

# **The Efficiency of Eastern Mediterranean University: Evidence from a Data Envelopment Analysis**

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## ABSTRACT

Academic works have been carried out to measure the productivity and performance of many Universities around the world. Most of these studies are done in accounting terms but the main challenge of industries today is how well work is being done in this organizations. This leads us to the topic of this thesis organizational efficiency. Talking about efficiency, most writing on this subject have focused on comparing efficiency among organizations or department within an organization. But in this work we will be measuring the efficiency of an organization. The main motivation for this thesis is to measure the concept of efficiency and productivity of Eastern Mediterranean University over the year between 1990 and 2015 by conducting Data Envelopment Analysis (DEA) efficiency scores and Malmquist Productivity Index. This work focuses on non-parametric measurement of efficiency to determine the efficiency of Eastern Mediterranean University (EMU). The result shows that most of the years are efficient and productive (all efficiency scores are close to 1 or equal to 1) in terms of technical efficiency and productivity.

**Keywords:** EMU, DEA, Malmquist index, number of staff, number of graduated students

## ÖZ

Yapılan birçok akademik çalışma, etkinlik ve verimlilik konusunun diğer kurumlarda olduğu gibi üniversitelerde de önemli olduğu vurgulanmaktadır. Çalışmaların çoğu örgütsel bağlamda olduğu için örgüt içerisinde yapılacak performansında önemi çok büyüktür. Bu durum örgütsel verimliliğin önemini işaret ediyor olmasına rağmen, örgüt içi verimlilik ve etkinlik çok daha fazla önem taşımaktadır. Bu tezin ana motivasyonun amacı Doğu Akdeniz Üniversitesinin 1990 ile 2015 yılları arasındaki etkinliği ve verimliliği ölçülmesidir. Bu çalışmada Veri Zarflama metodu ile Malmquist index metodu kullanılmıştır. Çalışmanın sonuçları birçok yılın teknik etkinlik ve üretkenlik bağlamında olumlu olduğunu açıklamaktadır.

**Anahtar kelimeler:** Doğu Akdeniz Üniversitesi, Veri Zarflama Metodu Malmquist index metodu, çalışan personel sayısı, mezun olan öğrenci sayısı

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## LIST OF ABBREVIATIONS

EMU	Eastern Mediterranean University
DEA	Data Envelopment Analysis
HE	Higher Education
HEIs	Higher Education Institutions
YÖK	Turkish Higher Education Council
TCA	Turkish Cypriots Teacher's Academy
TRNC	Turkish Republic of Northern Cyprus
YÖDAK	Higher Education Inspection and Evaluation Board
TEDQUAL	Teaching Education Quality in Tourism
EUA	European University Association
ABET	Accreditation Board for Engineering and Technology
IAU	International Association of Universities
FUIW	Federation of the Universities of the Islamic World
ASSIN	Accreditation Agency for Degree Programs in Engineering, Informatics, Natural Sciences and Mathematics
AACSB	Association to Advance Collegiate Schools of Business
DMUs	Decision Making Units

# Chapter 1

## INTRODUCTION

The Higher education service organization is currently facing a lot of challenges ranging from diverse demands from a community of different stakeholders. The interest of the government, students and the surrounding community is just overwhelming.

According to Barbu (2012), these institutions or Universities develop and run high quality academic programs that are adapted to the diverse needs of their clients and at a reduced production cost using scarce resources. As a result of the limited public budget and the revenue generated from the tuition fee and invested into these institutions, the place of efficiency and productivity measurement is very crucial in evaluating how these organizations are performing. Also, since anything you do either as a teacher, student, administrator or government equally have an effect on the efficiency and productivity of the university.

To resolve this or satisfy the different parties, there is need to research the way things are done in these institutions in order to gather relevant information that can be used to make decisions. This study that evaluates the performance of EMU over the years will provide results which are beneficial to the different stakeholders. The finding of the research will be so significant in answering the overwhelming interest of the different parties in the case of EMU.

## **1.1 Purpose of The study**

This research is aimed at evaluating the yearly efficiency or inefficiency and productivity of EMU. Many research works have emphasized on the measurement of efficiency and the performance of Higher Education Institutions (HEIs) around the world by comparing one institutions or one department in an institution to the other. There are no works that look at or carried out an evaluation of the efficiency or productivity of an institution or a department as the years evolves. This research is to carry out such an evaluation in the case of EMU. The research therefore, fits into the gap cited above.

The results of the overall assessment of the efficiency and productivity of EMU that will be gotten from this study will provide general information to the government, the central administration, other staffs and students at large. Such information is very vital for example the government who is the major sponsor of education in EMU will gain knowledge that can help to direct strategy development and implementation, and the decision made from henceforth.

The specific findings on the evolution of efficiency across EMU for the past years are so critical to all parties especially the decision making authorities. The management will be able to pick out the efficient and inefficient years as well as productive and unproductive years with ease. This will help the authorities to carry out further research to determine the causes of the inefficiency or the efficiency experienced within such years. A discovery of these factors or causes of efficiency or inefficiency will help for directions and decisions for the future.

A careful look at the efficiency or inefficiency of inputs and outputs are so significant, as they findings will help the University to carry out adjustment on the major characteristics that influence such inputs or output. Finding on the input and outputs lead to decision that improve the performance of EMU.

Finally the students are so sensitive to the results of these studies, as it will constitute a major determinant of the direction and decisions they make.

## **1.2 Research Questions**

This study is based on the following research questions:

1. We want to know whether EMU has been efficient and productive or not between the years 1990-2015?
2. In which academic year(s) was EMU most efficient or productive and in which year(s) has EMU been most inefficient or unproductive?
3. Averagely can we say EMU is efficient or productive?

## **1.3 Definitions**

Effectiveness: The extent to which an organization's goals are realized or how well an organization can solve its problems.

Efficiency: The production of maximum amount of output using minimal amount of inputs. It linked the transformation of inputs to outputs. To measure efficiency we compute the ratio of output to the ratio of input. The main use of efficiency determination is that it help to minimized the wastage and direct the effort of management in organizations

Performance: The accomplishment of a given task measured against preset known standards of accuracy, completeness, cost, and speed.

Technical Efficiency: Technical efficiency refers to the maximum possible output with a given set of inputs.

Malmquist Productivity Index: The Malmquist productivity index evaluates the total factor productivity change of a DMU between two periods. It is defined as the product of efficiency change (catch-up) and technological change (frontier-shift). The efficiency change reflects to what extent a DMU improves or worsens its efficiency, while technological change reflects the change of the efficiency frontiers between two periods.

## **1.4 Delimitations, Limitations, and Assumptions**

### **1.4.1 Delimitations**

The major strength of this study is embedded in the DEA evaluation tool that is used in the analysis. The DEA is highly reputed for its ability to convert multiple inputs into multiple output without taken into consideration the link or relationship between inputs and outputs (Murillo, 2004).

1. Based on the delimitation above, the researcher decided on the various variables that are included in the evaluation.
2. The research warrants the use of secondary data because of the population of the data set and the time period under consideration.

### **1.4.2 Limitations**

1. There is no research allowance; the limited budget of the research student cannot permit an extensive exploitation of the various documents that can be useful for the research.
2. The data used is from a secondary source so all the disadvantages of secondary data are can be found in this data set.
3. The sensitive nature of the data involve might made it difficult to obtain complete data on some variables.

### **1.4.3 Assumptions**

Everything being equally this research is carried out under the following assumptions:

1. The impact of the other environmental factors that can influence the input and the output variables, and hence the overall result is negligible. This research is carried out in North Cyprus and the country is under sanctions and hence an enclosed economy. Therefore, facts link to this are considered being constant or has negligible effect on the variable used in the research.
2. The second assumption is make on the secondary data collected, the secondary data collected is from the various offices in the University is assumed to represent all the operations that took place in the University over the years considered. Based on this, there are no missing records so the results obtain represent the case of EMU.
3. The next assumption is that of the method used which consider that deviation of the various DMU from the production frontier is deterministic and can only be caused be inefficiency.



