that area. Also, in spite of the existence of research literature on the importance of learning outcomes at different tiers as described in the previous paragraphs and case study-based literature for the improvement of student learning outcomes at a particular tier there is no overarching framework that not only connects the stakeholder expectations to student learning outcomes but also has an AoL component for continuous improvement of student learning outcomes at different tiers. The proposed framework in this research attempts to address this research gap to some extent.

3 An integrated framework for the alignment of stakeholder expectations

As emphasised in the previous section, it is important to align the stakeholder expectations with the student learning outcomes at different tiers of a higher educational institution on a dynamic basis. Stakeholder expectations based on their importance should inform the prioritisation of the institutional/program level student learning focus areas, which in turn will facilitate the development of appropriate ILOs/PLOs at the granular level. In this section, a QFD based approach is presented to align and prioritise institutional and program learning focus areas with the stakeholder expectations.

QFD chart also known as the House of Quality (Hauser and Clausing, 1988) is typically used in manufacturing and service industries to translate customer expectations into relevant design specifications to truly reflect the 'voice of the customer'. QFD chart is one of the foremost tools used to prioritise the 'voice of the customer' in new product and service development. For a thorough review of the QFD tool and the relevant literature review, reader may refer to Chan and Wu (2002a, 2002b) and Chan and Wu (2005). In the context of QFD for quality service design, readers may also refer to Ermer and Kniper (1998).

QFD has been used in a variety of contexts in higher education as well. For example, Kelesbayev et al. (2016) used the QFD methodology to know if the educational service offerings are aligned with the needs and expectations of students in a university setting. To facilitate improved strategic planning for educational institutions, Raharjo et al. (2007) used analytic hierarchy process (AHP) in conjunction with a QFD framework to prioritise the needs and expectations of internal stakeholders (students and faculty) and external stakeholders (employers). Singh and Rawani (2019) in their research used QFD methodology to prioritise National Board of Accreditation quality parameters in engineering education to align them with the students' needs and expectations. However, research that specifically investigates the relationship between the stakeholder expectations and the relevant student learning focus areas/student learning outcomes at a given tier of a higher educational institution either through the application of a QFD or otherwise has not attracted much attention.

In this research, QFD based frameworks are proposed that consider relevant stakeholder expectations at the institutional and program levels to align them with the

existing institutional and program level focus areas to not only prioritise the student learning focus areas that need more attention but also to identify new focus areas for proper alignment based on the importance attached to the specific stakeholder expectations and the extent to which they are currently satisfied by a higher educational institution. The QFD application for aligning the stakeholder expectations with the institutional learning focus areas is discussed in Sub-section 3.1, and the alignment of the stakeholder expectations with the program learning focus areas is discussed in Sub-section 3.2. Models proposed in Sub-sections 3.1 and 3.2 are analogous to the original QFD models typically used in manufacturing and service industries in the sense that the stakeholders assume the role of *customers* and the identification of student learning focus areas/outcomes at different tiers is similar to the development of *design specifications*.

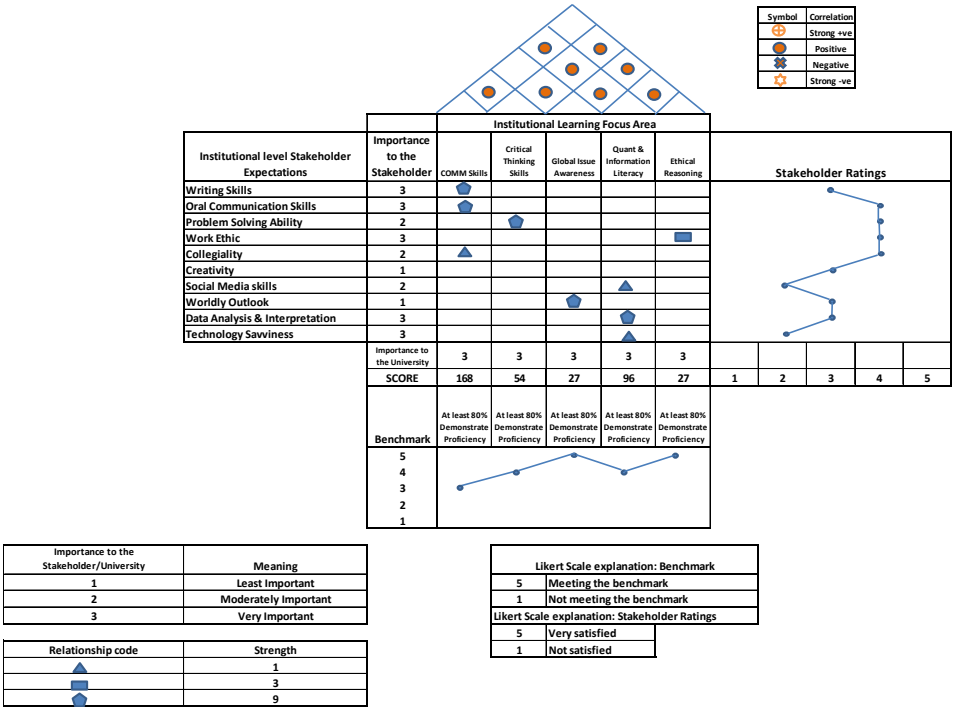
3.1 Alignment of stakeholder expectations with the institutional learning focus areas

3.1.1 Weighted score calculations for institutional learning focus areas

Please refer to the illustrative example in Figure 1 for the application of QFD to align the stakeholder expectations at the institutional level. Since there could be significant differences among different higher educational institutions in how specific measurable learning outcomes are structured at a particular level for a given focus area (for example, critical thinking skills), student learning focus areas are primarily considered in this hypothetical example to reduce the complexity and to encourage the adoption of the proposed framework among tertiary education providers.

