



UNIVERSITI PUTRA MALAYSIA

***AN EXTENDED EUROPEAN FOUNDATION FOR QUALITY
MANAGEMENT EXCELLENCE MODEL FOR QUALITY PERFORMANCE
IN MALAYSIAN HIGHER EDUCATION INSTITUTIONS***

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MANAGEMENT EXCELLENCE MODEL FOR QUALITY
PERFORMANCE IN MALAYSIAN HIGHER EDUCATION
INSTITUTIONS**

By

ROSLI BIN ISMAIL

**Thesis Submitted to the School of Graduate Studies, Universiti
Putra Malaysia, in Fulfilment of the Requirements for the Degree of
Doctor of Philosophy**

August 2016

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

**AN EXTENDED EUROPEAN FOUNDATION FOR QUALITY MANAGEMENT
EXCELLENCE MODEL FOR QUALITY PERFORMANCE IN MALAYSIAN
HIGHER EDUCATION INSTITUTIONS**

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August 2016

Chairman: Masrah Azrifah Azmi Murad, PhD
Faculty: Computer Science and Information Technology

In the recent years, Information Systems (IS) have significantly impacted most organizations and they were widely researched. Subsequently, it is obvious that using IS influences all components, functions and activities of an organization.

In Europe, The European Foundation for Quality Management (EFQM) excellence model was introduced at the beginning of 1992 as the framework for assessing organizations for the European Quality Award. In fact, this model has been claimed to be the most widely used model of the national excellence awards in the European countries. However, despite the supportive role of IS in quality management, it does not exist in EFQM excellence model as an individual criterion.

Hence, this study aimed to extend the EFQM excellence model by integrating the model with Measurement, Analysis and Knowledge Management; and Student, Stakeholder and Market focus factors in Malcolm Baldrige National Quality Award (MBNQA) model to make it more useful and contributory for an implementation in Malaysian Higher Educational Institutions (HEIs). Therefore, the study posed several objectives as follows: Firstly, the study proposed an extended EFQM excellence model by integrating the EFQM excellence model and MBNQA model. Secondly, the study was carried out to evaluate the interrelationships among the extended EFQM excellence model criteria in the Malaysian HEIs. Thirdly, this study was done to determine the effects of information systems on the extended EFQM excellence model in the HEIs of Malaysia.

The extended EFQM excellence model comprised of 11 criteria which included leadership; policy and strategy; people; partnership and resources; student, stakeholder and market focus; measurement, analysis and knowledge management; processes; people results; customer results; society results; and key performance results.

Based on the extended EFQM excellence model, twenty four (24) hypotheses were developed and statistically tested. The study used cross-sectional survey methodology. The samples were drawn from Malaysian HEIs based on the directory in the Ministry of Higher Education (MOHE) of Malaysia's website. The final number of respondents involved in this study was 118 HEIs. The data of the study were analysed by applying Structural Equation Model (SEM).

In brief, the results supported twenty (20) hypotheses while four (4) hypotheses were not supported. And, also, the data supported the impacts of IS on several criteria of the extended EFQM excellence model and this evidenced that both EFQM criteria and IS criterion should be implemented holistically, rather than piecemeal.

Finally, an acceptable level of fitness was achieved. When the fitness of the model is acceptable, it is concluded that not only the theory of EFQM excellence model are supported by the data, but also the integration of the EFQM excellence model with IS has successfully been conducted.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**PENGEMBANGAN MODEL KECEMERLANGAN YAYASAN EROPAH BAGI
PENGURUSAN KUALITI UNTUK PRESTASI KUALITI INSTITUSI
PENGAJIAN TINGGI DI MALAYSIA**

Oleh

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Kebelakangan ini, Sistem Maklumat (SM) telah memberi kesan ketara kepada kebanyakan organisasi dan terdapat juga banyak kajian telah dijalankan secara meluas. Seterusnya, ia jelas menunjukkan bahawa menggunakan SM boleh mempengaruhi komponen, fungsi dan aktiviti dalam organisasi.

