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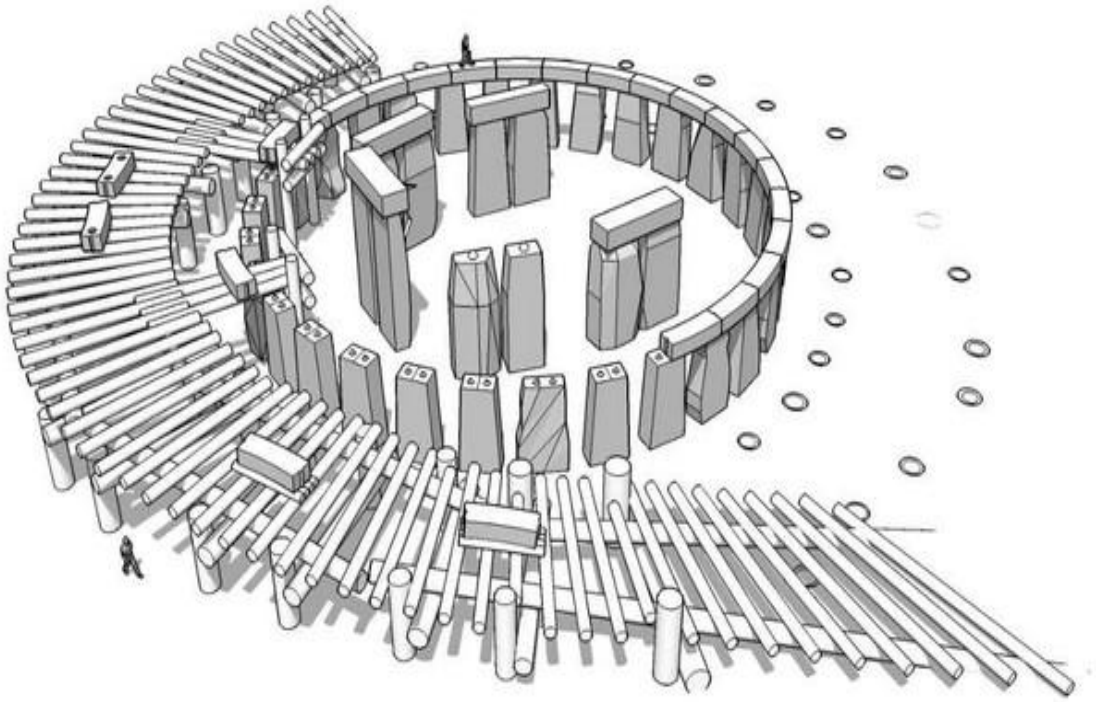

Healthcare Facilities

Trends and Drivers

Master's Thesis in the Design and Construction Project Management

MANDANA MOTAMED

Department of Civil and Environmental Engineering
Division of Construction Management

CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden 2010
Master's Thesis 2010:20

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Cover:
"Results from the first excavation at Stonehenge in 44 years has turned-up very little to justify Professors Darvill and Wainwright theory that the site was an ancient hospital. Their view, which contrasts with Professor Parker-Pearson's use of Stonehenge as a cemetery, is based on the condition of some Neolithic people buried in the area suffered from broken and deformed bones, and may have had surgical operations."
Reference: <http://www.nowpublic.com/culture/stonehenge-latest-dig-reveals-roman-interference-0>

Department of Civil and Environmental Engineering
Göteborg, Sweden 2010

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Dedicated to my beloved parents...

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ABSTRACT

In today's globalized world, the social and economic development of a nation is fully related to the healthy population of that nation as well as other related nations. The most important drivers in healthcare services can be regarded to be rooted into four different but interrelated contexts: 1) Demographic trends, 2) The changing role of patients, 3) Research and technology development, 4) Decentralization and privatization. All these drivers make a rise in demand for healthcare services; and consequently, can lead to an increase in demand for Healthcare facilities. It can be concluded that issues regarding healthcare facilities can play an important role in the whole healthcare system since healthcare facilities, actually, helping out in lodging and distributing healthcare services. A healthcare system is describable by its recognized institutions that can be regarded as official coordinators among the service providers and the end users. To this end, these institutions are supported by other organizations that are acting as a network. In this study, in order to deeply understand what is actually going on with the supporting network and also become aware of its dominant trends, it has been decided to find related organizations within Europe. To do so, those organizations that own an English website have been chosen through surfing the web. All required data are extracted from each studied organization and categorized into separate tables. All these findings have been analyzed by means of a comprehensive table that encompasses and displays all required criteria. In addition, a through literature review has been done to back up the outcome gained from all these findings and analyses. Where required data cannot be found within the websites of studied organizations, questionnaires are regarded as a useful means to reach all those essential information. The results were three folded: 1) The most important role the target organizations are playing is: acting as a hub and being a centre for sharing lessons learned and acquired experiences. 2) The supporting network is concentrated within United Kingdom, Nordic region and Netherland. 3) The most important outcome of "findings and analyses" part seems to be the tendency of the majority of studied organizations toward *architecture and design* of the healthcare facilities. Thus, it has been decided to find out the origin of the importance of architecture and design issues in the healthcare facilities by a brief flash back to the history of healthcare architecture and design. The end result extracted from all previously reviewed literatures have also supported this finding. Thus, the finding regarding the importance of design and architecture disciplines within healthcare facilities cannot be regarded as an unexpected outcome. Furthermore, as there are actually plenty of trends in healthcare facility design and architecture, further interdisciplinary studies are suggested in this regard.

