The Innovation Capabilities Model in Higher Education Institutions: A Conceptual Framework

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Abstract. Education 4.0 signifies the progression where Higher Education Institutions (HEIs) adopt innovative education for enhanced learning. HEIs, as learning entities are crucial for a nation's success driving innovation. This article introduces factors boosting HEIs' innovation capabilities, shaped by Total Quality Management (TQM). By reviewing relevant literature, critical factors aligning with TQM principles were revealed: leadership management commitment, people management, student focus, continuous improvement, stakeholder focus, recognition and reward, and vision. In essence, Education 4.0 calls for HEIs to embark on a transformative path, integrating innovative educational practices. The conceptual model proposed in this article offers a framework for HEIs to strengthen their innovation ecosystem, furthering their role as learning organizations. This model can serve as a springboard for future advancements in HEIs' innovation capabilities and shape the educational landscape with more research. Additionally, this study also served as the foundation for empirical analysis and could be a fundamental basis of ideas for the introduction of critical factors involved in the innovation capabilities model for HEIs.

Keywords: Education 4.0, Higher Education Institutions, Innovation Capabilities, Total Quality Management.

1 Introduction

Quality management is described as a holistic management concept that increases all activities of an organization via continuous improvement and organizational transformation [1]. The execution of TQM principles in an organization will enhance its performance and expand the potential for organizational excellence [2].

On this premise, and in accordance with the demand of the organization's current quality performance assessment, TQM practices, and their applications have been involved in various range of sectors, such as in small and medium enterprises (SMEs) [6], TQM in food and beverages (F&B) industries [7-9], TQM in hospitals [10-12] and

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any other services institutions. TQM had brought successful achievements in various sectors previously. Therefore, the success of TQM in the industrial sector encouraged attempts to use TQM in the higher education sector.

The education sector is working to modernize itself by incorporating new technological, theoretical, and practical knowledge into the fields, especially in the wake of the Covid-19 pandemic. Every educational institution must endeavour to succeed in a competitive environment brought about by the expansion of knowledge and educational standards across all sectors. Thus, the TQM concepts pertinent to every part of the innovative performance in academic management, learning, and administration activities will be applied in this research.

Following the introduction of the topic in this paper, a clarification of the research underpinning theory will be further discussed in the second section which includes the implementation of TQM in HEIs. The research framework of this paper will be further elucidated in the next section and subsequently explicate the development of conceptual model in the following section. The elaboration of the research framework will cover the TQM linkage with innovation capabilities and dimensions in TQM.

2 Research Underpinning Theory

2.1 Implementation of TQM in HEIs

TQM has been adopted by a large number of businesses across the globe, but its implementation in non-profit organizations, such as HEI presents more obstacles and challenges than it does in business organizations. In higher education, top management, senior administrators, and faculty/staff are the main TQM proponents [13]. TQM in HEIs is a procedure wherein the institutions apply a comprehensive quality approach to the environment and all aspects of the academic process [14]. Yahiaoui et al [15] also stated one of the most effective strategic alternatives for raising the standard of higher education is TQM. The importance of TQM in HEIs is vital in enhancing the performance of institutions, including innovation capabilities. Findings from Long et al [16]; Sirisan et al [17]; Wu and Gu [18] revealed that TQM had a positive influence on innovation capabilities. However, there is uncertainty in determining of TQM success factor, notably in HEIs. The success and applicability of TQM principles in education have received varied reviews in previous papers. Therefore, the necessity to review of the TQM principles in HEIs is required.

TQM consists of multiple dimensions to be applied in HEIs such as quality management and leadership, institute productivity, and control and measurement of processes and staff interaction [18]. A research from Asif et al [19], the enablers found in TQM that were adopted in Pakistan universities for improving organizational performance are leadership, vision, measurement and analysis, process control and evaluation, program design and resource allocation, and stakeholder focus. Furthermore, Alrashed et al [20] identified the enablers in TQM for measuring performance at university, and the results have shown that continuous improvement, education and training, and quality of work life significantly affect performance measurement, while

resources and teamwork significantly not supported explaining performance measurement. Notarjacomo et al [21] stated the pillars of TQM in HEIs for distance learning considered in their study are leadership, students, staff, technological resources, and continuous improvement. Next, for the TQM measure in Filipino, HEIs was found to be adopted by top-management commitment, teaching and learning delivery modes, college facilities, system and process management, customer satisfaction, and linkage [22]. While Al Jabri and Nadarajah [23] posited the element in TQM in HEIs comprising of top management support, student focus, continuous improvement, and employee involvement.