Di Eropah, model kecemerlangan Yayasan Eropah bagi Pengurusan Kualiti (YEPK) telah diperkenalkan pada awal tahun 1992 sebagai rangka kerja bagi menilai organisasi untuk anugerah kualiti di Eropah. Bahkan, model ini telah dikatakan menjadi model yang paling banyak digunapakai bagi anugerah kecemerlangan di negara-negara Eropah. Namun begitu, walaupun SM berperanan menyokong dalam pengurusan kualiti, ia tidak wujud dalam model kecemerlangan YEPK sebagai satu kriteria individu yang berasingan.

Sehubungan dengan itu, kajian ini bertujuan untuk mengembangkan model kecemerlangan YEPK dengan mengintegrasikan model YEPK dengan kriteria pengukuran, analisis dan pengurusan pengetahuan; dan pelajar, pihak berkepentingan dan tumpuan pasaran yang terdapat di dalam model Anugerah Kualiti Kebangsaan Malcolm Baldrige (AKKMB) dan menjadikannya lebih berguna serta boleh menyumbang kepada pelaksanaan di Institusi Pengajian Tinggi (IPT) Malaysia. Oleh itu, kajian ini mempunyai beberapa objektif seperti berikut: Pertama, kajian ini telah mencadangkan untuk mengembangkan model kecemerlangan YEPK dengan mengintegrasikan model kecemerlangan YEPK dan model AKKMB; Kedua, kajian telah dijalankan dengan menilai hubungan antara kriteria model pengembangan kecemerlangan YEPK di IPT Malaysia. Dan, ketiga, kajian ini telah menentukan kesan sistem maklumat kepada komponen model pengembangan kecemerlangan YEPK di IPT Malaysia.

Model pengembangan kecemerlangan YEPK dalam kajian ini terdiri daripada 11 kriteria iaitu kepimpinan; dasar dan strategi; pekerja; perkongsian dan sumber; pelajar, pihak berkepentingan dan tumpuan pasaran; pengukuran, analisis dan pengurusan pengetahuan; proses; keputusan pekerja; keputusan pelanggan; keputusan masyarakat; dan keputusan prestasi utama.

Berdasarkan model pengembangan kecemerlangan YEPK, dua puluh empat (24) hipotesis telah dibangunkan dan diuji secara statistik. Metodologi kajian ini menggunakan kajian keratan rentas. Sampel kajian merupakan IPT di Malaysia yang diambil berdasarkan direktori di dalam laman web Kementerian Pengajian Tinggi (KPT) Malaysia. Bilangan akhir responden yang terlibat dalam kajian ini adalah sebanyak 118 IPT. Data kajian ini dianalisis dengan menggunakan Model Persamaan Struktur (MPS).

Secara ringkasnya, keputusan yang diperolehi menunjukkan dua puluh (20) hipotesis disokong dan empat (4) hipotesis tidak disokong, juga data menyokong kesan sistem maklumat kepada beberapa kriteria di dalam model pengembangan kecemerlangan YEPK dan ini membuktikan bahawa kriteria di dalam YEPK dan kriteria SM perlu dilaksanakan secara holistik, dan bukan secara berasingan.

Akhir sekali, tahap kecergasan yang boleh diterima telah dicapai. Apabila kecergasan model telah diperolehi, ia boleh disimpulkan juga bukan sahaja teori model kecemerlangan YEPK disokong oleh data, tetapi juga integrasi model kecemerlangan YEPK dengan SM telah berjaya dijalankan.

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I certify that a Thesis Examination Committee has met on 15 August 2016 to conduct the final examination of Rosli Bin Ismail on his thesis entitled "An Extended European Foundation for Quality Management Excellence Model for Quality Performance in Malaysian Higher Education Institutions" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

AMOS	Analysis Moment of Structures
BSC	Balanced Scorecard
CFA	Confirmatory Factor Analysis
EFQM	European Foundation for Quality Management
EQA	European Quality Award
GOF	Goodness-of-Fit
GOFI	Goodness-of-Fit Index
HEI	Higher Education Institution
IS-QM	Information Systems and Quality Management
KM	Knowledge Management
KPR	Key Performance Results
LD	Leadership
MAKM	Measurement, Analysis and Knowledge Management
MBNQA	Malcolm Baldrige National Quality Award
MOHE	Ministry of Higher Education
NIST	National Institute of Standards and Technology
NQA	National quality awards
PPL	People
PPLR	People results
PR	Partnership and Resources
PRC	Processes
PS	Policy and Strategy
SEM	Structural Equation Modeling
SOR	Society results
SR	Student results
SSMF	Student, Stakeholder and Market focus
TQM	Total Quality Management
UNESCO	United Nations Educational, Scientific and Cultural Organization

CHAPTER 1

INTRODUCTION

1.1 Overview

Globalization has led increasingly competitive environment in higher education institutions (HEIs). To succeed in today's great competition, it is important to improve the performance of HEI to meet an international academic trend and raise overall academic standards and institution's performance.