Key words: Healthcare services, Healthcare facilities, Europe, Architecture

Contents

Preface

The purpose for doing research under the title of Healthcare Facilities is six folded and all of them are interrelated to each other:

- To investigate the main drivers by which demands in healthcare services can be increased,
- To diagnose the impact of healthcare services on healthcare facilities,
- To find out more about the invisible hands of supporting organizations in the domain of healthcare facilities,
- To identify their ultimate goals and orientations,
- To explore their main drivers by which they can fulfil their future missions,
- To discover their reason for choosing the stated orientations and the main area of concentration.

This thesis work recounts the outcomes of a study undertaken to diagnose these items. In fact, the study can be regarded as a qualitative research and has been conducted from February to May 2010. The work is based on an ongoing survey which has been initiated by the Forum for Healthcare Research at Chalmers University of Technology in Sweden.

This thesis work was essayed by Mandana Motamed as the researcher under the supervision of Associate Professor, Dr. Göran Lindahl.

Gothenburg city, May 2010

Mandana Motamed

1 Introduction

Nowadays, the rapid pace of life within ever-changing urban areas along with the increasing population and their multicultural nature combined with the quick development of knowledge reminds us about the boundless world we live in and also challenges us about how infinite today's world could be. In such a universalized world, the quality of life within all nations can be regarded as strongly interrelated to each other; i. e. life style development in one part of the globe can easily affect others elsewhere. In fact, the social and economic development of a nation is fully related to the healthy population of that nation as well as other related nations (Sansom, 2010).

The total healthcare expenditure within the EU (27) is between 4 to 11% of GDP (Gross Domestic Product) (Dybczak and Przywara, 2010). According to the prediction of European Commission, by the year 2050 the healthcare expenditure will rise by 2% of GDP (Mahony, 2010). Dybczak and Przywara (2010) believe that such a growth in healthcare expenditure can lead to an increase in public awareness and expectation and consequently demand for healthcare services.

In fact, by raising the awareness about health issues and the importance of wellbeing, plus the continuous advancement of medical technologies, increasing aging society and other related subjects, it is clear that there is an increasing tendency toward understanding well-designed healthy environments.

In general, it can be noticed that changes in demand for healthcare services will lead to interrelated changes within healthcare facilities as these kinds of services should be accommodated by and also distributed from related facilities. For this reason, it has been regarded beneficial to dig out the most important drivers in healthcare services in order to be able to smoothly move on to the healthcare facilities issues. The following part will present information regarding crucial demand drivers in healthcare services.

1.1 Demands in Healthcare Services

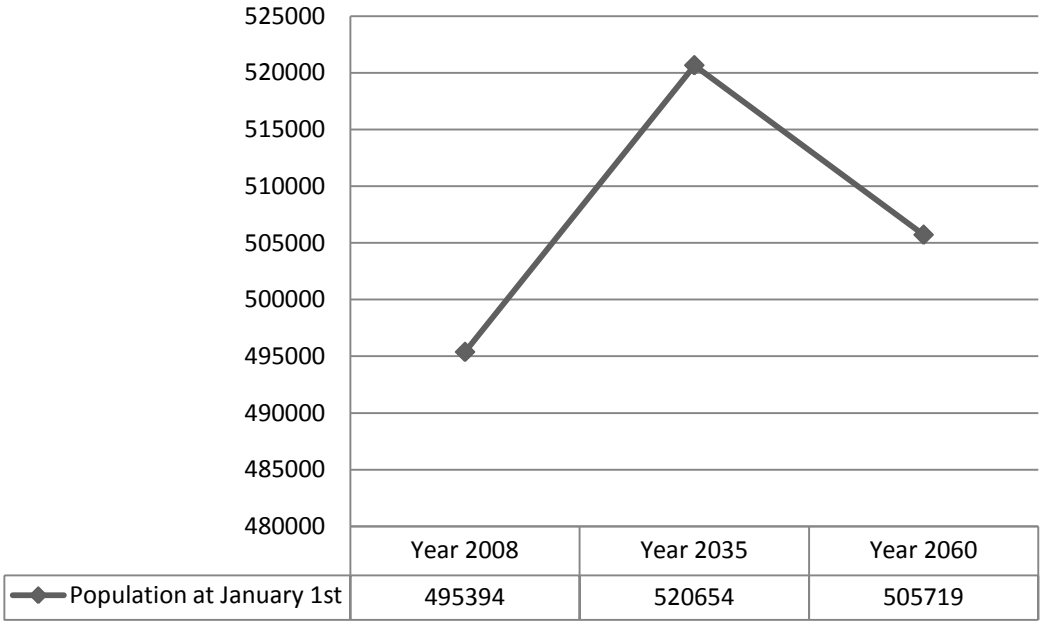
The most important drivers in healthcare services can be regarded to be rooted into four different but interrelated contexts (Magnussen et al, 2010).