4. I assume that the results of this research will help EMU to provide better academic programs and achieve their objective in the coming years.
5. Everything being equal, all the inputs has an impact on the production function of the University and hence the efficiency of the University.

## **1.5 Conclusion**

This research work is going to fit the gap cited above by analysis the evolution of the efficiency and productivity of EMU. Despite the limitation of the research, the findings will be relevant to the government, the University administration, students and other parties that have interest in EMU. It will also contribute to the body of previous knowledge on the evaluation of efficiency in the case of EMU and North Cyprus.

## **1.6 Research Structure**

This study is classified into six chapters; the first chapter shows introductory part. Chapter two follows next with some literature review. Chapter three explains the case of EMU in terms of efficiency and productivity while chapter 4 spells out the methodology used in obtaining the empirical results explained in chapter five. And Chapter six crowns it up with a conclusion, managerial implication and recommendation.

## **Chapter 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The place of Higher education (HE) in the development of the economy is so important due to the fact that education is responsible for the creation of new knowledge as well as human capital needed by all other sectors. The HE sector is also funded largely from taxes and as such there is need for accountability or simply how efficient are these bodies are using their resources. In this chapter our work will be organized under the following to build sufficient literature from the past works of other authors, in order to give us a better understanding of this thesis. We will be looking at concept of efficiency, definition of efficiency, types of efficiency, the university system, the higher education efficiency and conclusion

#### **2.2 Concept of Efficiency**

The concept of efficiency can be looked at in different ways generally speaking; it is used for approval to show that a job is economically well done. As a technical assessment it stemmed out of industrialization and it focuses on performance measurement usually the performance of machine (Sen, 1975). It is worth noting that whether efficiency is considered as a general term or not, the underlined consensus between these dimensions among others is that efficiency looks at the ratio of input variables to output variables.

### **2.3 Definition of Efficiency in the Content of Higher Education**

The concept of efficiency in HE is regarded as being comprised of two dimensions: efficiency which is the relationship between outputs and inputs; and effectiveness that looks at the congruency in the relationship between outputs and the organizational goals. Efficiency as a way to measure or determine the performance of HEI only gained attention recently as compared to effectiveness. From diverse research work, there is a difficulty in measuring the efficiency of HEI which lies in the development of concepts and determination of inputs and outputs in ways that represents the processes and objectives of HEI and also in a manner that management can benefit from the information or result of the findings (Lindsay, 1982).

The main challenges in measuring the efficiency of HEI are relates to the fact that HEI's have features that are difficult to measure their efficiency. These include the fact that it is a non-profit seeking institution, there are no inputs and outputs prices and HEIs have multiple inputs and outputs Johnes (2006). These difficulties will constitute the major determinant of the measurements tools or methods that will be used to evaluate efficiency or our methodology in the next chapter.

From the works of Johnes (2006) and Arcelus et al. (1997) technical efficiency in HEI's is the ratio of current institutional output to the maximum output obtained at a given level of inputs. There are two basic inputs that characterize university activities. The people who includes all the staffs, administrative, teaching and support staffs, number of undergraduates and post graduates; and financial component which include expenditures. So far as the outputs we have tuition fee, number of publication, number of graduated students and number of project received.

Therefore efficiency can be defined as the ratio of outputs to inputs (John, 1985).

## **2.4 Type of Efficiency**

Many studies try to analyze technologies and cost efficiencies with the different methodologies. Technical efficiency refers to the maximum possible output with the use of given amount of inputs. While allocative efficiency is the distribution of productive resources to produce the best mix of output. They have been applied to test the efficiency of universities. When these two dimensions- technical and allocative efficiency are applied together they make up economic efficiency. Therefore when technical or allocative inefficiency is present, we will say that the organization is operating in an under efficient state or consider to be less efficient. Moreover, economic efficiency also represents a central benefit of decentralization. Therefore, if we cannot arrive at economic efficiency in a given organization then we can conclude that the economic benefits from an act of further decentralization of tasks or functions are likely to be limited.

Another type of efficiency is dynamic efficiency. Dynamic efficiency is a type of efficiency that accepts the economically efficient usage of scarce resources with time. In some cases, it is dynamic efficiency that is applied to test the efficiency

Nowadays the term “administration efficiency” which is first determined by Wilson (1887), becomes an important concept. Wilson argues that one of the most important aims of the administration theory is first to successfully determine what it can do then determine the best method to do them with the lowest cost and energy. And the problem with efficiency is that of an organization not to an individual.

Alternative types of efficiencies includes two important approach to efficiency which has also been applied to study carry out on efficiency research in HEI. Economic efficiency and social efficiency research in HEI are in the works of (Abbot & Doucouliagos, 2003).

## **2.5 The University System**

Many Universities in the world are owned and mostly funded by the government departments in charge of education. This implies that they are influenced by the government through appointment to post of responsibility and the allocation of funding. In north Cyprus education is under the ministry of National Education and culture. Generally the funds of public Universities have a number of provider among which the government is a major funding arm in many countries be it state or federal. Tuition collected from students in case of University which charged tuition is another sources. From a record, 61 percent of funding is from the government by (Karmel, 1998) in the case of Australia. This clearly warrants the interest of the government in these institutions went it comes to measuring their operating efficiency and productivity. Also funding has long ceased from being given based on institution but it is now based on a model of funding that considers the kind of program in terms of the field and level of study. The grants main for research has been transfer to the University for Effective Allocation. They also generate revenue from tuition fee especial for some postgraduate programs, specific and special activities such as research and services in the university (Dawkins, 1988). In the quest to assure efficiency and productivity a unified system was put in place with the assumption to create large institutions that can cut down cost by taken more students. Funds from the Government are mostly allocated in the form of block grant. Teaching funds are allocated following a grouping of fields of studies and study level not the type of

institutions. The funding for research is allocated through what is called research quantum which takes into consideration the performance of the different universities as far as research work is concern. They use an index that consider publication output from a perspective of the amount and type of degrees, amount of previous grants alongside with other findings from industries and so on.

## **2.6 The Higher Education Efficiency Systems**

As a result of the sensitivity of the HE system, there have been an increase in the number of research works and analyses focusing on measurement of higher education efficiency and productivity of institutions around the world. All these analyses are done with inspiration from the works of Debreu (1951), who put forth the definition of efficiency and has carried out a number of works on efficiency. The results obtained from his works on the measurement of efficiency among others constitute the basis for the scores that are used for the ranking charts of universities. The optimal distance from the production frontier border is computed and the differences between these results give the position of each university. These authors referred to efficiency as a given level of adhesion that is seen in the process of production following defined optimality standard. That is to say, it is out to measure an expansion or reduction in output or input which is linked to a given level of input or output vector respectively. When we consider the notion of DMUs<sup>1</sup> which changes resources or input into services or output in the HE sector, we can give definitions to the following different notions of efficiency technical, allocative, scale and scope as already seen above.

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<sup>1</sup>A set of peer decision making units (DMUs) with multiple inputs and multiple outputs

Our research focuses on the technical notion of efficiency measurement, which expresses capacity of DMUs to generate the best or highest amount or level of output or results from a given association of inputs and technological knowhow. Also, it can be defined as the use of the minimum amount of resources to achieve a maximum amount of results. We have established that our aim for efficiency in the higher education system is technical efficiency and technical efficiency cannot increase gains in either one output without reducing quality of other outputs. For example, to increase the efficiency of teaching and research in a university at the given level of capital, labour and other inputs without decreasing quality (Abbott & Doucouliagos, 2003). Also the measurement of technical efficiency is considered as the most efficient major of assessing the way work is carried out in an institution if and only if the university has made or is focusing on teaching or provision of education and research under the given level of resource constraints and given level of quality as the number one priority. Despite all these negative observation as far as HE system is concern technical efficiency is considered as the most valid techniques for assessing the performance of universities (Pestieau & Tulkens, 1993).