In response to growing concerns from stakeholders regarding HEI's inconsistent performance, HEIs are increasingly seeking ways to improve education quality (Lawrence and McCollough, 2001). Thus, many higher education institutions have looked at methods from industry to create competitiveness (Chen et al., 2009; Vazzana et al., 1997).

In the field of quality management, the Malcolm Baldrige National Quality Award (MBNQA) in the USA and the European Foundation for Quality Management (EFQM) excellence model in Europe are the most popular awards in this field (Wiele et al., 2000). The MBNQA model, which was modelled on the Deming Prize in Japan, was created by the United States Department of Commerce in 1987 as an evaluation system of best practices and business performance (Bell and Keys, 1998). In 1992, the EFQM launched a European Quality Award (EQA), the model of which is now widely used for the systematic review and measurement of the quality of operations (EFQM, 2012).

1.2 Background

As prime producers of knowledge, Higher Education Institutions (HEIs) have become key institutions in the knowledge-based economy (Reichert, 2006). According to Azman et al. (2010), the HEIs in Malaysia are the main drivers of the knowledge economy and the main producers of quality human capital. Over the past decade, the Malaysian government has placed greater emphasis on improved efficiency and productivity in the higher education sector as an engine for promoting quality human capital for a knowledge-based economy. This sector has undergone some fundamental changes, which have led to its rapid expansion. Importantly, the government raised the share of research and development in GDP from 1.5% in the Eighth Malaysia Plan (2000–2005) to 4.9% in the Ninth Malaysia Plan (2006–2010). The HEIs were the recipients of these national research and development funds (Ministry of Higher Education, 2007). As a result, there is a need to monitor the quality performance of HEIs to see if the government's objectives are being met (Johnes, 2008).

The discussion of “quality” demands a variety of views, the orientations of the different people, things and the way it was defined. The link of quality managements (QMs) and organizational performance is an important issue and difficult to evaluate. Defining the accurate role of QMs and organizational performance is difficult because it covers many areas (Dumond, 1994) and wide subjects (Neely et al., 2005). As Thiagaragan et al., (2001) mentioned that ignoring QM matter is equivalent to lack of success, and the winning strategy in a competitive environment is improvement of QMs in the organization (Lee et al., 2001). Therefore, efforts have to be undertaken to improve the quality managements because organizational performance is centrally based on it.

A general consensus in the literature that QMs affect performance (Martínez-Costa et al., 2009). The bulk of the QMs and organizational performance literature highlighted the favorable results (e.g. Li et al., 2003; Martínez-Lorente, 2007; Saizarbitoria et al. , 2006; Yasin et al., 2004). Specifically, literature reported the improvement in term of financial (Corbett and Montes-Sancho, 2005), quality of product (Noori, 2004), employee involvement (Sacchetti, 2007; White et al., 2009), image (North et al., 1998), quality consciousness (Nwankwo, 2000) and communication (Heras et al., 2002).

However, there have been disagreement reports from the past investigations about how QMs drive to the expected organizational performance outcomes. A large body of previous studies does not give much evidences on how precisely QMs affect organizational performance (Jiménez-Jiménez & Martínez-Costa, 2009; Kumar et al., 2009), and it remains questionable (Jiménez-Jiménez & Martínez-Costa, 2009).