In a nutshell, the list of the enablers described by works of literature in TQM for HEIs is summarized in Table 1.

Table 1. Enabler of principles for TQM in HEIs.

Authors	Enablers
Wu and Gu [18]	• Quality management and leadership • Institute productivity • Control and measurement of process • Staff interaction
Asif et al [19]	• Leadership • Vision • Measurement and analysis • Process control and evaluation • Program design and resource allocation • Stakeholder Focus
Alrashed et al [20]	• Continuous Improvement • Education and Training • Quality of Work Life
Notarjacomo et al [21]	• Leadership • Students • Staff • Technological resources • Continuous improvement
Cabacang [22]	• Top-management commitment • Teaching and Learning Delivery modes • College facilities • System and process management • Customer satisfaction • Linkage
Al Jabri and Nadarajah [23]	• Top management support • Student Focus • Continuous improvement • Employee involvement

3 Research Framework

Figure 1 describes the flow of this research which begin with examining the path association by classifying the enablers for TQM from literature reviews, and the linkage TQM to Innovation capabilities that provide to the university performance level. The linkage in between the TQM and innovation capabilities described in the next section.

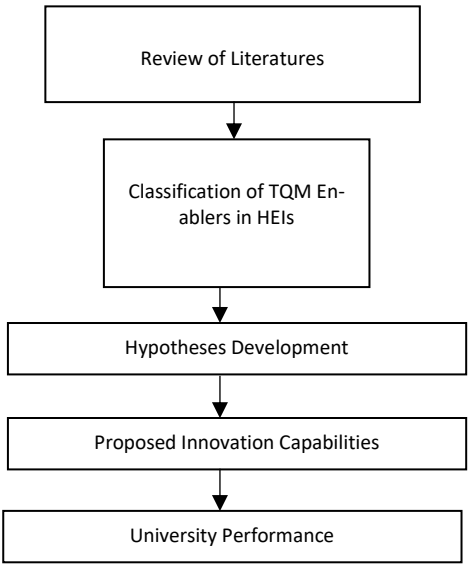

Fig 1. Research framework.

4 TQM Linkage with Innovation Capabilities

Organizations now rely on innovation performance to achieve a competitive advantage and maintain their market position. Al Jabri and Nadarajah [23] posited, implementing quality management to boost innovation performance and obtain a competitive edge is challenging for higher education institutions. As a result, the number of research examining innovation capability as a source of competitiveness for organizations has risen tremendously due to the increasing attention paid to it.

The function of TQM as a foundation for innovation has also been examined by several researchers. The use of TQM methods is essential for enhancing organizational performance, but there is still debate on the theoretical basis for the relationship between TQM and innovation [24]. Several studies have revealed the findings that TQM significantly influences innovation performance [16,18,23-26]. In contrast, Mahmud et al [27] indicated that TQM had an insignificant impact on innovation performance.

The primary goals of TQM and innovation capabilities are to increase customer satisfaction and gain a competitive advantage. Without innovation, organizations will suffer to compete successfully [28]. Therefore, the goal of this study is to provide a

conceptual framework for higher education that would enhance innovation capabilities by elevating quality management practices.

5 Dimensions in TQM

An enabler would represent in many terms commonly extract the vagueness of determination for a category type. Table 2 shows various TQM enablers from some illustrative examples with the proposed enablers classification.

Table 2. A comparative study of the enablers of TQM in HEIs.