Stakeholder expectations and their relative importance (1, 2, 3 on Likert scale) are listed on the left-hand side of the QFD relationship matrix as shown in Figure 1 in this explanatory example. Stakeholder ratings (1, 2, 3, 4, 5 on Likert scale) of the higher educational institution on different stakeholder expectations are indicated to the right of the relationship matrix. Stakeholder expectations/ratings data is typically collected with planned survey instruments and questionnaires communicated to different stakeholder groups prior to undertaking the task of aligning and prioritising the institutional level focus areas. Current institutional learning focus areas are listed above the relationship matrix in the centre of the chart and the relative strengths of association (1, 3, 9) between the stakeholder expectations and the institutional learning focus areas are indicated by different symbols in the relationship matrix. Relative strengths are subjective and should be decided upon by carefully assessing the strength of association between a given stakeholder expectation and a corresponding institutional learning focus area. Relative importance of the institutional learning focus areas as perceived by the higher educational institution (1, 2, 3 on Likert scale) and the perceived degree of benchmark level performance achievement from the institutional perspective (1, 2, 3, 4, 5 on Likert scale) are indicated at the bottom of the relationship matrix. A relative importance of 3 for all the institutional learning focus areas (as shown in the QFD chart) is indicative of equal and high importance attached to all the institutional learning focus areas. However, if there are any priorities among the institutional learning focus areas from the institutional perspective, appropriate higher/lower ratings (on the Likert scale) could be utilised in the relative importance ratings.

Figure 1 Alignment of stakeholder expectations with the institutional learning focus areas (see online version for colours)



To prioritise the existing institutional learning focus areas and to assess their adequacy based on stakeholder expectations, a weighted score is calculated for each of the institutional learning focus areas. Weighted score is calculated by the following equation as proposed by Vanteddu and McAllister (2014) in their QFD based model for healthcare process improvement.

The weighted score for a specific institutional learning focus area j is given by:

$$\sum_{i=1}^{m} x_i y_j z_{ij} \forall j$$

x_i = relative importance of the i^{th} stakeholder expectation from the stakeholder perspective

y_j = relative importance of the j^{th} institutional learning focus area from the institutional perspective

z_{ij} = perceived strength of relationship, between the i^{th} stakeholder expectation and the j^{th} institutional learning focus area.

$i = 1, \ldots, m$: stakeholder expectation index number

$j = 1, \ldots, n$: institutional learning focus area index number.

For example, weighted score for the institutional learning focus area *communication skills* (*COMM Skills*) is calculated as follows. *COMM Skills* is related to three stakeholder expectations, namely, *writing skills*, *oral communication skills* and *collegiality*.

$$\begin{aligned} \textit{Weighted score for COMM Skills} = & \begin{pmatrix} \textit{Stakeholder rating for Writing Skills} \\ \textit{*University rating for COMM Skills} \\ \textit{*Relationship strength between} \\ \textit{Writing Skills and COMM Skills} \end{pmatrix} \\ & + \begin{pmatrix} \textit{Stakeholder rating for Oral} \\ \textit{Communication Skills} \\ \textit{*University rating for COMM Skills} \\ \textit{*Relationship strength between Oral} \\ \textit{Communication Skills and COMM} \\ \textit{Skills} \end{pmatrix} \\ & + \begin{pmatrix} \textit{Stakeholder rating for Collegiality} \\ \textit{*University rating for COMM Skills} \\ \textit{*Relationship strength between} \\ \textit{Collegiality and COMM Skills} \end{pmatrix}. \end{aligned}$$

$$\textit{Weighted score for COMM Skills} = (3*3*9) + (3*3*9) + (2*3*1) = 168.$$

Likewise, it can be seen that the weighted scores are 96, 54, 27 & 27 for the institutional learning focus areas *quant & information literacy*, *critical thinking skills*, *global issue awareness* and *ethical reasoning* respectively.

3.1.2 Prioritisation and alignment of institutional learning focus areas

High weighted scores indicate that prioritising *COMM Skills* and *Quant & Information Literacy* for focused improvement would result in charting a more efficient path toward meeting stakeholder expectations. However, attention should also be paid to the perceived degree of benchmark level performance achievement from the institutional perspective and the stakeholder rankings of the higher educational institution on different stakeholder expectations for aligning and prioritising the institutional learning focus areas with the stakeholder expectations.