Furthermore, there is no a clear consensus on the comprehensive model for QMs (Antony, 2009; Klefsjö, Bergquist, & Garvare, 2008; Tarí, 2005), and organizations were blurred to adopt the real QMs model in order to avoid its unsatisfied outcomes (El Shenawy, Baker, & Lemak, 2007). At the beginning stages in development of QMs dimension were based on the pioneer quality scholars’ perspective (e.g. Deming, Juran, Crosby, Feigenbaum, Taguchi and Ishikawa). According to Saraph et al., (1989), Sila & Ebrahimpour (2002) were known as the first contributors in suggesting the dimension of QMs based on critical success factors (CSFs). The volume of empirical works in the field of QMs increased after the introduction of these CSFs (Sila & Ebrahimpour, 2002). On the other hand, a number of organizations formulated their QMs dimension based on the key national quality awards (NQAs) criteria (Sila & Ebrahimpour, 2002; Tarí, 2005). By applying these NQAs, previous investigations have examined the relationship between QMs and performance. Unfortunately, there is certainly not a clear consensus on the dimensions of QMs (Samson & Terziovski, 1999), and in the higher education institutions, what dimensions postulate QMs has not been comprehensively performed (Sakthivel et al., 2005).

In brief, there is no widely accepted consensus on what a specified type of organizational performance measure can be employed to observe the organizational results specifically in operations management (Jitpaiboon & Rao, 2007; Parthiban & Goh, 2011). Thus, this section shows that there is an inconclusive form of exactly how QMs affects the organizational performance. Furthermore, it is also still unclear what dimensions and other variables should be considered when measuring or conceptualizing QMs and organizational performance (Kumar et al., 2009), and how these dimensions and variables are connected to each other (Boiral & Roy, 2007).

1.3 Problem Statement

In Malaysia, HEIs have come under public scrutiny for failing to improve or at least sustain international rankings with regards to offering outstanding education (Yu et al., 2009). Based on a government survey conducted between August 2006 and July 2007 (Ramachandran et al., 2007), which was carried out to evaluate the quality of local public universities, it was found that most universities failed to achieve outstanding rankings. The results of the survey have affected the perception towards public education offered in the country (Koh, 2008).

The problem has forced the management of institutions to look back and investigate on what each has overlooked to result in the current situation. As a result of that, the higher authorities of the HEIs are eager to reclaim better rankings and improve the reputation. To maintain continual progression and improvement, performance has to be constantly measured to guarantee that the best quality of work is achieved (McCabe, 2001). Therefore, there is a need to develop comprehensive quality management model for HEIs to reclaim better rankings and improve the reputation.

There are various quality awards in Malaysia such as the Malaysian public sector, which include the quality management circles quality award 1984; Native authority quality award 1993; Prime Minister's quality award 1990; finance ministry's secretary general quality award 2001; public service quality award 1992; and district workplace quality award 1992, but the most prestigious one is the Prime Minister's Quality Award (Basmenj et al., 2013). The Prime Minister Quality Award of Malaysia and the overall structure of the SETARA 2009 rating instrument (applied in Malaysian higher education institutions) reflected the MBNQA model (Talwar, 2011). It means here, the Prime Minister Quality Award of Malaysia focuses on a single type of result, basically the single business results is one major flaw of MBNQA model and the EFQM builds on the key principles of MBNQA to introduce field research and overcome the flaw of MBNQA (Oyewobi et al., 2015) which places more emphasis on the role of processes and comprise two types of results: the business result and human-oriented result such as people satisfaction, impact on society and customer satisfaction (Dror, 2008).

Since 1950, Japanese has brought fundamental changes to management in effort to reconstruct their economy, which still affecting enterprises around the world. Reflecting quality as a duty for all departments in the company, the Japanese Deming prize was the result of important attribute to quality management in Japan. Then, US and Europe established their own quality awards, MBNQA for US and EFQM for Europe (Gómez, Costa, & Lorente, 2011). After that many countries created their own national awards which were designed based on these three awards (Curkovic et al., 2000). Despite European countries applying EFQM as an excellence model many other countries are applying EFQM. These countries have their own standards and excellence model but currently many companies applying EFQM to be more competitive and efficient in the global market. Applying EFQM is not limited to the size of organization and its sector; it can be used by all types of organizations (Gómez et al., 2011). As developing countries are moving quickly toward applying globally accepted excellence models, a revision of EFQM application in Malaysian HEIs will be proposed in this study.