Asif et al [19]	Al Jabri and Nadarajah [23]	Cabacang [22]	Notarjacomo et al [21]	Alrashed et al [20]	Wu and Gu [18]	Proposed Enablers Classification
Leadership	Top management support	Top-management commitment	Leadership		Quality management and leadership	Leadership management commitment
	Employee involvement		Staff		Staff interaction	People management
	Student Focus	Customer satisfaction	Students			Student Focus
Stakeholder Focus		Linkage				Other stakeholder focus
Measurement and analysis + Program design and resource allocation + Process control and evaluation	Continuous improvement	Teaching and Learning Delivery modes + College facilities + System and process management	Technological resources + Continuous improvement	Continuous Improvement + Education and Training + Quality of Work Life	Institute productivity + Control and measurement of process	Quality system improvement + Recognition and reward
Vision						Vision

6 Development of Conceptual Model

6.1 Leadership Management towards Innovation Capabilities

Leadership is crucial for promoting innovation in higher education. Leaders can adopt strategies of fostering a culture of learning, communicating the importance of innovation, and practicing transformational leadership. According to Texeira-Quiros et al [29] employee training and development programs, professional growth opportunities, staff involvement, and continual improvement can enhance leadership. While, McLaughlin and McLaughlin [30] emphasize that understanding individuals' attitudes towards innovation is important in developing structured innovation capabilities through training and organizational leadership. Effective communication and inclusive practices such as promoting diversity, open communication, trust-building, and empathy can lead to new and innovative teaching methods and research initiatives [31]. Furthermore, transformational leadership is a successful leadership style in higher education that motivates individuals to work together towards a common goal by aligning their values with the institution's mission and vision. This leadership style encourages collaboration and teamwork, as demonstrated in a recent study by Gui et al [32]. Theng et al [33] highlighted the effectiveness of transformational leadership in bringing positive changes to institutions, while Calen et al [34] emphasized its importance in promoting work innovation capabilities during the Covid-19 pandemic. Lathong et al [35] suggest that promoting knowledge sharing among employees is an effective strategy for transformational leaders. According to Lei et al [36], transformational leadership positively affects innovation capability, mediated by self-efficacy and optimism, with self-efficacy having a stronger impact than optimism.

Thus, these led to the formation of the following assertion of alternative hypothesis:

H1: Leadership management commitment has influence on innovation capabilities.

6.2 People Management towards Innovation Capabilities

People management towards innovation capabilities in higher education is an important aspect of ensuring that HEIs can continue to drive progress and make important contributions to society. Effective TQM practices have a significant positive relationship with people management [16]. Staff involvement is also highlighted as important for successful TQM implementation, leading to motivated, committed, and involved employees who contribute to continuous improvement [37]. According to Jin et al [38]; OECD [39], individuals with the right skills and talents working effectively are important to maximize creativity and implement projects successfully. Besides that, effective people management in an institution is essential for maintaining high levels of professionalism and creating a positive work environment [40], which can lead to successful project implementation and sustainable business performance [41]. A study by Khurniawan et al [42], found that quality teaching staff plays a vital role in successful TQM implementation in vocational schools by fostering high commitment and teamwork. Furthermore,

In TQM, employee involvement and participative management are essential for continuous business improvement and enhanced productivity. All members of the organization must display total commitment to quality management, and managers and workers should collaborate as partners in the innovative quality revolution [43].

Hence, this led to the development of following alternative hypothesized statement:

H2: People management has influence on innovation capabilities.

6.3 Student Focus towards Innovation Capabilities

TQM focuses on continuous improvement, innovation, and customer satisfaction, with students as the main "customers" [38,44]. One way that TQM principles are used in higher education is through the implementation of quality assurance processes. These processes are used to ensure that educational programs meet established standards and that students are receiving a high-quality education [45]. Quality assurance processes can include regular assessments of curriculum, teaching methods, and student learning outcomes. A study by Krakhmalova [46] suggests that developing the innovative potential of young people by integrating education, science, and practice aligns with TQM's objectives of continuous improvement, innovation, and customer satisfaction, particularly in a student-centered approach, which is key to achieving high-quality learning outcomes. In team projects, Usher and Barak [47] stress the importance of team diversity, especially in online learning environments. In order to develop innovation capabilities among students, Setiawan et al [48] found that Information Technology (IT) adoption and IT usage are important for success in hybrid learning environment. Collaboration between universities and industry is also essential to bridge the gap between students' skills and industry needs, as highlighted by Ellitan & Mulia [49]. Furthermore, universities can nurture students' social entrepreneurial intentions, with government support for related initiatives [50].