- Demographic trends
- The changing role of patients
- Research and technological development
- Decentralization and privatization

1.1.1 Demographic Trends

The population of the European Union (EU) is going to increase from 495 million to 521 million in 2035, calculated on 1st of January of each year. It has also been predicted that from the year 2035 up to year 2060 (calculated on 1st January of each year) the EU population will be decreased from 521 million to 506 million. In addition, during this period (2008-2060) the annual birth rate has been expected to decrease while the annual number of death will continue to grow. In fact, from 2015 the death rate is predicted to become higher than the birth rate. Thus, the natural growth of the population would come to the end and the only factor that remains influential in population growth would be the net positive rate of migration. Yet, from 2035 onwards even this positive rate of migration cannot balance the decreasing number of births and also the increasing death rate. Therefore, the population is going to decrease dramatically, as shown in *Chart 1* (Eurostat, 2008).

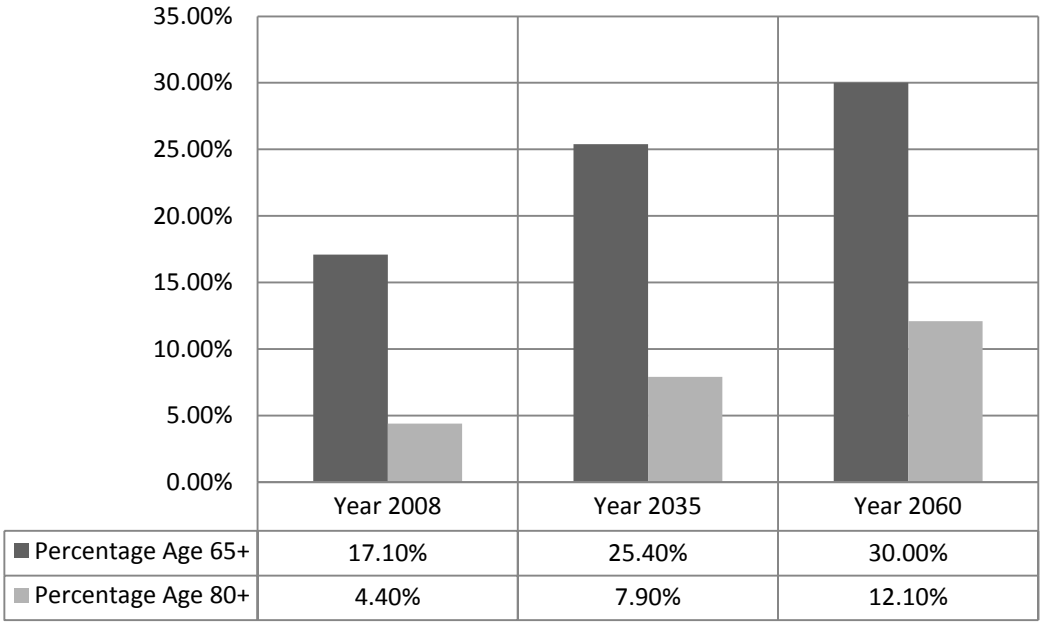
Chart 1 *EU (27) Total Population (000s)*



Data Source: Eurostat News release (26 August 2008)

Moreover, it has been concluded that the population of the European Union is growing older. In fact, the population of the European elderly society aged 65 years old and over is increasing from 17.1% of the total population in year 2008 to 30.0% of the entire population of year 2060. Within the same span of time (2008-2060), the number of the European elderly inhabitants aged 80 and over is going to rise from 4.4% to 12.1 % of the total population. The rational reason for this phenomenon can be explained as the steadily low fertility rate and also the rising number of those individuals who live long enough to grow old; this can be seen in all member states, (*Chart 2*) (Eurostat, 2008).

Chart 2 *EU (27) Old-age Structure*



	Year 2008	Year 2035	Year 2060
Percentage Age 65+	17.10%	25.40%	30.00%
Percentage Age 80+	4.40%	7.90%	12.10%

Data Source: Eurostat News release (26 August 2008)