Observing that there is no institutional learning focus area associated with the stakeholder expectation *Creativity* and that there are 4 stakeholder expectations, namely, *Work Ethic, Collegiality, Social Media Skills* and *Technology Savviness* none of which have a maximum relative strength of association of 9 with any of the current institutional learning focus areas indicate the necessity to modify the existing set of institutional learning focus areas to more accurately reflect stakeholder expectations at the institutional level. Perceived degree of benchmark level performance achievement of 3 for the institutional learning focus area *COMM Skills* and the stakeholder assigned ratings of 3 and 4 for the closely related stakeholder expectations of *Writing Skills* and *Oral Communication Skills* considered together with the highest weighted score of 168 for *COMM Skills* indicate the necessity of assigning high priority to develop plans to closely

monitor and improve this institutional learning focus area by providing the necessary resources, improving data collection and assessment methodologies at the lower tiers of student learning as appropriate. Appropriate ILOs for the *COMM Skills* focus area will need to be developed and also curricular maps for the measurement of these ILOs at the Program and course levels through the development of corresponding PLOs and CLOs will also need to be undertaken at this stage. Since, a majority of the ILOs (for all the focus areas at the institutional level) are typically assessed through a variety of general education courses, required for all the programs, curriculum maps for ILO assessment can be developed independently of the program specific learning outcomes.

Perceived degree of benchmark level performance achievement of 4 on the institutional learning focus area *Quant & Information Literacy* and the stakeholder assigned ratings of 2 on *Social Media Skills* and *Technology Savviness* and 3 on *Data Analysis and Interpretation* for the related stakeholder expectations indicate a possible misalignment of this institutional learning focus area with the relevant stakeholder expectations. This calls for a detailed review/revision of the focus area content and the relevant ILOs, PLOs and CLOs at all the levels of student learning. This information from the QFD chart coupled with the second highest weighted score of 96 for *Quant & Information Literacy* focus area indicate to the necessity of assigning priority to develop the necessary action plans to continuously monitor and improve this focus area by providing the necessary resources at all the downstream institutional tiers of student learning.

Perceived degree of benchmark level performance achievement of 4 on the institutional learning focus area *Critical Thinking Skills* and the stakeholder assigned rating of 4 for the closely related stakeholder expectation *Problem-Solving Ability* indicate to the good progress made on this institutional learning focus area. Considering the third highest weighted score of 54 for this institutional learning focus area, going forward, it would be a good idea to retain and continuously improve the current data collection and assessment methodologies for the ILOs, PLOs and CLOs at the institutional, program, and course levels of student learning.

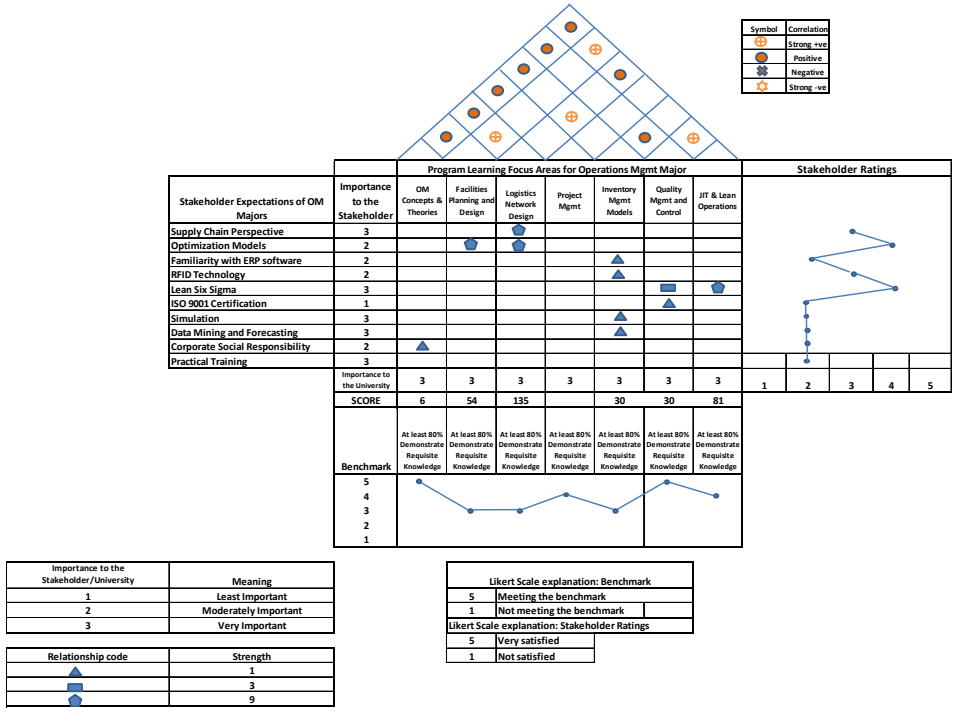
Perceived degree of benchmark level performance achievement of 5 on the institutional learning focus area *Global Issue Awareness* and the stakeholder assigned rating of 3 for the closely related stakeholder expectation *Worldly Outlook* indicate to the possible misalignment of what is expected and what is measured for the appropriate learning outcomes at all the tiers of student learning. Considering the weighted score of 27, it may be a good idea to identify the specific elements of the stakeholder expectation *Worldly Outlook* by conducting additional stakeholder surveys for facilitating the revision of the focus area content, relevant ILOs, PLOs and CLOs at lower tiers of student learning for better alignment.