Therefore, the following alternative hypothesized propositions are put forward:

H3: Student focus has influence on innovation capabilities.

6.4 Continuous Improvement towards Innovation Capabilities

Previous study by [51] discussed that continuous improvement is needed in all areas of the institutional work in order remain competitive with the changes in the internal and external environment. Study by Munazza and Sobia [52] discussed that in ensuring a continuous improvement towards achieving innovation capabilities, the employees of university which is the mainstay should be knowledgeable, skilled, have positive attitude and very determined to their work. This can be achieved by having a training system for developing their skills with respect to customers' needs. Besides, Abdullah Al-Melham and Abdullah Al-Subaie [53] mentioned that universities can encourage innovation activities by establishing innovation centers and providing conducive working environment and enough resource to their innovators. This statement is aligned with a study by Krasovskiy et al [54] who mentioned that in order to practice innovation in the university, an innovative environment is very necessary, taking care all the func-

tioning units such as research, the professionals, infrastructures and the necessary funding. An innovative environment will enable for more possibilities for innovative activities to take place. These activities are of few stages before a good end product (in a shape of products, services or processes) can be seen. The stages are first the pre-innovation activities where organizations' staffs are aware of the need for innovations and universities has the technology resources to carry out the innovation. Next, is the stage of carrying out the research and scientific works. Finally, the stage of implementing, designing and disseminating the end product of the innovation [54]. A very good example of innovation by a private university in India is discussed by Aithal and Kumar [55], where they mentioned that the university is practicing continuous improvement in the areas of designing the course and planning its curriculum, in their teaching and learning process, research activities, providing good consultations and extension, providing good infrastructure and learning resources, taking care of the student support and progression, maintaining a good governance, leadership & management and finally also providing a good social service & support.

Thus, based on the arguments and literatures discussed above, the following set of alternativehypotheses are postulated as follows:

H4: Continuous improvement has influence on innovation capabilities.

6.5 Other Stakeholder Focus towards Innovation Capabilities

Study by Santoso et al [56] emphasized that improving skills of universities lecturers' innovation capabilities should not only depend on the internal process of universities, rather should include the ideas from all possible parties, such as government, local communities and collaborations with other educational institutes. Universities can also collaborate with industry to especially gain funding which is needed to commercialize their products [57]. According to Tseng et al [58], universities are seen as the major source of knowledge creation and industries nowadays are recognizing the importance of scientific knowledge creation and cooperating with the universities to not only enhance their knowledge but also to gain a competitive advantage in their industry. These are seen as a plus point factor for universities' innovations. Collaborating with the industries do cause the strategies of universities to be influenced by these industries, which is normally located in the same region as the university [59]. This is not seen as wrong however, as besides students, stakeholders of a university also consist of its employees, society, governing bodies and others [60]. Thus, it is important for the universities to recognize and work in the directions aligned with the needs of all these stakeholders. This need also has been emphasized to always be monitored and updated whenever is required [61]. Besides, Aleixo et al [62] also were aligned with this concept and suggested that HEIs should not only work solely to develop innovations but also to partnership with other bodies such as the government organizations, customers and research partners itself. It is believed that, the path and directions of a university towards its desired future will be clearer when there is strong cooperation between universities and its collaborators [63].

Hence, this led to the development of following alternative hypothesized statement:

H5: Other stakeholder focus has influence on innovation capabilities.