## **2.7 Teaching and Research Efficiency**

From the notion of DMUs it is clear that in Higher education system the efficiency of specific sectors such as teaching and so on has been assessed some good examples of this can be seen in the works of (Agasisti & Salerno, 2007; Agasisti & Dal Bianco, 2009; Bonaccorsi et al., 2006; Agasisti & Johnes, 2010) which consider the efficiency of an entire nation and (Agasisti, 2011) which present a departmental analysis of universities in Italy. Also on this issue we can equally see the writing of Madden et al. (1997) A closed look at a number of literatures on the measurement of departmental efficiency (Halkos & Tzeremes, (2012); Buzzigoli et al., 2010; Tauer et

al., 2007; Kao and Hung, 2008; Tyagi et al., 2009; Moreno & Tadepalli, 2002; Köksal & Nalcaci, 2006; Pesenti & Ukovich, 1996; Rizzi 1999; Gimenez & Martinez, 2006), and in addition to this works Tyagi et al., (2009), presented findings from nineteen university departments and concluded that in most of them the staffs were not effectively utilized in terms of both teaching and research.

Also efficiency calculations from twenty six other departments in Universities at Cornell USA indicated that the efficiency of so many departments is highly dependent on the definition of inputs and also outputs variables, and others showed technical inefficiency no matter the definition of inputs and outputs. In Turkey precisely at the Middle East Technical University, efficiency scores from fourteen departments indicated that results are highly dependent on the specifications of inputs and outputs hence there should be carefully specified Koksall & Nalcaci, (2006). In Greece a research on sixteen Departments University of Thessaly indicated that there was strong departmental inefficiency in the areas of poor allocation of resources or inputs and the development of the policies of the departments Halkos et al. (2012). Still in this line, analyses of forty two other departments in a US University indicated that deans or administrators of the departments have to pay attention to managerial implication from DEA and used them in order to increase the level of efficiency Moreno & Tadepalli, (2002). In Taiwan, the efficiency of forty one departments at the University of Cheng Kung was analyzed. In this analysis all the department with similar features were put together and this gave an estimate of the number of outputs that each department needs before it can be efficient through a process of decomposition were the outputs are divided by the scores. Also in Spain the cost efficiency of forty two departments were



examined at Autonomous University in Barcelona. The findings indicated that in the determination of efficiency size is not too relevant and also the efficiency levels of non-tenured staffs were very high Gimenez & Martinez, (2006). In these analyses little contribution came from universities from Italy in the University. An overview of the seventy departments in Firenze University indicated a discrepancy between research and teaching and it clearly stated that the staffs are allocated to teaching than to research Buzzigoli et al. (2010). In the University of Venice, seventeen departments came under analysis and just as in the case of Firenze similar results were realized despite the fact that the method were slightly altered by using both DEA and Stochastic Frontier Analysis (SFA) Rizzi (1999). Finally, we look at the University of Trieste where efficiency was analyzed in thirty seven departments which round up these literatures based on the specification of input and outputs and the different results obtained.

## **2.10 Importance of Measuring Efficiency**

This study is important for the government, academic institutions and also for practical reasons. Firstly, the local government is interested in the performance of academic intuitions as seen in the analysis performed academically by the American Progressive political movement (Light, 1997 & McGregor, 2000). The analysis carried out by the local government goes a long way to resolve problems such as providing education in efficient ways that help them to used scare resources to meet diverse and increasing demand for education. For example university enrollment in Austria increased for 165937(1981) to 695485 (200) (Dawkins, 1988). The Austrian authorities have also adopted a number of policies in an attempt to resolve concerns of inefficiency related to size and scope by breaking their universities into smaller

campuses at multiple locations around the country, based on their finding from the measurement of efficiency (Abbott & Doucouliagos, 2003).

Secondly, based on the fact that HEIs face challenges in determining their performance, the measurement of efficiency is of great value to the stakeholder in assessing how the organization is doing. The result also help universities in the development and implementation of their policies.

Thirdly the different organization in charge of the ranking of universities around the world use the result obtained from the measurement of efficiency among others to constitute the basis for classification of universities around the world. The scores that are used for the ranking charts of universities are determined as follows, the optimal distance from the border is computed and the differences between these results give the position of each university.

### **3.11 Conclusion**

After a review of the literatures a number of issues are identified. The majority of the research carried out to determine the efficiency of universities has been with a lot of difficulties ranging from the lack of participation or collaboration from some administrator, problems related to the characteristic of some features of the HE variables use in the DEA and finally the issue of defining the inputs and outputs has been so critical.

Also most of the work has concentrated on the use of DMUs in the measurement of efficiency and the used of this departmental efficiency to made comparison. We will add to this research works by looking at the efficiency of the entire university using carefully defined inputs and outputs variables.

## **Chapter 3**

### **CASE STUDY: EMU**

#### **3.1 Development of Higher Education in North Cyprus**

The history of Higher education in the Turkish Cypriots community in Cyprus indicates that there was only one education institution at the tertiary level before the Cyprus conflict in 1963. This was the Turkish Cypriots Teacher's Academy (TCA) which was created in 1934. As a result of the conflict Cyprus was split into two in 1974, and the Northern part occupied by the Turkish Cypriot started addressing the higher education problem in order to permit its citizens to have access to education. In 1979 the Higher Institute of Technology was created and the language of instruction was chosen to be English language. Following a well-developed standard of academics laid by the HTI coupled with well-equipped laboratories, the HTI received meritoriously the accreditation of the Turkish Higher Education Council (YÖK) that allowed HTI to run their first ever BSc in Engineering a four-year program. In 1984 successful candidates were conferred the first BSc. in engineering from HTI.

The naming of EMU came to lamp light when the TRNC parliament enacted into law a bill in 1986 that granted the then existing HTI the autonomy to become a state trust institution. This was done following an agreement between Turkey government and that of North Cyprus, and began to develop a public institution with the covering of YÖK in the same year.

The covering provided by YÖK made EMU diplomas and certificates to be generally recognized and accepted internationally, though the international community does not recognize the sovereignty of TRNC. The new standard set for university put the TRNC government into serious construction work and infrastructures were growing at an unimaginable rate with funding primarily from TRNC government and support or aids from the Turkish government. The income generated by the introduction of EMU in North Cyprus made the population realize that Higher education constituted a relief or answer to the creeping economy of North Cyprus due to economy isolation. Hence private institutions of higher learning set in and there was the establishment of the Girne American University (GAU) founded in Kyrenia in 1985, Near East University (NEU) founded in Nicosia in 1988, the European University of Lefke in 1989, American University founded in 1992, not still operational as from 1999, Cyprus International University founded in Nicosia in 1997, Middle East Technical University (METU) founded in Güzelyurt in 2002 which is a campus of Turkish state university. Other Turkish universities are following after METU, for example Istanbul Technical University (İTÜ) are in the process of opening campuses in Northern Cyprus as indicated by the agreement they have signed with the Higher education authorizing body. Though the new standard in education and the direction it has taken in the TRNC, entails the emerging other problems the government and private individuals recognized or realized pretty early that education constitute huge benefits for the economy and North Cyprus due to the influx of international students in their numbers into North Cyprus. This was much welcome as it was seen by the government as a solution not only to generating revenue for TRNC but also boosting the tourism sector due to the international exposure of the Island as the number of students increases. The crippling tourism

sector due to international non recognition was regenerated by the introduction of Higher education into the Island. . TRNC today is home to about 40,000 students plus, 25.000 plus are from Turkey and 4000 plus from other different countries, enrolled and studying in TRNC in the different universities.