Perceived degree of benchmark level performance achievement of 5 on the institutional learning focus area *Ethical Reasoning* and the stakeholder assigned rating of 4 for the closely related stakeholder expectation *Work Ethic* indicate to the reasonable progress made on this institutional learning focus area. Taking into consideration the weighted score of 27, it would be a good idea to retain and continuously improve the current data collection and assessment processes at all the tiers of student learning for this focus area. However, it may also be important in this case to explore the specific elements of *Work Ethic* from the stakeholder perspective for better alignment with the institutional learning focus area.

Once the institutional learning focus areas are finalised and finetuned based on the above explanatory analysis and the relevant ILOs, PLOs, CLOs are in place, student performance can be measured and improved in a uniform way at all the tiers of learning consistent with the stakeholder expectations. It may be important to maintain the uniformity of PLOs at the program level to the extent possible for facilitating inter program comparisons. Also, standardisation of the general education courses (at the course level) and the various tests of proficiency (for writing proficiency, listening skills, critical thinking evaluation etc.) may facilitate the synchronisation and improvement of the assessment processes at different programs within a higher learning institution.

3.2 Alignment of program specific stakeholder expectations with the program learning focus areas

Figure 2 Alignment of stakeholder expectations with the program learning focus areas (see online version for colours)



Symbol	Correlation
⊕	Strong +ve
●	Positive
✖	Negative
✡	Strong -ve

Stakeholder Expectations of OM Majors	Importance to the Stakeholder	Program Learning Focus Areas for Operations Mgmt Major: OM Concepts & Theories	Facilities Planning and Design	Logistics Network Design	Project Mgmt	Inventory Mgmt Models	Quality Mgmt and Control	JIT & Lean Operations
Supply Chain Perspective	3			●				
Optimization Models	2		⬟	●				
Familiarity with ERP software	2					▲		
RFID Technology	2					▲		
Lean Six Sigma	3						▬	⬟
ISO 9001 Certification	1						▲	
Simulation	3					▲		
Data Mining and Forecasting	3					▲		
Corporate Social Responsibility	2	▲						
Practical Training	3							
Importance to the University		3	3	3	3	3	3	3
SCORE		6	54	135		30	30	81
Benchmark		At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge	At least 80% Demonstrate Requisite Knowledge

Stakeholder Ratings: 1 2 3 4 5

Importance to the Stakeholder/University	Meaning
1	Least Important
2	Moderately Important
3	Very Important

Relationship code	Strength
▲	1
▬	3
⬟	9

Likert Scale explanation: Benchmark	
5	Meeting the benchmark
1	Not meeting the benchmark
Likert Scale explanation: Stakeholder Ratings	
5	Very satisfied
1	Not satisfied

3.2.1 Weighted score calculations for program learning focus areas

In addition to aligning the institutional level stakeholder expectations with the institutional learning focus areas through relevant ILOs, PLOs, and CLOs it is also important to align program specific stakeholder expectations pertaining to a specific major with the relevant program level focus areas, PLOs and CLOs. In this sub-section, an illustrative example is presented for the alignment of stakeholder expectations of operations management (OM) majors with the relevant program level focus areas.

In this sub-section, we extend the application QFD tool for aligning the program specific stakeholder expectations with the existing program level focus areas for OM majors for identifying the deficiencies and also to facilitate the prioritisation of the focus areas for continuous improvement. In this illustrative example, for OM majors at the undergraduate (UG) level, program specific expectations related data from the relevant stakeholders such as employers, alumni, industry advisory groups, chambers of commerce can be collected with planned survey instruments, focus group studies, questionnaires et cetera, designed in an open-ended format. Summarised stakeholder expectations are then compared with the existing OM program focus areas for alignment and prioritisation. Program specific focus areas and the relevant PLOs are different from the common PLOs (typically general education related competencies) adopted across all the programs, which are aligned with the ILOs and the relevant institutional level focus areas as described in the previous sub-section.

Stakeholder expectations of graduating OM majors along with their relative importance (1, 2, 3 on Likert scale) are listed on the left-hand side of the relationship matrix as shown in Figure 2 in this illustrative example. Current OM program focus areas are listed at the top of the relationship matrix on the QFD chart and the relative strength of association (1, 3, 9) is indicated by different symbols in the relationship matrix. Relative strengths are subjective and should be decided upon by carefully assessing the strength of association between a given stakeholder expectation and a corresponding program learning focus area. Relative importance of the OM Program focus areas as perceived by the program housing academic unit (1, 2, 3 on Likert scale) and the extent of benchmark level performance achievement (1, 2, 3, 4, 5 on Likert scale) are indicated at the bottom of the relationship matrix. A relative importance of 3 for all the program level focus areas is indicative of equal and high importance attached to all the focus areas. However, if there are any priorities attached to the program level focus areas by the relevant academic unit, appropriate higher/lower ratings (on the Likert scale) could be utilised. Stakeholder ratings (1, 2, 3, 4, 5 on the Likert scale) of the program housing academic unit on different stakeholder expectations are indicated to the right of the relationship matrix in Figure 2.