Recently, many authors supported the importance of information systems (IS) in supporting quality management (Ang et al., 2001; Sánchez-Rodríguez, et al., 2006; Xiang et al., 2010). Information system is a critical factor in an effective management of the organizations and in identifying areas of improvement. The TQM theory also emphasizes on decision making based on facts that involves analysis of information about customers' needs, problems in term of processes and activities and the success or failures of corrective attempts (Samson & Terziovski, 1999). Clearly, the IS factor is one of the TQM core concepts.

In Europe, the EFQM excellence model is one of the most comprehensive and prevailing models which is applied in many European countries (Arumugam et al., 2011; Mavroidis et al., 2007), however, IS do not exist in EFQM excellence model as a single factor (Arumugam et al., 2011) and it places more emphasis on the role of processes and results (Oyewobi et al., 2015). On the other hand, IS has emerged as second importance factor after leadership in MBNQA model (Su et al., 2003; Flynn & Saladin, 2001; Wilson & Collier, 2000), the focus of MBNQA is on a single type of result but with emphasis on the measurement, analysis and knowledge management (Dror, 2008) and some other national excellence award frameworks, such as Australian Business Excellence model, Singapore Quality Award model, and Malaysian Quality Management Excellence Award to support the remaining criteria which fall under customer and market focused strategy and action plans (Bou-Llusar et al., 2009; Sharma and Kodali, 2008). Thus, this study will propose the integrated quality management model that would be based on existing models.

Quality management systems have been widely studied by examining quality models and also various case studies in public organizations and large companies, but quality management in HEIs has received far less attention (Lee and Lee, 2013). Authors such as Gulbro et al. (2000) believe that there are differences between the implementation of a quality model in large organizations and small organizations. Moreover, these differences are

apparent in the implementation of the excellence model. For instance, according to Dewhurst et al. (1999), some aspects of the quality model are emphasized differently in large companies and public organizations compared to the small organizations. Similarly, according to Eskildsen et al. (2004), the focus on the EFQM criteria differs between large organizations and small organizations; for example, the tendency to emphasize on the enabler criteria is more in small organizations. It is necessary to perform more empirical research to explore more deeply the links between the agents that compose the quality model and the results (Black & Porter, 1996; Westlund, 2001). All these indicate that the knowledge of causal structure, importance, effects as well as achievable of criteria cannot be adequately provided for HEIs by merely relying on the studies which have been conducted in different sectors.

In the recent years, IS and Quality Management have significantly impacted most organizations and there were widely researched. IS, including information transfer and feedback among all the different levels in an organization, will form the necessary foundation for an effective quality management (Zeng et al., 2007). The importance of IS factor in supporting quality management system is supported by the TQM theory and frequently considered in different quality models. Moreover, the positive influence of this factor on quality enablers and its contribution to organizational results have been examined and approved by several researchers.

According to Tannock et al. (2002), without sufficient information and data of excellence parameters, the organization cannot identify the weaknesses in their policy and strategy, people management, and processes. IS plays vital roles as all quality improvement activities are based on informed decision-making (Terziovski et al., 1996). As a result, improvement areas are not distinguished and corrective actions are not performed. Thus examining the IS role in an organization view is necessary to weave the IS function into an organizational context.

1.4 Research Questions

Based on the background of the study as well as the research problems discussed in the preceding section, this study aimed to answer the following research questions:

1. How the EFQM excellence can be integrated with MBNQA model and measure quality performance in Malaysian HEIs?
2. How can the interrelationships between the extended EFQM excellence model factors in the HEIs of Malaysia be evaluated?
3. What are the contributory effects of IS factor on the extended EFQM excellence model in the HEIs in Malaysia?

1.5 Research Objectives

The aim of this research is to propose an extended EFQM excellence model by combining the EFQM excellence model with the customer, stakeholder and market focus; and measurement, stakeholder and knowledge management factors in MBNQA model and make it more useful and contributory for a proper implementation in the HEIs of Malaysia. The following objectives were outlined in the current study:

1. To propose an extended EFQM excellence model by integrating the EFQM excellence model and MBNQA model.
2. To evaluate the interrelationships between the extended EFQM excellence model factors in the HEIs of Malaysia.
3. To determine the effects of IS on the extended EFQM excellence model in the HEIs of Malaysia.