### **3.2 Information About Eastern Mediterranean University**

Since the establishment of the EMU it has not been an all smooth ride, the transformation process has been a noteworthy one. The establishment of the Higher Technological Institute (HTI) in 1979, with the principal missions of EMU was to provide learning opportunities to young Turkish Cypriots students at the higher education level and to train high-caliber technical staff who were to shoulder the charge of developing the new and young state of TRNC. The composition of HTI was made up of an English Preparatory School, Electrical Engineering Departments training and offering Diplomas to Engineering Technician, the Civil engineering department, and the Mechanical engineering department. As a results of the high quality and standards of the academic and laboratory infrastructure put in place at the HTI, a four-year Bsc. Engineering program was accredited by YÖK to start operation in 1982. Following this accreditation HTI was to be transformed into a university and in 1986, the governments Republic of Turkey and that of Northern Cyprus (TRNC) consented to create in TRNC an institution or university. The Parliament in TRNC finally granted the HTI by vote, a law that formally establishes a public university named Eastern EMU.

From mission and vision of EMU, it urges the administration of EMU to puts special emphasis or pay attention to internationalization objective if the University. Following this clause of internationalization the efforts of EMU administration has

not been focused only on attracting and getting students from other areas around the world but the EMU administration. Also has been incurring expenses to develop international practices for cooperation and exchange students programs, in order to meet standards and market the school. So far, EMU has been able to sign agreements with 80 organizations and education bodies at all levels both nationally and all over the globe, amidst continued awareness rising and endeavors from the government of the Greek Cypriot, individuals and organizations to support these efforts. The quest for internationalization has made EMU to also put special stress on developing a system of education that has a high quality assurance and meet international standard during the development process. In line to implement this policy, each program run at EMU has gained the accreditation of YÖDAK- in charge of accrediting the operation of university and other HEIs, and also the accreditation of YÖK. In addition to this, other school programs are either partly or completely recognized or acknowledged by other international certified foreign organizations in charge of accreditation (example, Engineering Council and Ministry of Higher Education). Also, a great number of programs offered at EMU are accredited by trustworthy international accreditation organizations and institutions for example TEDQUAL, ASSIN, and ABET. During this process of development, EMU has also become a member of several international reputable associations for example IAU, FUIW and EUA. The opportunity of becoming a member of these organizations and institutions gives EMU the chance to benefit from the activities, publications, know-hows, conferences and workshops in order to improve quality assurance measures. The University has also been evaluated by the EUA as part of an Institutional Evaluation Exercise.

To see the outcome of unceasing internationalization determinations, the university (EMU) presently is offering studies to 13,000 plus students coming from more than 68 different nations, and having over 1000 academic staff with 35 different nationalities. EMU currently, providing education in 10 faculties, Foreign Language School, English Preparatory schools and 4 schools of very high quality education.

Besides Higher education in fact EMU is a major force as far as the provision of truly international university standard education is concerned this is the primary mission of the university. Since inception EMU is pleased to have graduated over 34.000 students both at the undergraduate and postgraduates levels.

### 3.3 Data on EMU

Table 3.1. Data on EMU

Elements	Quantity
Ranking	Among 25000 world best
Administrative STAFFS	100
undergraduates and associate programs	95
Number of Post graduates Degrees	77
Social and cultural clubs	50
Total number of students	20000
Nationalities represented	106
Library Printed books	150000
Library Electronic books	80000
Library Journals	10000

International accreditations	10
Recognitions	3
Membership	32
Certificates	3
Number of Faculties	11
Number of schools	6
Number of Institutes	3
Other services	21

### **3.5 Policies**

Focusing on the vision and mission of EMU, the management developed a number of guidelines to help achieve the objective of the organization:

#### **3.5.1 Internationalization**

As a main priority of EMU, they aim at increasing the number of students international from foreign destinations in its postgraduate and undergraduate programs from around the world. In Addition to this, the University is has for some time been deploying strategies to attract not only students from abroad but also qualified staffs for training and course programs via exchange programs and building relationship with institution of higher education and international academic organizations.

#### **3.5.2 Quality Assurance (QA)**

Currently, EMU is embracing new quality assurance guidelines and principles in order to advance QA in administrative affairs and education in line with the European Higher Education Guidelines and Standards of Internal QA.



### **3.5.3 International Accreditations**

Many of the programs running at the EMU campus have already gain the accreditation of some reputable internationally accreditation bodies. We can cite the following to attest this fact TEDQUAL for the Tourism programs, ABET for the Engineering programs and for computer programs ASSIN. In the recently concluded years, the have been an addition of these accreditations as part of efforts aim at expanding and diversifying the strength and image of the various programs by getting into agreements with some of the well internationally recognized and accepted accreditation organizations and institutions namely such RIBA, AACSB and so on. The underlining policy or objective of EMU is aimed at increasing the strength of all its academic programs through international accreditations.

### **3.5.4 Conducting Research**

There are equally modification for the teaching to encourage research and professionalism. This gives staffs the opportunity to write and published academic materials such as journals and other papers and to take part in different conferences and seminar in other to gather international experience.

### **3.5.5 The Financial future**

As many state owned Universities EMU is not different when it comes to financing the operations of the University. The sources of its revenue are government state funding sand the tuition fees collected from the student. The administration of EMU is putting great emphasis on the generation of revenue in order to ensure EMU financial sustainability. To achieve this, necessary measures has been taken to reduce its expenditures and increase its income as well as improving quality standards both administratively and academically in the meantime. An increase in their financial resources will permit the university administration to improve the investments in the facilities, academic staff, technical and physical infrastructure alike.

### **3.5.6 Student Centered Education**

The need of the students are at the center of all the operations in EMU and they focus of the administration is to develop an education system that is student-centered. The course contents, programs design, and the materials for courses, have already been revised and updated. Work in this aspect is continuous and as such is still going on as new projects are underway to ensure continuous improvements.

### **3.5.7 Following the Bologna Principles**

Unfortunately EMU is not part of Bologna Process as Northern Cyprus institutions of Higher learning are not part of this body, but EMU has made efforts to remain dedicated to following the rules set by Leuven Communiqué of 2009. This can be seen in the principles and objectives of EMU.

## **3.5 Conclusion**

Conclusively EMU despite the inclusiveness of North Cyprus for political reasons has grown from an HTI institution from 1986 to a major institution of Higher learning in 2016. Though EMU is not the best but its ranking shows that there has been a lot of work done to achieve the current position. The challenges of EMU are equally enormous especially at the post graduate level of education, the number of doctorate degree programs offered are quite limited which is a question of competence. Also the professionalization of courses in most of the departments is still a huge challenge also a question of competence.

However they are doing well nationally and internationally according to the stated policies objectives. This can be attested by number of enrolled students taken courses in EMU now, graduated ones since inception and different international accreditation agreements.

## Chapter 4

### RESEARCH METHODOLOGY

#### 4.1 Introduction

Here, we will discuss the overall methodology use in answering the research question in order to achieve the aim of the study. Our aim as seen above is to assess the efficiency and productivity of EMU over the years. Base on this objective the approach must be carefully examine so as to achieve the aim. We will start by looking at the research design, research procedures, model that is chosen for this study, how the data is collected and the methods of data analysis.

#### 4.2 Research Design

The DEA<sup>2</sup> is non-parametric and non-statistical method of analyzing efficiency and productivity which does not make assumptions concerning the functional form (production function) of the firm or the way inefficiency is distributed (Fare et al., 1994). It rather computes the production frontier based on linear programming techniques using all the inputs and output. The DEA equally measures the ratio of weighted inputs to that of outputs which are not assigned in a priority manner but are calculated by DEA tools that permit each unit to be reflected at it most efficient level relatively to the others. In our context HE, DEA can handle the multiple inputs and output (Shephard, 1970), which in this analysis we have four inputs and three outputs variables. It also generalizes a single production function to estimate a distance

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<sup>2</sup> DEA is a linear programming methodology for evaluating the relative technical efficiency for each member of a set of peer decision making units (DMUs) with multiple inputs and multiple outputs. It has been widely used to measure performance in many areas.

function. The distance function is very relevant in our case base on the following advantages. It does not make any assumptions about the behavior of the firm therefore eliminating issues such as profit maximization and cost minimization which cannot be apply in the context of HEIs. This means that the lack of knowledge about input prices in the HEI is completely resolved by the DEA. The hypotheses under observation in this work warrant a method that looks at the overall efficiency or inefficiency and productivity of EMU. The qualities of DEA above perfectly provide information that addresses the hypothesis and hence the research question. Therefore this research is designed to use the DEA based on the congruency between DEA techniques and the research questions.