As explained in the previous subsection, the weighted score for a specific program learning focus area *j* is given by:

$$\sum_{i=1}^{m} x_i y_j z_{ij} \forall j$$

For example, weighted score for the program learning focus area *Logistics Network Design* is calculated as (3*3*9) + (2*3*9) = 135. Weighted scores for all the other program level focus areas calculated in a similar fashion are indicated below the relationship matrix in Figure 2.

3.2.2 Prioritisation and alignment of program learning focus areas

Observing that there is no program learning focus area associated with the stakeholder expectation *Practical Training* it indicates to the necessity of making student internships and/or other real-world experiential opportunities as key graduating requirements for better alignment with the stakeholder expectations. Also, it can be seen that there are six stakeholder expectations, namely, *Familiarity with ERP (enterprise resource planning)*

software, RFID Technology, ISO 9001 Certification, Simulation, Data Mining & Forecasting and *Corporate Social Responsibility* none of which have a maximum relative strength of association of 9 with any of the current program level learning focus areas. This indicates to a significant misalignment between the stakeholder expectations and the program emphasis areas. Some of these stakeholder expectations, which are not adequately represented by the existing set of program learning focus areas can be included as additional independent focus areas or combined with one or more of the current program focus areas. For example, *familiarity with ERP software* and *RFID Technology* can be included as new topics in the current curriculum for *Inventory Mgmt Models* and/or *JIT & Lean Operations* focus areas because of the broad intersection of the body of knowledge among these topics. Likewise, *ISO 9001 certification* body of knowledge can be included as a new topic in the curriculum for the current program focus area of *Quality Mgmt and Control*. Observing that the current program focus area of OM Concepts and Theories has just a weak association with just one of the stakeholder expectations, it could be strengthened by the inclusion of a broader coverage of the *corporate social responsibility* topic. Also, noticing that the *Project Mgmt* focus area currently has no association with any of the stakeholder expectations, emphasis on this may be gradually reduced, while at the same time, *simulation* and *data mining & forecasting* topics can be introduced as new program focus areas for a better alignment with the stakeholder expectations.

Perceived degree of benchmark level performance achievement of 3 on the program learning focus area *logistics network design* and the stakeholder assigned ratings of 3 and 4 for the closely related stakeholder expectations of *supply chain perspective* and *optimisation models* considered together with the highest weighted score of 135 for the program learning focus area *logistics network design* indicate the necessity of assigning high priority to develop the appropriate PLOs for this focus area consistent with stakeholder expectations. Relevant CLOs also need to be developed and aligned with all the PLOs at this stage. In addition, effective data collection and assessment procedures need to be designed for improving the performance on this program level learning focus area. CLO data collection should facilitate the identification of individual topics/modules that majority of students are struggling with for developing the appropriate corrective action plans for improved student learning at the course level, which in turn will influence the performance at the PLO level. Improved performance on the *logistics network design* program learning focus area would also positively influence the performance on the program learning focus areas *Inventory Mgmt Models, Facilities Planning and Design, JIT & Lean Operations* and *OM Concepts & Theories* because of their positive association in the subject matter content as indicated in the crown/top portion of the QFD chart.

Perceived degree of benchmark level achievement of 4 on the program learning focus area *JIT & Lean Operations* and the stakeholder assigned rating of 4 for the closely related stakeholder expectation of *Lean Six Sigma* expertise considered together with the second highest weighted score of 81 indicate to the necessity of developing the relevant PLOs for this focus area better aligned with the stakeholder expectations. Relevant CLOs at the course level also need to be developed and aligned with all the PLOs at this stage to facilitate effective data collection and assessment for improving the performance on the CLOs and consequently on the PLOs relevant to this focus area. CLO data collection should facilitate the identification of individual topics/modules that majority of students are struggling with for developing targeted corrective action plans for improved student

learning. Improved performance on the *JIT & Lean Operations* program learning focus area would also positively influence the performance on the program learning focus areas *Facilities Planning and Design*, *Quality Mgmt & Control*, *Logistics Network Design* and *OM Concepts & Theories* because of their positive association in the subject matter content as indicated at the top the QFD chart.

Perceived degree of benchmark level achievement of 3 on the program learning focus area *facilities planning and design* and the stakeholder assigned rating of 4 for the closely related stakeholder expectation of *optimisation models* considered together with the third highest weighted score of 54 indicate to the necessity of developing the relevant PLOs for this focus area better aligned with the relevant stakeholder expectations. Relevant CLOs at the course level also need to be developed and aligned with all the PLOs for this focus area to facilitate effective data collection and assessment for improving the performance on the CLOs and consequently on the PLOs. CLO data collection should also facilitate the development of targeted corrective action plans for improved student learning. Improved performance on the *facilities planning and design* program learning focus area would also positively influence the performance on the program learning focus areas *Logistics Network Design*, *JIT & Lean Operations* and *OM Concepts & Theories* because of their positive association in the subject matter content as indicated at the top the QFD chart.