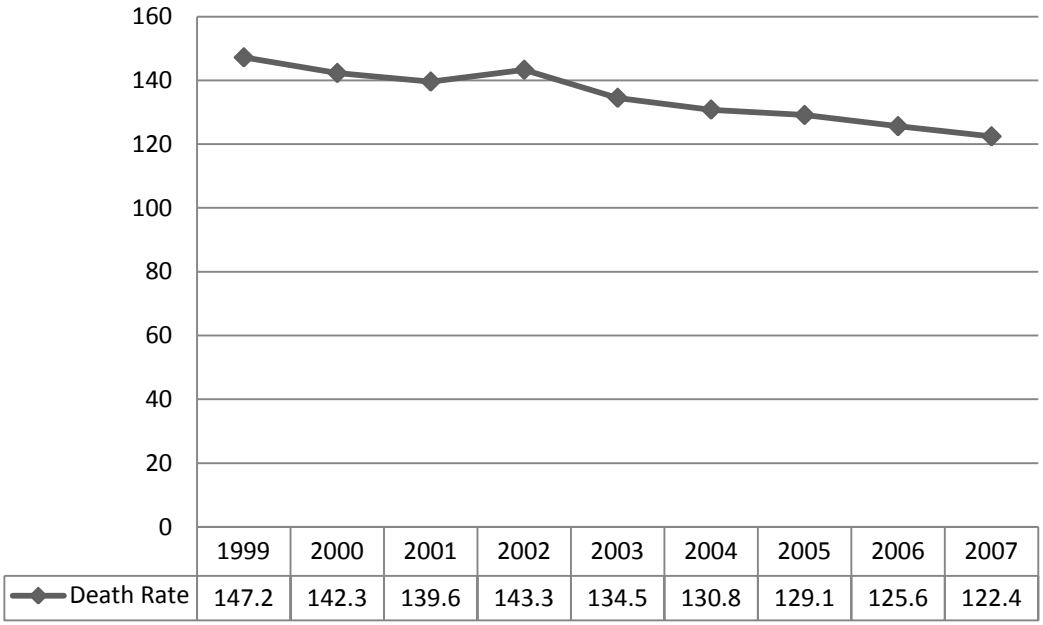
According to Ogg and Bonvalet (2006), Duane Alwin, the North American sociologist and demographer discussed that "society reflects, at any given time, the sum of its generations. Where one set of cohorts is especially large - like the Baby Boomers - its lifestyle dominates the society as it passes through the life course". The aging population that has been resulted by the last baby boom (1950's and 1960's) and also the increasing rate of life expectancy plus the decreasing fertility rate is going to be the dominant cohort in the society while the number of younger population is shrinking gradually. It has been regarded that elderly society has a huge impact on the consumption and consequently the demand for healthcare services. Despite the fact that the consumption of healthcare services fully depends on the health condition of the entire society not the age, it has been believed that elderly people tends to use healthcare services more often than younger cohorts. Therefore, the rising demand for healthcare services can be related to the increasing number of elderly people (Dybczak and Przywara, 2010).

According to Mahony (2010), Ann-Sophie Parent, director of the European Older People's Platform (Age) declared that "What is significant in the EU is that there is a rather steady increase in life expectancy but there is no parallel increase in healthier lifestyles. That means that people live for a long time, but they are facing illness or chronic diseases or disabilities also for a longer period of time." From this quote, it can be understood that the recent elderly society (those who were born within the post war baby boom period) is more prone to consume healthcare services than it used to be in the past. In fact, this matter can fuel the consumption of healthcare services in today's world.

As a negative consequence of the living condition that has been developed during recent decades, overweight and also obesity as a chronic disease have been pronounced as wide-spread problems in European countries since the 1950's. In fact, vast varieties of available foods combined with the tendency toward less physical jobs lead a huge group of contemporary Europeans to suffer from obesity steadily. The obesity rate in European societies is growing in such a fast pace that just within a couple of years it has been doubled. Since obesity can increase the death rate as well as the prevalence of chronic diseases, it has been regarded as an important cause for increasing health expenditure (Calza et al., 2008).

Despite the growing rate of obesity as a chronic disease and also its relation to mortality rate, the death rate due to chronic disease has been declined within recent years, *(Chart 3)*. This matter not only can be regarded as evidence on the above quotation by Ann-Sophie Parent, but also can prove the positive and improving impact of healthcare provisions on this subject.

Chart 3 EU (27) Death Rate Due to Chronic Disease/100 000 persons



	1999	2000	2001	2002	2003	2004	2005	2006	2007
Death Rate	147.2	142.3	139.6	143.3	134.5	130.8	129.1	125.6	122.4

Data Source: Eurostat (09 February 2010)

1.1.2 The Changing Role of Patients

Motivated by the experience of the Second World War, the American government initiated developments to create suitable conditions for healthcare improvements. From the onset of 1960s, many EU countries pursue the Americans in this regard as the economic condition of this time seemed to be favourable. During this period, healthcare development was uncontrollably wild. In fact, at this time:

- The planning for healthcare development was not regarded as an important factor
- No one were questioning the critical issues within healthcare
- "Governments approved the developments from the sidelines, letting things go instead of controlling" claimed De Gooijer (2007).

Afterwards and from the beginning of 1980s, governments began to understand that the current development process within healthcare had to be under control. Thus, from this time onwards, the healthcare reform has been started in EU countries. These reforms were many; yet, the main subject was the equal access to the healthcare services for most of inhabitants of European Union regardless of their fiscal ability. In these countries, governments were obliged by the national constitutions or so to take the responsibility in this regard (De Gooijer, 2007). It has been assumed that when the government take all the responsibilities and individuals are served with lots of rights, a kind of danger can be formed by converting end users from active consumers to passive recipients. Therefore, from the beginning of 1990s, end users of healthcare services have been urged to accept more active roles in this regard (Magnussen et al., 2010).