The design of these research is based on the fact that our university using two main variables the people and their activities and the financial components. These can be further divided into four outputs and input variables. Let Y1 graduated students that are producing good results or degree using the input X1 number of under and post graduate students, Y2 total university tuition fee which capture the revenue of the school using the inputs X2 number of under and post graduates students paying fees, Y3 number of publication using inputs X3 number of full time working staff and Y4 number of projects using inputs X4 expenditure on staff's salaries and wages.

### **4.3 Research Procedure**

The number of graduated students, that is both undergraduates and post graduates are included to reflect the quantity and quality of undergraduate and post graduates degree which are output of the University. For the inputs post graduates and under graduates inputs are included using the number of students enrolling at the undergraduate and post graduate level. This help to measure the quantity and quality

of undergraduates and postgraduates currently enrolled in the university. The approach used here differ from the one used by Athanassopoulos & Shale, (1997). In their approach they used the A levels results of the undergraduates students for quality and the quantity of students as different variables which help to capture both quality and quantity of the student enrolling at the undergraduates. The same measure for the post graduates captures quantity and quality at the post graduate level. The number of staffs which includes full time number of working staff that is to say teaching and research personnel's, administrative and support staffs are included to represent the inputs from the staffs into the higher education production function. Meanwhile the publications, quality and quantity of graduated students reflect the output from the research grants, quantity and quality of research carried out by the staffs of the University and also the teaching efforts alongside with other services offer by the University. The research quality and quantity of degrees are the outputs from these inputs.

In addition to the variables mentioned above other input and output variable have been included to capture the financial components of the University since efficiency looks at the overall functioning or how well things are being done in the school. The input is captured as expenditures which include the expenditure on the staffs salaries and wages, expenditures on facilities and equipment and other financial engagement such as interest payment and so on. The output is captured by the tuition fees collected from student who are not on scholarship or on partial scholarships.

The dataset from the above inputs and outputs will be inputted into the Warwick DEA package and envelopment test will be run in line with the hypothesis of this research.

Firstly, we will run the DEA technical efficiency score test that will provide an evaluation of the year efficiencies of EMU as stated in the first hypothesis.

Secondly, we will run the Malmquist Productivity Index which will provide us with a yearly evaluation of the productivity of EMU stated in hypothesis number two

#### **4.4 Research Questions**

This study is based on the following research questions:

1. We want to know whether EMU has been efficient and productive or not between the years 1990-2015?
2. In which academic year(s) was EMU most efficient or productive and in which year(s) has EMU been most inefficient or unproductive?
3. Averagely can we say EMU is efficient or productive?

#### **4.5 Model**

We will use the DEA to assess the efficiency productivity of EMU. As seen from the works of the following authors Dantzig (1951);, Farrell (1957) and Charnes et al. (1978), is thank to them that (DEA) was created. Since then it has been a major business analysis tool use in measuring how efficient and productive an organizations is operating among others. Their works brought forth a linear relative piece wise production function that permits the measurement of the firm's technical efficiency. The DEA model has over the years appeared in many articles that has as objective to measure efficiency and productivity. It major strength lies in its ability to analysis multiple inputs, converting them into multiple out puts even in cases where the relationship between input and outputs are not known (Murillo, 2004) . This strength of DEA is simply because is non parametric (makes no assumptions on the firms behavior). DEA has been publicized greatly among scholars as a very apt tool to be use in the determination of efficiency in all type of organization especial not for

profit intuitions like universities. Two principle model of DEA forms the bases of its strength;

#### 4.5.1 Output Orientate Model

Output orientation is when all the inputs are unchanged. Therefore the result obtain is strictly based on the output variable. This orientation is called Constant Return to Scale (CRS). A plot of the ratio of outputs/inputs gives the linear piecewise graph of the organization, which is called the production frontier or function. This implies that all the units that are lineup with the frontier are the efficient ones, since each one cannot augment its outputs unless the other diminished at given level of inputs.

#### 4.5.2 Input Orientate Model

We can equally look at the VRS (variable return to scale) where contrary to the CRS, output are fixed and the inputs varies hence it is called input orientate (Banker et al., 1984). A major different between CRS and VRS is that the choice of orientation do have great effect on the efficiency in the latter option but not in the first.

The two orientations are of great importance to this study as almost all the variables concerned are fixed in one year but varying in another year either an input or output. For instance, the tuition fee paid by the student's just change in fall 2015 in EMU after being fixed for some years. Therefore we are going to adapt in our research the framework of the CRS under the assumptions of the VRS which gives rise to the following linear programming model that will be used to compute efficiency by DEA;

$$\begin{aligned}
 \text{Max} \quad & \phi_k + \varepsilon \sum_{r=1}^s S_r + \varepsilon \sum_{i=1}^m S_i \\
 \text{st} \quad & \phi_k y_{rk} - \sum_{j=1}^n \lambda_j y_{rj} + s_r = 0, \quad r = 1 \dots s \\
 & x_{ik} - \sum_{j=1}^n \lambda_j x_{ij} - s_i = 0, \quad i = 1 \dots m
 \end{aligned}$$

$$\sum_{j=1}^n \lambda_j = 1,$$

$$\lambda_j, s_r, s_i \geq 0 \quad \forall j = 1 \dots n; \quad r = 1 \dots s; \quad i = 1 \dots m$$

Where there are  $s$  outputs and  $m$  inputs;  $Y_{rk}$  is the amount of output  $r$  realised in unit  $k$ ;  $x_{ik}$  is the amount of input  $i$  used by unit  $k$ ;  $\phi_k$  the coefficient of efficiency; and  $s_r, s_j$  are the output and input slacks<sup>3</sup>, respectively. Technical efficiency of unit  $k$  is measured by  $1/\phi_k$ <sup>4</sup>;  $k$  is efficient if its efficiency score is 1 *and* all slacks are zero.  $\lambda_j$ <sup>5</sup> in the Benchmark for DMU  $j$ .

### 4.5.3 Specification of Outputs and Inputs

Here we addressed two critical issues one relating to the input/output specification and measurement and the other the significance of to each of the input/outputs included in the DEA frame. These two issues are viewed as definition and measurement problems of inputs and outputs in the HES (Johnes, 2004). In addition to this is how to differentiate controllable inputs by HEIs and uncontrollable ones such as factors in the environment. There following resolution proposal are available to handle the two questions.

The first is to carry out the evaluation of efficiency without separating the controllable from the uncontrollable (Cubbin & Tzanidakis, 1998; Grosskopf, 1996) which is most of the time adapted by DEA in the HES. But the results obtained do

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<sup>3</sup> Its absolute value is the s- (input slack) or s+ (output slack) in the LP equations. Positive values indicate increase, and negative values indicate decrease

<sup>4</sup> DEA uses  $\phi_k$  as efficiency score in input-oriented model, and uses  $1/\phi_k$  (the reciprocal of  $\phi_k$ ) as efficiency score in output-oriented model

<sup>5</sup> It contains the benchmark DMUs for the evaluated DMU which is  $\lambda$ . In other words, they are those DMUs in the reference set whose  $\lambda$  is not zero.



not take into consideration the environment especially when there are harsh environmental conditions then such result will either be overestimated or insufficient. On the other hand, we approach the issues by using a two stage process whereby in the DEA we first of all use a set from the input which are controllable and analysed their efficiency. In addition to this, the efficiencies are analysed in relation to the uncontrollable inputs by the help of statistical techniques. Results from the past, show that efficiencies gotten from the two stages are a little better from those of one stage.