Assessed/estimated degree of benchmark level performance achievement of 5 on the program learning focus area *Quality Mgmt & Control* and the stakeholder assigned ratings of 4 and 2 for the closely related stakeholder expectations of *Lean Six Sigma* and *ISO 9001 Certification* considered together with the weighted score of 30 indicate to the misalignment among the focus area concentration and the stakeholder expectations. Particularly this points to strengthening the focus area body of knowledge with the ISO 9001 certification related content as appropriate. After strengthening the focus area to improve the alignment with the relevant stakeholder expectations appropriate PLOs should be developed at the program level and CLOs at the course level. Properly aligned PLOs and CLOs would facilitate the reliable assessment of student learning consistent with stakeholder expectations. Improved performance on the *Quality Mgmt & Control* program learning focus area would also positively influence the performance on the program learning focus areas *JIT & Lean Operations, Inventory Mgmt Models* and *OM Concepts & Theories* because of their positive association in the subject matter content as indicated at the top the QFD chart.

Assessed degree of benchmark level performance achievement of 3 on the program learning focus area *Inventory Mgmt Models* and the stakeholder assigned ratings of 3 on *RFID Technology* and 2 on *Familiarity with ERP Software*, *Simulation*, *Data Mining and Forecasting* taken together with the weighted score of 30 indicate to the misalignment among the focus area concentration and the stakeholder expectations. Particularly this points to strengthening the focus area content with business analytics content as appropriate or new focus area(s) could be developed consistent with stakeholder expectations. After strengthening the focus area to improve the alignment with the relevant stakeholder expectations appropriate PLOs should be developed at the program level and CLOs at the course level. Properly aligned PLOs and CLOs would facilitate the reliable assessment of student learning consistent with stakeholder expectations. Improved performance on the *Inventory Mgmt Models* program learning focus area would also positively influence the performance on the program learning focus areas *Logistics Network Design, Quality Mgmt & Control* and *OM Concepts & Theories*

because of their positive association in the subject matter content as indicated at the top the QFD chart.

Program learning focus area *OM Concepts & Theories* because of its weak relationship with just one of the stakeholder expectations need to be strengthened significantly to have a strong association with at least one stakeholder expectation or eliminating this focus area and redistributing the content among other focus areas may also be considered. At that stage PLOs and relevant CLOs can be developed for aligning learning outcomes consistent with stakeholder expectations.

The proposed frameworks in Sub-sections 3.1 and 3.2 are flexible enough to accommodate dynamic stakeholder expectations and the relevant student learning focus areas at different tiers of a higher educational institution. For example, changing stakeholder expectations due to unforeseen events such as Covid 19 could be accommodated easily by collecting new data and then the relevant student learning outcomes can be developed/modified accordingly.

4 An AoL framework for the integration of stakeholder expectations

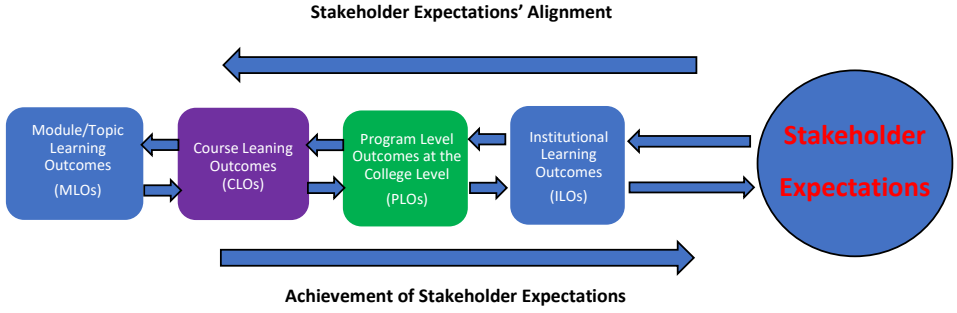
Once the institutional learning focus areas are determined, corresponding measurable ILOs are developed. Consequently, corresponding PLOs could be finalised taking into consideration ILOs and the relevant program specific focus areas followed by the finalisation CLOs at the course level. In this section, an AoL framework based on the continuous improvement philosophy is proposed for the alignment of learning outcomes at different tiers in an institutional setting consistent with the stakeholder expectations (Figure 3). Stakeholder expectations are typically transmitted top down from the institutional level to the course level and the achievement of those expectations is tracked from the course level to the program and institution levels as typically student learning outcomes are assessed primarily at the course /program levels and the relevant data will be combined to monitor the progress of achievement of stakeholder expectations at the program/institutional levels.

For seamless interconnectivity between the stakeholder expectations and learning outcomes at different tiers in an institutional setting, there should be clearly established relationships/pathways between the ILOs, PLOs and CLOs at the interface of each set of learning outcomes (such as ILO to PLO interface, PLO to CLO interface, et cetera). Relevant processes, outcome measurements, data analyses and corrective actions at each tier of the learning assessment should be clearly defined so that stakeholders can be assured of the achievement of learning outcomes and also to provide assurance that the relevant processes are continuously improved upon.

It is important to have information symmetry regarding the processes, data collections sources, and the relevant analyses among all the stages at which learning outcomes are assessed. Absence of information symmetry among learning outcomes at different levels will lead to duplication of effort and the wastage of precious academic resources. For example, goals and objectives related to general education (typically, communication skills, ethical reasoning, quantitative and information literacy, global citizenry, et cetera) though tend to be the key components of institutional and program level outcomes, lack of information symmetry between the institutional and program level processes leads to different measures, methods, samples being used to measure the same thing , which may lead to *different* at best and *misleading* at worst conclusions. A unified set of processes

with interconnectivity properly established among different learning outcomes at the university, college and course level would facilitate the accurate assessment of the learning outcomes and also aid with the development of appropriate improvement actions. Even though the interconnectivity could be extended to module/topic level beyond the course level (Figure 3), it is being limited only up to the course level in this research.