In today's world of healthcare, it seems that the fiscal ability of patients is a more dominant factor rather than being equal in receiving healthcare services. In fact, a kind of market has been made for healthcare services. This matter can easily be noticed from the increasing number of individuals who are not insured and also the appropriate condition for preferential treatments. In fact, governments of EU countries have backed off from the economic procedure of healthcare services and let things up to the market. This Phenomenon has reached the following results:

- The governments' role regarding their participation in patients' equal access to the healthcare services has been reconsidered,
- More severe eligibility factors for social security have been made,
- Shrinking levels of welfare have been emerged,
- Patients who are left on their own means and decisions have been appeared.

In brief, beginning from around 1975, the social environment of the EU countries has been varied and the healthcare was not an exception. The immediate consequence of this change was the growing number of individuals who are not successfully involved in the new healthcare market or the ones who could not even make it to enter the marker (De Gooijer, 2007).

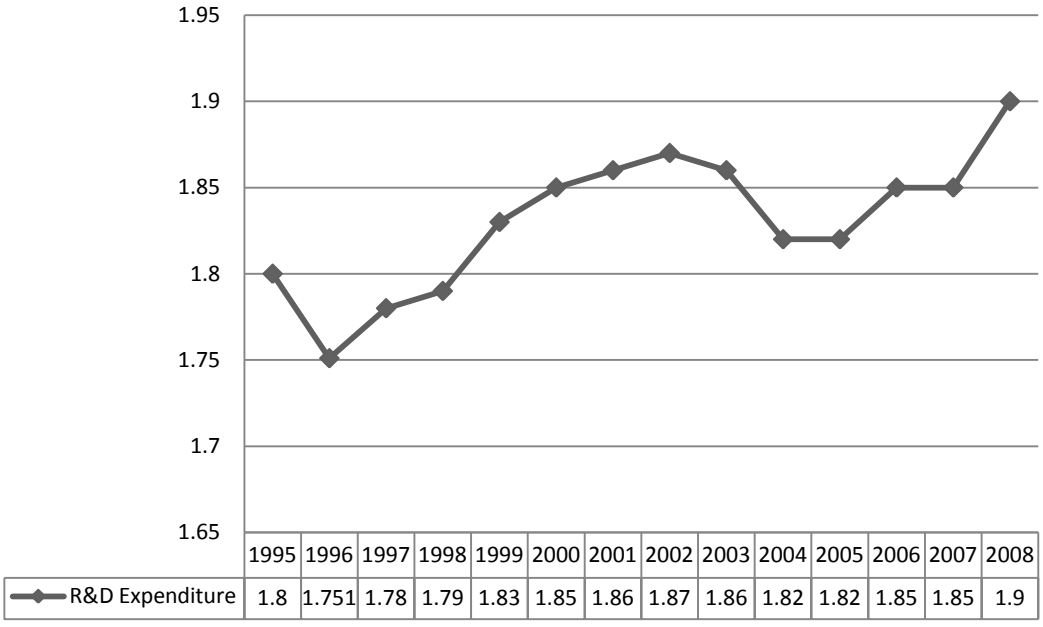
In general, by emerging such a competitive market for healthcare, providers try to prepare as various services as it could be for their customers (patient centric approach). This way, patients will have lots of options to choose from. Thus, new kinds of healthcare services and consequently new kinds of demands can be formed in addition to the former sorts of healthcare demands.

Moreover, another important change in patients' role can be noticed within the future elderly society. In fact, it has been regarded that the future 65 years old and over Europeans will be more educated and wealthier. Thus, it is more probable for them to use medical services than younger cohorts.

1.1.3 Research and Technology Development

During recent years, it has been regarded that the total R&D (Research and Development) expenditure has been increased within countries of EU (27), *(Chart 4)*.

Chart 4 *EU (27) Total R&D Expenditure (GERD) by All Sectors of Performance and All Types of R&D Activities/Percentage of GDP*