In this research, we are going to take into consideration the two responses above. The reason for this is that we cannot isolated an organization from the environment, as such the true efficiency or productivity of an organization to the must reflect the surrounding environment. The second response will be consider so as to make further judgment on the finding from the efficiency score by computing the means of the scores.

#### **4.6 Data Collection**

This research uses secondary data<sup>6</sup> from records in EMU an unpublished<sup>7</sup> works on the variables used in assessing the efficiency and productivity of EMU. The data is taken from different offices<sup>8</sup> concerning the respective variables from 1990-2015. This constitutes the basis of our analysis. In order to collect relevant data, forms where designed and sent to be filled by the different heads of these offices in charge of academic records in the University.

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<sup>6</sup> Internal secondary data –is data collected in the organization where the research is being carried out.

<sup>7</sup> Extracted from unpublished works of Pr. Dr Sami Fethi

<sup>8</sup> Offices includes Library, Graduate institute, Registrars Offices, and Rectors offices.

#### 4.6.1 Suitability of the Data<sup>9</sup>

To evaluate whether the data is suitable enough to address the research question through the stated hypothesis, we are going to look at the following

##### 1. Nature of the Data

The collected is on the numerical values of the different variables described in Table 4.2.1 below. Base on the purpose of this study the nature of the variable is quiet in support for the study since the data was collected with the main purpose of computing accounting values and what we are using if the quantitative figures of the same records.

##### 2. The Objective of the Data

The data was collected by the university for the principal purpose of accountability. Considering the variables deployed in this research the numerical values of the variables are to be used for the analysis. This is pure in line with the objectives of the accounting practice which make use and prefer numerical values for the sake of quantification Robson, (1992). Therefore, this data is very relevant for this study which is out to make use of the yearly amount of the variable in other to compute efficiency scores and productivity.

Table 4.2. A description of the variables<sup>10</sup> and their definition is as shown below

<u>Variables</u>	<u>Definition of the variables</u>
<u>Outputs variables</u>	
1. Number of graduated students	The quantity and quality of undergraduate and post graduates degree issued

<sup>9</sup> Nature and objective of original data should be inquired

<sup>10</sup> As a result of non-availability of data on some of the variable this result finally adopt four of the variables described in Table 4.2

- |                           |   |
|---------------------------|---|
| 2. Number of publications | Reflect the output from the research grants, quantity and quality of research carried out by the staffs of the University |
| 3. Tuition Fee            | The total tuition fee collected from the student to represent the revenue of the students                                 |

Inputs variable

- |  |   |
|--|---|
| 1. Number of post graduates and under graduates enrolled | The quantity and quality of undergraduates and postgraduates at enrollment  |
| 2. Number of staffs                                      | Which includes full time number of working staff- academic staffs (teaching and research personnel), administrative and support staffs                      |
| 3.Expenditures   | Which include the expenditure on the staffs salaries and wages, expenditures on facilities and equipment and other financial engagement (interest payment). |
| 4. Number of Text books                                  | The inputs of the university in terms of number of text books to ease studies   |
- 

**4.6.2 Reliability of the data<sup>11</sup>**

The data has been collected on the above variables from the year 1990 to 2015 which is a period of about 25 years. This is a more than sufficient period of time to collect research data that can be used to carry out reliable evaluation of any concept that deals with time. Therefore the data is reliable enough to determine how the efficiency of EMU has been evolving over the years. The research is very different from other efficient measurement in that it is looking at efficient in a particular university rather than many other studies on efficiency that mostly focus on comparative studies among different universities. Hence they can collect data on each variable just for one year in each school.

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<sup>11</sup> Looks at who, when, which methods and at what time was the data collected

Also the records of the university are primary collected for the purpose of accountability and as such they no data item is expected to be missing if not the accounts of the university will not balance.

In addition to the justification concerning the reliability of the data, all the data items hold by the school are from documented records of university personnel and students. This implies that the data is highly reliable.

Based on the explanations above, we can therefore say that the data used for this research is reliable and ready to use.

#### **4.6.3 Adequacy of the data<sup>12</sup>**

The level of accuracy in a set of secondary data remains however difficult to evaluate when the researcher did not participate in the collection of the original data directly. But based on the assumption that the data was collected with strict administrative majors and for the purpose of accountability the data is accurate.

### **4.7 The Methods of Data Presentation and Analysis**

The information collected from the various input and outputs variables and inputted into the Warwick DEA package. The analysis is run with assumption relating to the specification of input. Everything being equal, all the inputs has an impact on the production function of the University and hence the efficiency of the University. The following features of the DEA package are used to analysis the data.

Firstly, descriptive statistical tools are used to plot various graphs that will help to indicate the trend followed by the different variables as the years evolves. These trends will help us to see how productivity is evolving over the years.

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<sup>12</sup> Level of accuracy

Secondly, compute the technical efficiency scores and the finding will answer our first hypothesis that is based on measuring the efficient of EMU. A score of 1 means most efficient DMU where the years represent the DMUs and score of zero means most inefficient year or DMU. Any score between this two extremes represent less efficient and inefficient years.

The third analysis will be Malmquist<sup>13</sup> productivity index while help us to determine the productivity of the firms as the years progress. The findings will response to the second hypothesis

## **4.8 Conclusion**

In this chapter we have look at the DEA model and its major strengths which lies in its unique ability to analyze efficiency using inputs and outputs that do not have any determined relationship. Also it can handle multiple inputs and outputs which makes it an efficient tool for this research.

Also we address issues relating to the collection of data. All data used is collected from respectively units in EMU from 1990 to 2015. Based on the model use the period of 25 years enable the DEA to give most efficient results as effects of missing records within any of the year will be minimized by the overall.

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<sup>13</sup>The Malmquist productivity index evaluates the total factor productivity change of a DMU between two periods. It is defined as the product of efficiency change (catch-up) and technological change (frontier-shift). The efficiency change reflects to what extent a DMU improves or worsens its efficiency, while technological change reflects the change of the efficiency frontiers between two periods.

## Chapter 5

### EMPIRICAL ANALYSIS

#### 5.1 Introduction

This part focuses on the measurement and evaluation of performance in Eastern Mediterranean University by applying two features of DEA, technical efficiency scores and Malmquist productivity index. The efficiency scores and Malmquist index of EMU based on input and output data is evaluated with DEA.

A DEA Warwick Package mentioned in the previous section first applied to the university in the sample is used. The technical efficiency coefficient ( $\theta_k$ ) obtained from a technical assumption of constant returns to scale provides the Technical inefficiency coefficient ( $1/\theta_k$ ).

#### 5.2 Graphical Presentation of DEA Data

In the first step descriptive statistical analysis is applied to understand the basic information and characteristics of the inputs and output data. The data is extracted between the year 1990 and 2015. In this section the data used for graphical presentation. Figure 1 shows total number of graduated students of EMU. Figure 2 also illustrates number of total working staffs at EMU. Figure 3 and figure 4 illustrate total number of books and total number of students respectively.