1.6 Scope of the Research

This study is a quantitative in nature and the samples were collected at one time (cross-sectional), the unit of analysis of this research is the higher education institutions (HEIs). HEIs in the context of this research encompass public universities, private universities, branch campus of foreign university, private university colleges and private colleges in Malaysia that are registered with the Ministry of Higher Education (MOHE) and have approval to recruit international students.

Data were gathered from the quality managers in charge of quality management in HEIs. These individuals typically have significant knowledge of the institutions' performance and quality management, thus providing some legitimacy and reliability to the responses. Lecturers and students are not participating in this study.

1.7 Significance of the Research

This study is able to significantly contribute towards extending the boundary of existing knowledge as well as providing valuable empirical evidence for practitioners as detailed in the succeeding paragraphs.

From the literature, a host of concepts as management paradigms have been examined and become the general management terminologies. For instance, TQM has survived and flourished through the efforts of researchers and practitioners. As mentioned earlier, the linkage between TQM and IS has been recognized, the studies have thus far rare and incomplete (Ju et al., 2006; Ooi, 2009).

The idea of this study, that both TQM and IS have great influence on organizational performance most especially in the emerging knowledge-economy where all organizations depend on knowledge, has opened up research opportunities to fill the gap. However, most of the studies that attempted to create a link between the two concepts lack empirical evidence, and the results are not practical enough to generalize.

The study provides a model with integration IS in MBNQA model and EFQM model which is essential to further understand TQM implementation in higher education sector. In this study, the researcher takes a more theoretical and empirical approach to investigate the relationship between TQM and IS on organizational performance by using quantitative research method. It is believed that the findings of this research will contribute immensely to the body of knowledge in this area by arriving at a better paradigm of improving organizational performance.

Although the proposition of the interrelationship between TQM and IS has been addressed individually by many researchers, but only a few of them, if any, have investigated this interrelationship empirically using structural equation modeling (SEM) analysis, particularly for higher education institutions. SEM analysis, as carried out in this study, provides a big potential for instrument validation. By testing SEM model, this study offers a rigorous validating analysis of TQM and IS on organizational performance construct that is helpful for future research.

More so, this study could benefit the academic leadership and academicians in educational institutions by enhancing their awareness about the core elements of TQM and key processes of IS to be considered when implementing these two paradigms, that are, TQM and IS. Hence, the present study contributes to the betterment of the education system and the world as a whole. In a few words, this study is significant because:

- In today's uncertain and ambiguous environment, TQM and the management of knowledge in business is a necessary and critical factor for organizational survival; and
- To obtain and maintain sustainable competitive advantage, organizations need a TQM approach that considers IS as a potential source of organizational performance improvement.

The Ministry of Higher Education in Malaysia has promoted quality assurance and TQM program in all Malaysian HEIs with the objective to gain better performance. On the other hand, issues and problems related to the performance of Malaysian HEIs as reported in the UNSCO and Malaysian governmental reports, indicate the lack of ability of Malaysian HEIs to deliver good educational services. By integrating the IS literature together with TQM literature, this study can scientifically convince the decision-makers of Malaysian HEIs that the implementation of TQM is one essential but insufficient

step in gaining high-level performance, unless supported by IS processes. Therefore, the outcomes from this study provide the much-needed information regarding the nature of TQM core elements of educational institutions and the intervening effect of IS on organizational performance by producing empirical evidence of these relations.

1.8 Structure of the Thesis

The thesis is divided into six chapters and the following discussion describes the content of each chapter.

Chapter 1 introduces the research topic, discussing the background and problem statement and stating the objectives and the significance of the research.

Chapter 2 discusses the review of literature and provide an analysis of gaps in knowledge in quality management, both in general and in higher education.

Chapter 3 provides a detailed discussion of the overall research methodology including the research approach, design, process, scope, methods, and limitations.

Chapter 4 is concerned with the formulation of an extended EFQM excellence model. The formulation process is discussed and evaluated, where performance factors are identified, relations outlined and operational definitions conceived.

Chapter 5 discusses descriptive statistics of the collected data given and a comprehensive statistical analysis of the extended EFQM excellence model is explained in detail in line with a review of the Structural Equation Modeling (SEM) technique used.

Chapter 6 reports on results and findings of the research and discusses the benefits and limitations of the model, conclusions, recommendations and further w

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