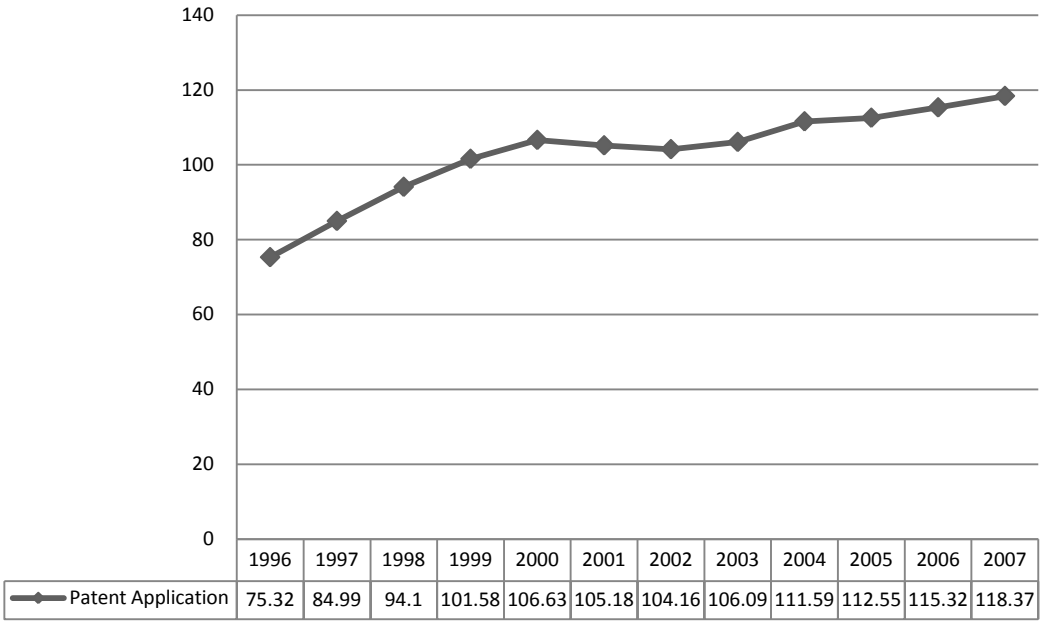


	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
R&D Expenditure	1.8	1.751	1.78	1.79	1.83	1.85	1.86	1.87	1.86	1.82	1.82	1.85	1.85	1.9

Data Source: Eurostat (12 March 2010)

Moreover, application for patent registration is rising steadily during recent years throughout EU (27), *(Chart 5)*.

Chart 5 *EU (27) Patent Application to the EPO by Priority Year at the National Level/ Millions of Inhabitants*



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Patent Application	75.32	84.99	94.1	101.58	106.63	105.18	104.16	106.09	111.59	112.55	115.32	118.37

Data Source: Eurostat (01 April 2010)

Higher expenditure on R&D as well as continuous growth in patent application can be translated to the existence of higher tendency toward and consequently demand for new innovations and technologies. In fact, it can be concluded that demand for innovative research and also technology development in all sectors, including healthcare, is increasing within recent years. According to Eurostat (2009), "Protection and improvement of human health" has recently gained a considerable share of government's financial support for more than 7% in R&D throughout EU (27). This can fuel the demand for more research and development activities within healthcare sector.

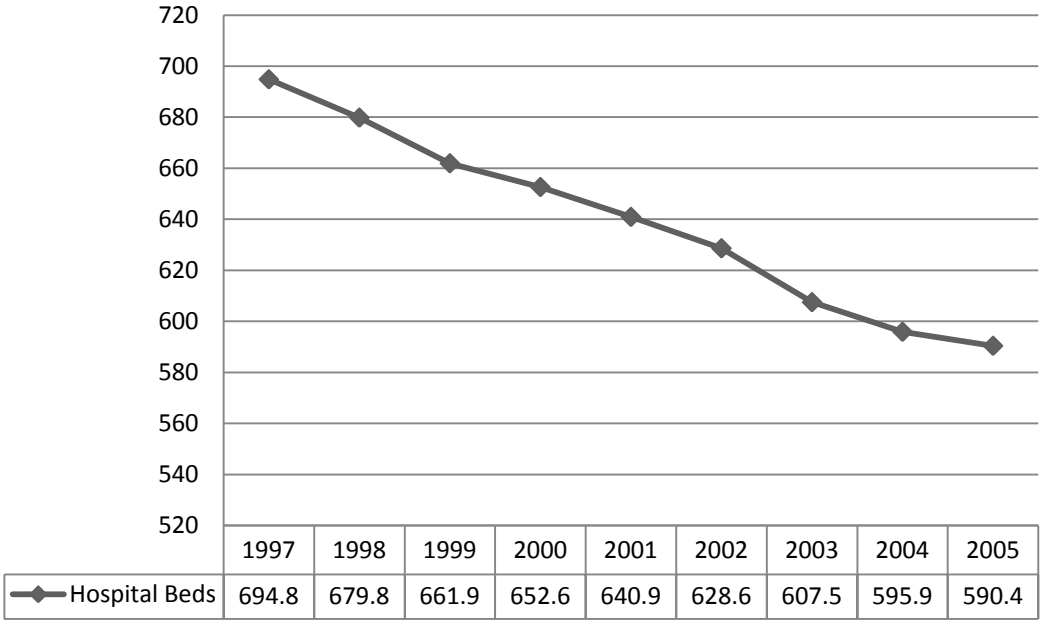
Demands for new medical innovations and technologies, and also demands for healthcare services are fully interrelated to each other i. e. demands for healthcare services grows as long as demands for healthcare technologies and vice versa. In fact, as people become richer and more educated, they are more aware of new medical opportunities that can be brought by new technologies (Dybczak and Przywara, 2010). Thus, they tend to demand more various technological innovations in order to relinquish their medical needs. Besides, rapid movement in technological development has broadened individuals' awareness regarding illnesses and also appropriate treatment as well as new medical opportunities that can be made by innovative technologies (Magnussen et al., 2010). Since the life cycle of most medical technologies are short, there always will be demands for healthcare services provided by these technologies.

1.1.4 Decentralization and Privatization

According to Magnussen et al, (2010), Saltman et al., (2007) believe that the concept of decentralization has been the favourable management strategy for many of the European healthcare systems since the late 1990s. Saltman et al. (2007) define the term decentralization as: some smaller organizations that are more functional and liable than larger ones (Magnussen et al., 2010).