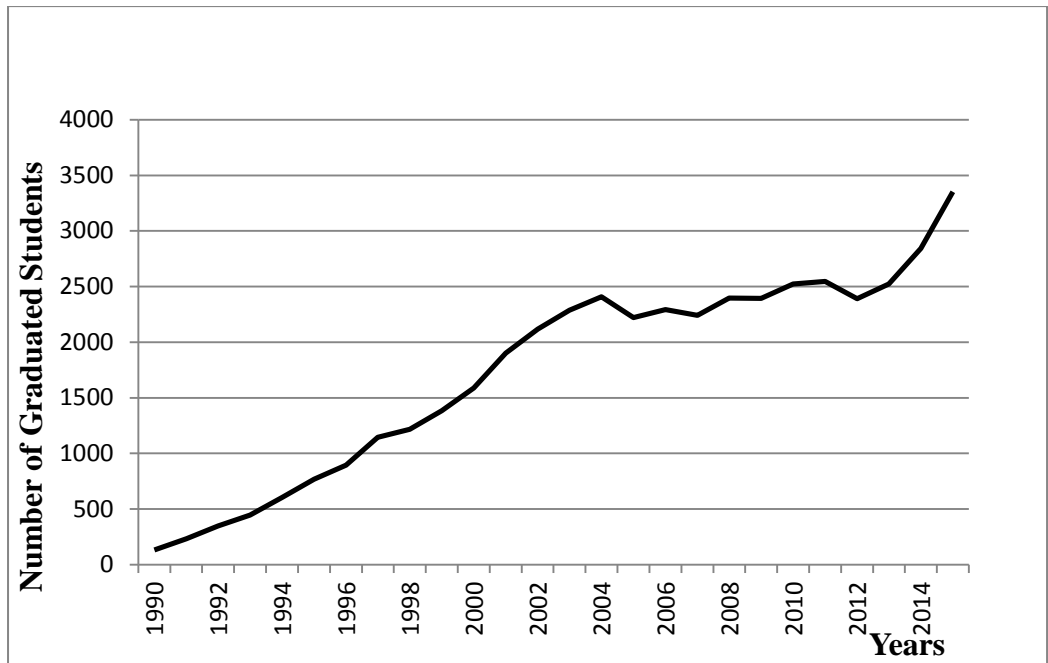


Figure 1. Number of graduated students

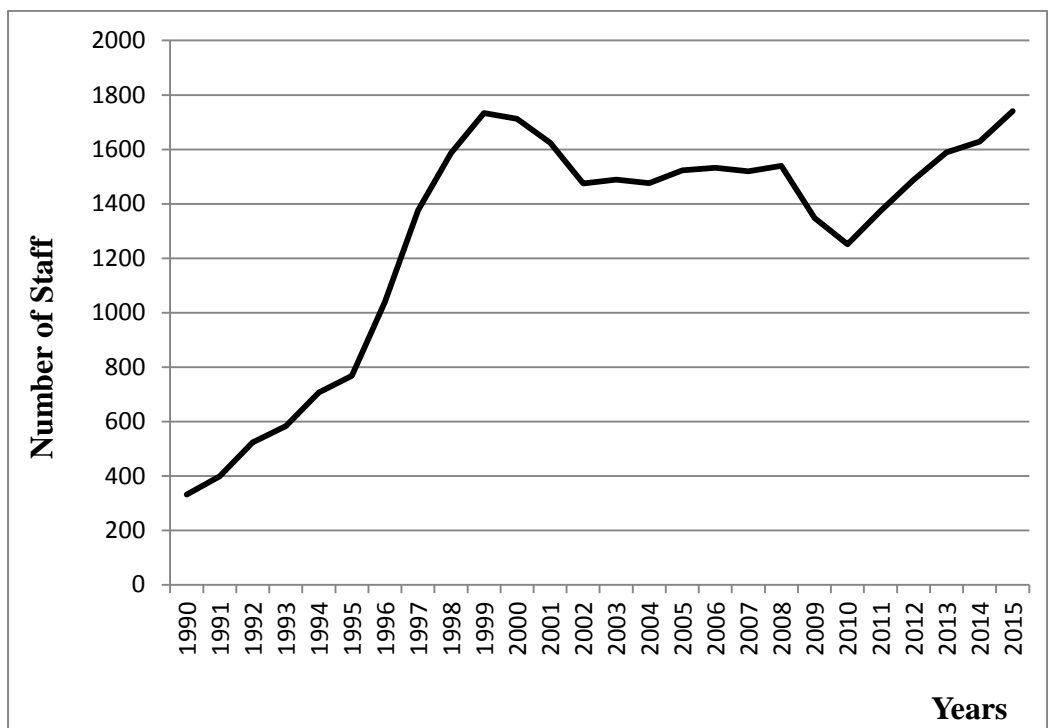


Figure 2. Total full time staffs

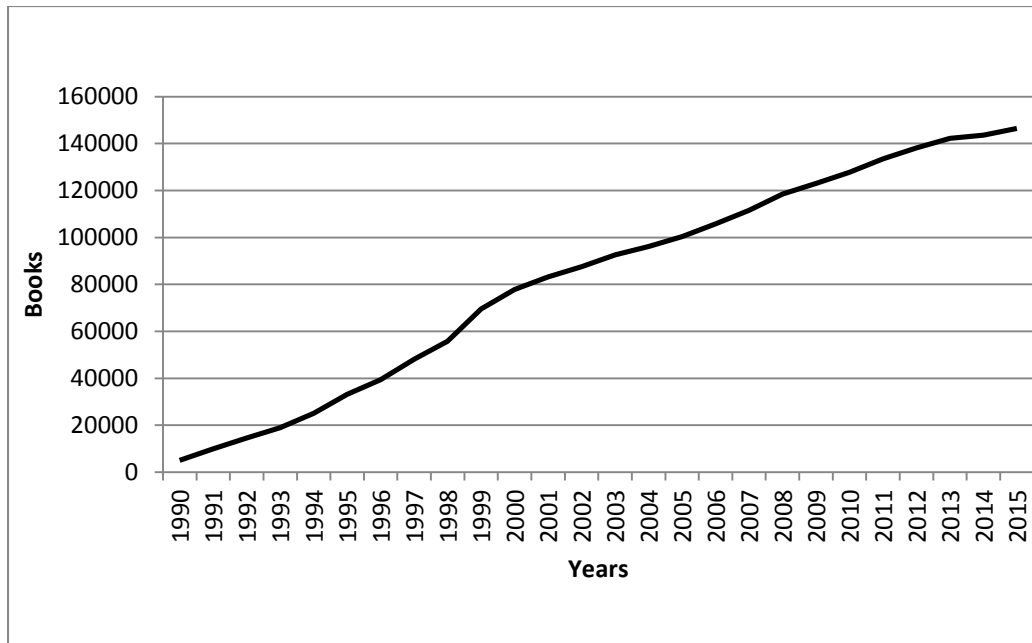


Figure 3. Number of books

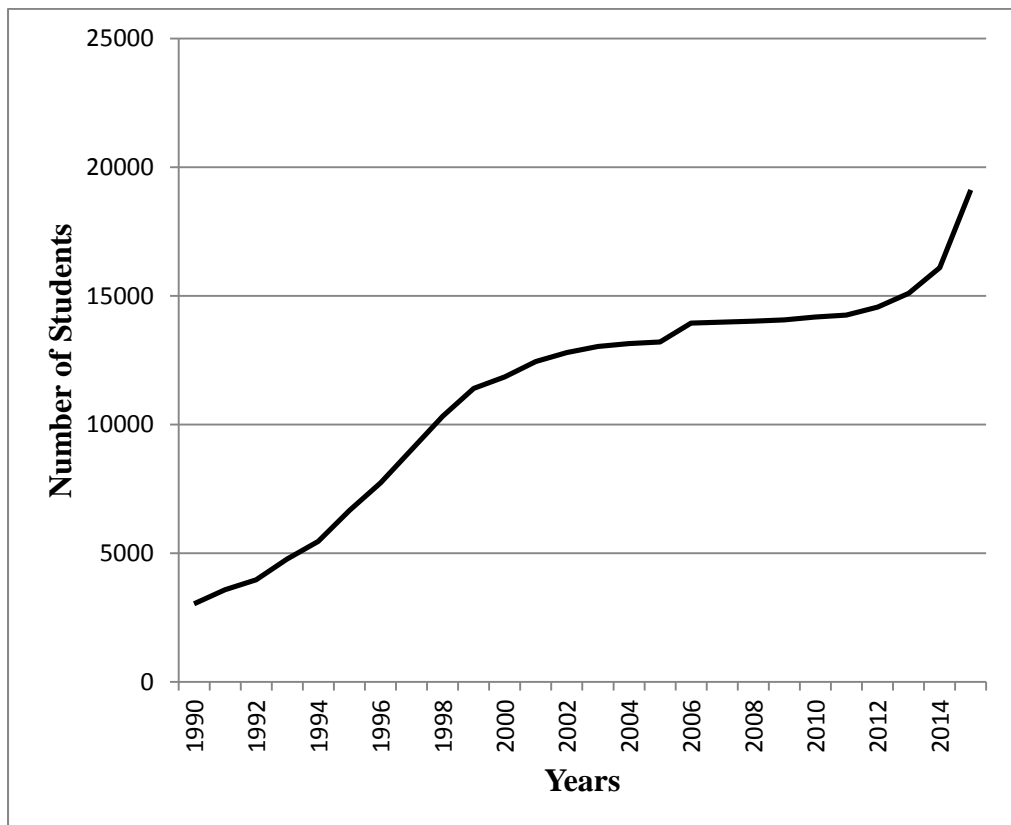


Figure 4. Total number of students



### 5.3 Interpretation of DEA Results

Table 5.3. DEA Technical Efficiency Scores

<b>Inputs</b>			
Total full time staffs			
Total students			
Total books			
<b>Outputs</b>			
Total graduated students			
Year	DMUs	Technical efficiency	
1990	1	1.00	
1991	2	0.88	
1992	3	0.93	
1993	4	0.76	
1994	5	0.76	
1995	6	0.71	
1996	7	0.67	
1997	8	0.65	
1998	9	0.63	
1999	10	0.68	
2000	11	0.73	
2001	12	0.74	
2002	13	0.75	
2003	14	0.78	
2004	15	0.79	
2005	16	0.82	
2006	17	0.81	

2007	18	0.85
2008	19	0.90
2009	20	0.94
2010	21	1.00
2011	22	1.00
2012	23	1.00
2013	24	0.99
2014	25	0.99
2015	26	1.00
	Mean	0.84

Table 5.3 shows technical efficiency scores of EMU over the period 1990 to 2015. In terms of technical efficiency, the average technical efficiency score<sup>14</sup> of majority years in EMU is 0.84. The efficient Decision Making Units<sup>15</sup> with the score of 1 are the years 1990, 2010, 2011, 2012 and 2015 (4 years) while the number of inefficient DMUs is 21 in the other years. Efficiency analysis of EMU examines information about how to manage and operate a university in order to obtain efficient performance. According to the results that are summarized in Table 5.3 the most efficient years<sup>16</sup> in terms of technical efficiency is 1990, 2010, 2011, 2012 and 2015. Therefore the relevant years mentioned above is accepted as the best efficient in terms of technical efficiency when it compared with the other years.

<sup>14</sup> The efficiency score in the DEA analysis are between 0 and 1. '1' means the most efficient DMU and '0' means the most inefficient DMU.

<sup>15</sup> DMU is regarded the relevant years under the study.

<sup>16</sup> It is accepted efficient if the score is 1 and to be an inefficient if the score is less than 1.

The technical efficiency score addresses the first research question. Following the result EMU has been inefficient in most of the years as just four years are most efficient. The average score of 0.84 means that on 84% efficient

Table 5.4. Malmquist results

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Inputs

Total full time staffs

Total students

Total books

Outputs

Total graduated students

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Year	DMUs	TFP
1990	1	1.00
1991	2	1.00
1992	3	1.00
1993	4	1.00
1994	5	1.00
1995	6	0.98
1996	7	0.91
1997	8	0.95
1998	9	0.93
1999	10	0.98
2000	11	1.00
2001	12	1.00
2002	13	1.00

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2003	14	0.98
2004	15	0.97
2005	16	0.98
2006	17	0.98
2007	18	0.99
2008	19	0.99
2009	20	0.94
2010	21	1.00
2011	22	0.94
2012	23	0.99
2013	24	0.99
2014	25	1.02
2015	26	1.03
	Mean	0.98

---

On the other hand, Table 5.4 represents total factor productivity (TFP, hereafter) scores based on Malmquist index. The result exhibits that the average productivity score of EMU between the year 1990 and 2015 is 0.98. Following the Malmquist results, the year 1990, 1991,1992,1993,1993, 2000, 2001, 2002, 2010, 2014 and 2015 are productive for EMU.

The finding of Table 5.4 provides answers to the first and second research questions as regards productivity. According to the Malmquist results, the year 1990, 1991,1992,1993,1993, 2000, 2001, 2002, 2010, 2014 and 2015 are most productive for whereas the rests are unproductive years.

Table 5.5. Average results for DEA and Malmquist Index

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Municipality	DEA Average technical score	Malmquist Index Average productivity score
Total	0.84	0.98

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Table 5.5 presents the average technical efficiency and productivity scores of both DEA and Malmquist index for each total average score so Technical efficiency scores are less than productivity scores. The results of the average scores provide answers to research question three. Looking at the percentages 0.84% for technical scores and 0.98 for Malmquist Index, we can say that on average EMU is productive but not efficient. This means that physical and human capital utilized in EMU in terms of productivity is much better than efficiency.