Figure 3 Alignment of student learning outcomes with stakeholder expectations (see online version for colours)



Properly established interconnectivity among ILOs/PLOs/CLOs will ensure the transmittal of stakeholder expectations faithfully from ILOs to PLOs and CLOs. Also, the degree of attainment of CLOs will indicate to the degree of attainment of relevant PLOs at the program/college level, which in turn will indicate to the degree of attainment of relevant ILOs at the university level. As part of the continuous improvement strategy, corrective/improvement actions planned at the institution level based on the degree of satisfaction of the individual ILOs will influence the planning and execution of the relevant processes at the program and course levels.

4.1 ILO-PLO alignment for AoL

AoL at different levels can be demonstrated by adopting a 'closing the loop' strategy rooted in continuous improvement philosophy such as a Plan-Do-Check-Act (PDCA) cycle (Shewhart, 1939; Deming, 1986). For example, once the ILOs are finalised consistent with the stakeholder expectations (*plan* step), establishing interconnectivity between each ILO and the relevant PLOs would constitute the 'Do' step of the PDCA cycle (Figure 4). Implementing relevant ILO achievement strategies such as providing the necessary resources, developing and standardising the necessary data collection procedures at all the levels of learning outcome monitoring et cetera would constitute some of the key components of the 'Do' step. Direct assessment of performance on ILOs for which data is collected at the institution level (such as student retention rate, graduation rate, etc.) and the indirect assessment of performance on ILOs for which data is collected at the program and course levels (such as communication skills, quantitative literacy among others) would constitute the 'check' step. And, finally data analyses on the achievement of ILOs, comparing the current performance data to benchmark measures (such as for the relevant peer level institutions and/or aspirant level institutions), identification of the causes for poor performance on one or more of the ILOs, and the development of the necessary improvement strategies for closing the loop

would constitute the 'Act' step. Planned improvement strategies adopted would be incorporated into the next round of PDCA cycle for the fine tuning and continuous improvement of the ILOs.

Figure 4 ILO – PLO Alignment

4.2 PLO-CLO alignment for AoL

At the program level, ILOs and the program specific learning outcomes based on the relevant stakeholder expectations would guide the development of the PLOs under the 'Plan' step (Figure 5). For example, for a college of business, PLOs in addition to focusing upon the general skills such as communication skills, ethical reasoning et cetera., which would be typically common to all the other programs would also focus upon program specific learning outcomes based on the major/option. Providing the necessary resources for the achievement of PLOs, ensuring interconnectivity between the PLOs and CLOs such that each CLO is connected to at least one PLO and vice versa, determining data collection methods, frequencies and maintaining data repositories among others constitute the key elements of the 'Do' step. Assessment of the PLO data based on the compilation of the course level outcomes that are both internal and external to a specific program (for example, *communication skills* may be assessed based on the performance in a course outside of the program), exit exams, proficiency demonstration tests et cetera, and comparing the assessment outcomes to established benchmarks constitute the 'Check' step. Finally, data analyses of PLO assessment data, identification of the causes for poor performance on one or more of the PLOs, and the development of

the necessary corrective action strategies for closing the loop would constitute the 'Act' step.

Figure 5 PLO - CLO alignment

4.3 CLO assessment and improvement

At the course level, during the 'Plan' step, relevant discipline faculty would determine the CLOs to ensure they faithfully demonstrate the mastery of the course content and also are compatible with the relevant PLOs (Figure 6). This is primarily accomplished through a thorough evaluation of course design and by establishing one to one connectivity between the CLOs and the relevant course modules. Development of necessary learning outcome measurement rubrics would also be undertaken during the 'plan' step. During the 'do' step, emphasis will be on class related learning activities depending on the mode of delivery (such as face to face, online, and hybrid modes) as part of the course content delivery strategy. Also, students will be provided all the necessary resources to master the course content during this step. Student performance will be assessed on the relevant CLOs during the 'check' step and detailed data will be collected on the performance of individual students who are struggling with the mastery of the material and the topics majority of the students are struggling with. Based on the assessment data collected during the 'check' step, appropriate corrective action strategies will be developed to improve the performance on identified CLOs during the 'act' step. Typical corrective actions may include increasing the number of hours dedicated to a topic, provision of

additional learning resources, improving the instructor accessibility to students among others.