In the past, healthcare services were delivered in hospitals where all medical facilities were centralized (Bach and Abar, 2008). Yet, at present, by emerging a market for healthcare services, the controlling power of governments became lighter and the power mostly transferred to decentralized private actors (De Gooijer, 2007). In fact, as shown before, patients have got more choices and also are given rights to choose their favourable healthcare services. Meanwhile, medical professionals have also entered the market and tried to answer patients' needs through their own private medical centres. In fact, in such competitive market, healthcare service providers put lots of efforts to figure out all patients' needs and consequently try to prepare all required healthcare services in order to be able to satisfy their end users and actually, attract more clients. This phenomenon can fuel the demand for healthcare services. In the other word, more options for healthcare services can easily be translated to more demands for healthcare services.

Chart 6 EU (27) Total Hospital Beds/100 000 inhabitants



	1997	1998	1999	2000	2001	2002	2003	2004	2005
Hospital Beds	694.8	679.8	661.9	652.6	640.9	628.6	607.5	595.9	590.4

Data Source: Eurostat (13 November 2009)

As shown before, healthcare technologies have been developing fast. In fact, more medical technologies have been developed over the recent years. These new technologies need more space to be accommodated than before. As a proper respond to this trend, hospitals have tried to make more space for these new medical technologies by decreasing the number of inpatient beds (*Chart 6*) and also build outpatient facilities in order to be able to house all required services (decentralization). These decentralized and privatized medical centres lead to higher demands for healthcare services.

1.2 Demands in Healthcare Facilities

As shown, all the above drivers make a rise in demand for healthcare services; and consequently, can lead to an increase in demand for Healthcare facilities. In fact, healthcare facilities are the home of these services and make them possible to get distributed to end users; so, more demands for healthcare services will result in more demands for healthcare facilities. The following will clarify how each of the stated drivers can improve the demand for healthcare facilities and boost the healthcare construction.

Regarding demographic trends, it has been stated that the enhanced living situation of recent years on one hand leads to an increase in life expectancy and longer life, and on the other hand ends to some chronic disease such as obesity. In fact people live longer but not necessarily with a healthier life style. This matter along with post war baby boom and also the decreasing rate of fertility generate an aging population in all European countries. Since healthcare services are used by elderly society more frequent than young people, demand in healthcare services can be increased by the boosting number of elderly population. In fact, there should be more healthcare facilities in order to be able to accommodate this growing number of elderly society. Thus, demands for healthcare facilities can be increased in this way.

Concerning the changing role of patients, it has been mentioned that the strong economic growth of the post war period led to an improvement in healthcare developments with a minor contribution of governments as controllers. Afterward, governments have been convinced to contribute for better results and it has been decided to define patients' rights. This matter put the patients in the centre of attention. Not only their right are important but they also got the power to choose their suitable services. This matter urged service providers to make multiple choices for patients. Thus, new sorts of demands for healthcare services has been formed. In addition, the future elderly society will be more educated and also wealthier. Therefore, it is more probable for them to use healthcare services more often. All these drivers can fuel the demand for healthcare services and consequently for healthcare facilities.

About the research and technology development, it has been pointed out that the improvement of the total expenditure for healthcare research and development can increase the public and professional awareness regarding healthcare opportunities. Information technology development along with the fact that elderly society are going to be a wealthier and more educated cohort in the future will amplify this awareness. This way, the increasing demand for healthcare services, as well as healthcare facilities, will be fuelled. Also, since the life cycle of medical technologies is short there always would be demands for brand new technologies. Consequently, more spaces and buildings would be needed to accommodate them all.

On the subject of decentralization and privatization, it has been declared that because of the healthcare reform, the controlling power of government had been diminished and actually transferred not only to patients but also to healthcare professionals. The

patients' power led them to gain more rights and choices for healthcare services. Thus, healthcare service providers have been competing to make better choices for patients; and consequently, the market for healthcare services has been developed. In this market, different healthcare professionals have popped up in order to challenge appropriate means by which healthcare services can be delivered. This has been led to more and various sorts of facilities that can lodge and deliver these services. In fact, lots of smaller buildings are being built near the acute care centre in order to house other non acute ones. Besides, ever-changing medical technologies, as stated before, need more space; thus, existing buildings cannot accommodate all healthcare services inside i. e. they have to be removed to new buildings; consequently, more healthcare facilities are needed.

All the above drivers not only cause a rise in demand for healthcare services, but also lead to and even fuel the healthcare construction boom. It can be concluded that issues regarding healthcare facilities can play an important role in the whole healthcare system since healthcare facilities, actually, helping out in lodging and distributing healthcare services. According to Magnussen et al. (2010), a healthcare system is describable by its recognized institutions. Despite some disagreements, some believe that these institutions can be regarded as official coordinators among the service providers and the end users. To do so, it has been noticed that these institutions need to be supported by other organizations. These organizations are acting as a network to backup the coordination activity and lubricate the process through organized paths. The following will detect this network within healthcare facility domain.

2 Supporting Network

It has been assumed that the so-called supporting network has a profound impact on the way the healthcare system is acting. Thus, the followings have been dedicated to a deep investigation of the supporting network and its role within healthcare facility domain.