6.6 Recognition and Reward towards Innovation Capabilities

Recognition and Rewards is one of the factors to ensure the implementation of TQM to be successful, ensuring the quality performance of a higher learning institute. Recognition can be seen as way of appreciating the contribution of the employees to the well-being of the organizational and this aspect cannot be neglected. Timely recognition and appreciation through several ways should be practiced, where promotions and awards are seen as the suitable way of rewarding them [64]. Study by Zhang [65] discussed that a regular and transparent procedure is needed in order to measure the performance level of the employees and a suitable selection criteria is very much needed for the reward list. Thus, it is recommended that HEIs' staffs themselves to be also involved in the selection process for the fore mentioned reward lists [61]. Recognition and Rewards were also found to enhance more success of knowledge management through the university-industry collaborations (UIC), creating more new innovations. An incentive mechanism such as pay increase; bonuses or promotion is found to enhance more success of knowledge management through the collaborations. Khadhraoui et al [66]; Lach and Schankerman [67] are also aligned with the above idea. They mentioned that monetary rewards and incentives for UIC activities can bring more successful innovations to the universities. Study by Aithal [68] also mentioned that universities should continuously encourage their employees who have research degrees, working on good reputable research work, consistently securing the teaching and research awards and finally also those who are having international reputation. This was also seen true from the views of researchers too. They mentioned that they feel motivated through recognition and rewards for their success [69]. Researchers are also found to mention that they expect a good mark for their successful innovative activities and it should be rated during promotion criteria [70].

Thus, these led to the formation of the following assertion of alternative hypothesis:

H6: Recognition and reward has influence on innovation capabilities.

6.7 Vision towards Innovation Capabilities

Vision is seen as ambition of the leader on what he wants his organizational, (HEIs in this case) to be in coming future [71]. Through vision that the leaders can bring all the employes to work together and reaching the highest potential of themselves [72]. Previous studies are aligned in concluding that the HEIs' vision to be a factor for its innovation capabilities [73-76]. Previous study by Nadim and Al-Hinai [61] discussed that vision actually also describes the innovative approach applied and the goal of the leaderships of HEIs. Arundel et al [77] also added a strategic vision, developed by good leaderships are mainly aims to supports the innovations in the universities. The innovation process in universities is very much goal-driven and is carried out by creating the infrastructure first, integrating education, science and business in order to develop new technologies, and these is possible only by a team of university staff, students and the higher management who controls the educational process [54]. Study by Păunescu

et al [78] mentioned that many HEIs nowadays are looking into social innovation ecosystem, however the individual vision each of the HEI, defines how the goal is being implemented. According to Aithal [68], HEIs with innovative education model and have proper mission, vision, objectives and core values to execute the plan, are able to create real innovators by creating highly competence students. Ghardashi et al [70] highlighted that one of the results of their interview is the importance of policy sagacity, which is closely related to vision of a university to also consider the environmental conditions and its changes so that it is aligned with its innovation.

Hence, this led to the development of following alternative hypothesized statement:

H7: Vision has influence on innovation capabilities.

6.8 Innovation Capabilities toward University Performance

Universities play as crucial role in innovation ecosystems [79]. Based on the research by Diaconu et al [80], achieving European goals on the development of a smart, sustainable, and inclusive economy is possible through university involvement in partnerships based on mutual interests and benefits in innovative systems where graduates have professional, scientific research, and social skills to integrate quickly and effectively into the labour market and academics value their research capabilities. Almaskari et al [81] been discussed pertaining the development of innovation capabilities in the HEIs and found that adopting strong leadership could impede the innovation development. A study from Adom et al [82], revealed that innovation capabilities within HEIs can foster high team spirits, risk taking, productivity, low resistance to change, competitive advantage, increase market share, increase productivity among staff, growth, and profitability of educational institutions, create loyalty towards the institution's services, and make teaching and learning convenient. All these effects would offer a high standard of performance and provide the quality for HEIs perspectives. Yordanova et al [83] provides a comprehensive picture of the interplay between educational innovations for achieving and improving major issues in universities, as well as the key roles of universities, together with the necessary indicators, bringing innovation performance to a national level. According to Guo [84], the core and fundamental points of innovation and development of colleges are to improve the quality of higher education, deepen the reform of the university education system, and cultivate students with inventive abilities just like in China.

Hence the alternative hypothesis is set as follows:

H8: Innovation capabilities have influence on university performance.

6.9 Research Hypotheses

The TQM perspective serves as the foundation for the conceptual model created for this study. Table 3 provided a summary of the eight hypotheses that were suggested and taken from the works of literature to be represented as alternative hypotheses.