Figure 6 CLO assessment and improvement

4.4 Student learning outcomes' revision strategy

To align the ILOs, PLOs and CLOs with dynamic stakeholder expectations and to make proactive changes to student learning improvement strategies, learning outcomes at different tiers should be reviewed periodically to make necessary revisions (Table 1). For example, ILOs being strategic in nature and are closely associated with the mission of the university, they should be reviewed on a relatively longer time horizon such as once in every 5–6 years. To keep different programs dynamic and to cater to the constantly changing needs of the employers and other stakeholders, PLOs ideally should be reviewed once in every 3–4 years. At the course level, to take advantage of the changes in the body of knowledge as relevant to the course content, it would be ideal to review CLOs once in every 1–2 years. Module learning outcomes, if they exist, should be reviewed every 1–2 semesters to consider potential changes in the emphasis and method of teaching as related to individual topics in a specific course. It is of importance to remember that no matter what specific revision timelines are followed for different learning outcomes it is necessary to synchronise the reviews at different tiers for better interconnectivity and alignment.

Table 1 Student learning outcomes' revision timelines

Learning outcomes	*Revision frequency*	*Inputs*
Institutional learning outcomes	5–6 years	Internal and external stakeholder expectations
Program learning outcomes	3–4 years	ILOs and stakeholder expectations that are unique to the program
Course learning outcomes	1–2 years	PLOs and changes in the relevant body of knowledge
Module learning outcomes	1–2 semesters	CLOs and changes in emphasis and method of teaching

5 Conclusions

Higher educational institutions are increasingly expected to be more accountable and provide an AoL to their internal and external stakeholders. Understanding and satisfying customer expectations has been the mantra in manufacturing and service sectors in the past few decades for surviving and succeeding in the present-day global markets. Likewise, it has become important in higher educational institutions to translate stakeholder expectations to achievable learning outcomes at institutional, program and course levels. Lack of proper alignment between the stakeholder expectations and learning outcomes adopted at different tiers in a higher educational institution leads to misallocation of resources, inaccurate measurement of progress on learning outcomes at different levels, duplication of work, and ineffective learning outcome improvement strategies.

As explained previously, even though there is a significant amount of research available on individual aspects largely related to student learning such as stakeholder expectations (Circa et al., 2021; Sandmaung and Ba Khang, 2013), course design (O'Shea and Hurriyet, 2018), teaching strategies (Dew et al., 2016), learning outcome assessment/improvement (Ohia, 2011; Alshanqiti et al., 2020) among others, literature that connects all the aspects in a single integrated/holistic model seems to be lacking. An attempt has been made in this research to present an overarching framework that connects stakeholder expectations with learning outcomes at all the tiers in a higher educational institution. In addition, an AoL framework is presented to continuously monitor and improve student learning assessment related activities at different tiers. The proposed model is flexible enough to accommodate different contexts/programs covering a wide variety of student learning outcomes to align with the relevant stakeholder expectations.

In this research, taking into consideration stakeholder expectations, an integrated framework for the alignment and improvement of student learning focus areas and the corresponding learning outcomes at different tiers in a higher educational institution is proposed. In this research, a QFD based approach is proposed with an illustrative example for the alignment and prioritisation of the institutional level learning focus areas with stakeholder expectations. Even though institutional focus areas and consequently the relevant ILOs influence the determination of the program learning focus areas and the relevant PLOs as related to the general educational learning skill set expected of all the students, it is important to consider the stakeholder expectations unique to a major/option within a program. To address this issue, a second QFD based model is proposed for the

alignment of stakeholder expectations of Operations Management majors with the relevant program learning focus areas and also to determine the relative importance of those focus areas for prioritising the improvement efforts.

After the identification of the key institutional and program level focus areas (for a specific major) it is important to develop specific measurable learning outcomes at different tiers and to connect them seamlessly to assure the stakeholders of the achievement of expected learning outcomes. To this end, an AoL based approach is proposed for developing and continuously improving ILOs, PLOs and CLOs at the institutional, program, and course levels and also to establish adequate interconnectivity among them to streamline data collection, assessment and improvement activities.

The hypothetical research framework proposed in this research is a holistic attempt to integrate stakeholder expectations with the student learning outcomes at the institutional, program and course levels in a higher educational institution to provide assurance of the achievement of student learning outcomes. However, taking into consideration the fact that each higher educational institution's academic environment is unique the proposed generic framework could be tweaked in line with the specific characteristics of a tertiary education provider. It is hoped that the proposed framework is utilised by the tertiary education providers not only to make stakeholder expectations an integral aspect of the student learning process but also to provide an AoL mechanism to measure, improve, monitor and report on the progress made in meeting the student learning related goals and objectives.

Even though the alignment of the student learning focus areas at the institutional and program levels with the stakeholder expectations is the primary focus in this research, future researchers may consider specific measurable learning outcomes instead, if the number of learning outcomes is manageable. This may facilitate direct interconnectivity with the relevant stakeholder expectations and save the additional step of developing the measurable learning outcomes from the learning focus areas. Strategic goals and objectives as typically highlighted in a higher educational institution mission and vision statements are not explicitly considered in this research. Future researchers may address this shortcoming by mapping such goals and objectives as espoused in the university mission and vision statements with the other identified institutional level stakeholder expectations. AoL framework presented in this research for the integration of learning outcomes at different tiers with the stakeholder expectations can be extended by future researchers with the provision of detailed steps at the ILO-PLO & PLO-CLO alignment interfaces for a specific major/option considered along with the relevant course curricula. It is also hoped that the integrated framework presented in this research is used and critically examined for its usefulness and flexibility in a variety of higher education institutional settings.

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