Those years less than 1 shows that low efficiency scores exist within this framework. Therefore I investigate to find the reasons that lead to the decrease efficiency score. The employee size and excess expenditure are important determinants for efficiency score. The general argument in the literature represents that the number of employees as well as excess expenditures in a workplace increase whereas the efficiency start to decrease.

## Chapter 6

### CONCLUSION

#### 6.1 Concluding Comment

Results of the DEA analysis to measure the performance of EMU in North Cyprus indicate that few of the years are either efficient while most of the years are productive (all efficiency scores are close to one or equal to 1) in terms of technical efficiency and productivity scores. This can also be seen in the average technical efficiency and Malmquist scores of 84% and 98% respectively.

On the other hand, many years are inefficient years in the case of EMU. As it is explained in the previous parts the result of the efficiency score can be explained by different factors, economic, financial and environmental factors.

First, the inefficiency score can be explained with employee size. However this situation can be explained with percentage of staff per student. Therefore we can conclude that the number of employees in EMU have negative effect on the efficiency score.

The second conclusion is based on the idea that lower expenditures and grants result in a higher efficiency. From this idea, independent revenue sources (grants) and the expenditures have effects on the efficiency. Increases in grants leads to decrease in the inefficiency as it appears in the EMU case. In addition same effect occurs with

increases in the total expenditures. Therefore we can conclude that university having lower expenditures and higher grants are more likely to be efficient.

## **6.2 Research Implications**

This research and its finding are so important to the parties interested in the existence of the EMU. The following implication can be generated;

Firstly, since the efficiency scores of all the years are not 1 meaning that in some years EMU is inefficient, this calls for the attention of management to make improvements. This should be taken so crucial since EMU is an international university and is face with high competition. The fact that some years are most efficient with scores of 1 implies that management should develop the practices that lead to these results and apply the result so as to obtain most efficient score in all the years.

Secondly, the employee size which is one of the sources of inefficiency as seen in the percentage of teachers to students indicates that management of EMU should attend to this issue in order to ensure quality results.

Thirdly, EMU as an international University have to ensure continuous efficient operations. Management has to do everything possible so as to keep the University image and reputations to students, accreditation boards and to meet international standards.

Fourthly, there is huggled competition in the higher education field. In some countries education is free or partly free and EMU which is not a tuition free university must

ensure highly efficient operations in every aspect from administration down to every student services, in order to secure a place in the market

### **6.3 Recommendation**

The management of EMU should consider the most inefficient or inefficient years as well as the most efficient years in order to carry out further research to determine the factors that are at the onset of such efficiencies or inefficiencies. The result of this research will be used in two fold. The factors that lead to efficiency in the efficient years will be maximized in the coming years and those that lead to inefficiency will be minimized in the coming years.



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