Table 3. List of alternatives hypotheses.

Alternative Hypotheses	
H1:	Leadership management commitment has influence on innovation capabilities
H2:	People management has influence on innovation capabilities
H3:	Student focus has influence on innovation capabilities
H4:	Other stakeholder focus has influence on innovation capabilities
H5:	Quality system improvement has influence on innovation capabilities
H6:	Recognition and reward have influence on innovation capabilities
H7:	Vision has influence on innovation capabilities
H8:	Innovation capabilities have influence on university performance

Therefore, in accordance with the existing literature, all the hypotheses provided substantiating evidence for their corresponding causal relationships.

7 Proposed Conceptual Model

The conceptual model developed for this research as illustrated in Figure 2 is underpinned by the TQM perspective in the context of HEIs. The conceptual model outlines the coordinated interactions between the TQM enablers (leadership management commitment, people management, student focus, other stakeholder focus, quality system improvement, recognition and reward, and vision) toward innovative capabilities. As the association for performance assessment, the university's performance depends on the HEIs' innovation capabilities.

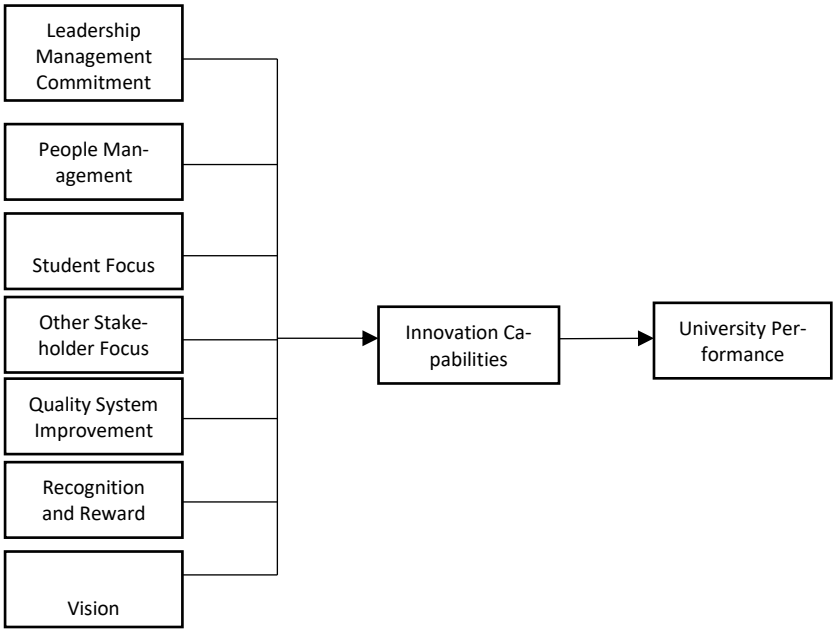

Fig. 2. Proposed conceptual model.

8 Concluding Remarks

TQM is a promising strategic tool for enhancing the quality of higher education and innovation capabilities. In HEIs, TQM involves a comprehensive quality approach to every aspect of the academic process. As in the study by Srinivasu and Anjaneyulu [85], TQM implementation in higher education leads to the optimization of all processes, from teaching to management and support. However, its implementation is more challenging in non-profit organizations like HEIs. To empower innovation capabilities in HEIs with TQM theory, literature reviews are conducted on critical factors that can provide a framework for HEIs such as leadership management commitment, people management, student focus, continuous improvement, other stakeholder focus, recognition and reward, and vision The proposed conceptual model could act as a basis for HEIs to embrace and elevate their innovation capabilities through the variables under study. Furthermore, the performance of HEIs is dependent on their innovation capabilities. HEIs with higher levels of innovation capabilities can enhance their overall performance and provide students with higher-quality education. The implementation of strategic initiatives such as TQM can help HEIs to continually improve their innovation capabilities, which can contribute to producing new and impactful research and attracting top talent. Thus, HEIs must prioritize the implementation of TQM principles to enhance their innovation capabilities and performance.

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