2.1 Methodology

In order to deeply understand what is actually going on with the supporting network within the healthcare facility area and also become aware of their dominant trends, it has been decided to find related organizations within Europe. To do so, those organizations that own an English website have been chosen through surfing the web. Each organization has been totally studied and analyzed.

All required data are extracted from each studied organization and categorized into separate Tables. These data and information are classified by means of: the *location* in which the studied organizations are actually situated, their *aim/vision/mission* and also their *drivers* that normally should lead them to reach the goal. The reason why findings are sorted in this way (based on location, aim/vision/mission and drivers) or in the other word, why basically it is important to extract these specific kinds of information from the studied organizations, not else, will be explained in the "Findings and Analyses" part and within the description of each category.

All these findings need to be analyzed in order to be able to extract initial results from them and finally get ready for the discussion part. To this end, all the former criteria i.e. *Location*, *Aim* and *Driver* along with new ones i.e. *Geographical span* in which studied organizations are active, and also *Title* by which these organizations get introduced, are deeply analyzed in details (more information regarding these two added criteria can also be found in the "Findings and Analyses" part under the description of each heading). Meanwhile, not only it is needed to show the connection between these criteria and each studied organization, but also it is so crucial to be able to see all these connections in relation to all studied organizations together. This scheme can facilitate the general perception and understanding of the analysis process. To this end, it has been assumed that a comprehensive table that encompasses and displays all required criteria together can be useful (*Table 1*).

Moreover, it has been assumed that it is crucial to back up the outcome gained from all these findings and analyses with related knowledge and literatures. To this end, a through literature review has been done i. e. "Demands in Healthcare Services" and "Demands in Healthcare facilities" parts.

Where required data cannot be found within the websites of studied organizations, questionnaires are regarded as a useful means to reach all those essential information.

2.2 Findings and Analyses

All findings of studied organizations can be found in *Tables 2-17*. Also, the initial analyses of these findings are displayed in *Table 1*. The complete description on the formation and rational basis of all these tables (*Tables 1-17*) can be studied in the "Methodology" part.

2.2.1 Title

It has been assumed that each organization normally choose a title based on its core-business in order to claim their main area of concentration on which they aim to concentrate their efforts and resources. For this reason, "title" is the first criterion for the mapping work. While among sixteen studied organizations seven have a general title and do not share a specific area of concentration (they have general indications like "Property", "Asset", "Facility" and "Built environment"), it has been seen that six out of sixteen organizations mentioned "Architecture" or "Design" within their titles. In the other word, "Architecture/Design" is the most frequent indication. Other indications based on their frequency orders are "Planning", "Management" and finally "Engineering". All these clues and indications can prove the vast variety of disciplines on which these organizations are aim to focus their core business and resources.

2.2.2 Location

In order to understand the context in which mapped organizations have developed, their locations are regarded important and come into consideration in the next place. It has been seen that out of sixteen studied organizations, eight are located in the United Kingdom territory (five in England and two in Scotland), five in Nordic region (one in Finland, two in Norway and two in Sweden) and also three in Netherland.

2.2.3 Geographical span

The geographical span in which each organization is active is regarded as the next crucial factor to map, since this investigation can be noticed as a measure by which their level of contribution within the related field can be determined. It can be noticed that twelve out of sixteen under studied organizations are active nationally while two others are engaged internationally and two are involved European-wide. Here, it is worthy to mention that many of organizations which their geographical spans of activities are regarded "National" tend to participate in international or European-wide events in order to benefit from lesson learned by others and also to be able to share their own experiences with their counterparts (according to their claims within their websites). While being internationally scattered (have other branches or offices in other countries across Europe or other parts of the globe) was one important criterion to regard an organization as internationally active, some indications within

their titles, which can inform us about their international contributions, are also taken into consideration.

2.2.4 Drivers

In order to make it feasible to reach the stated goals, studied organizations are experiencing lots of possibilities. All of them are agreed to act as a hub in order to gather and coordinate efforts as well as exchange knowledge and experiences. To this end, they constructed networks through the internet (web-portal) and lunch some joint events. Eleven out of sixteen studied organizations are holding seminars, conferences, congresses, debates, exhibitions, presentations, symposiums and workshops. As participants can benefit from lessons learned by their peers, these events can also be regarded as successful efforts to reach the training goals of studied organizations. Other ongoing efforts within training are: lunching professional courses, master classes and graduate studies, and also study visits, tours and trips. Eight organizations are engaged in this effort. Besides, nine of studied organizations are involving in research, various case-studies and other related projects. All the research outcomes along with the results of some events such as workshops, seminars, conferences and etc. plus the ending assignments and projects of training courses are published within related organizations. These publications can be in form of master thesis, PhD dissertation, reports, periodicals, journals, newsletters, articles and books. Eleven out of sixteen studied organizations are entitled to have such publications. Furthermore, advisory, advocacy and reviews are among other services that eight of studied organizations are offering.

2.2.5 Aim

Although all studied organizations have the same general goal i.e. to assist in elevating the health condition nationally or internationally, the domain on which they aim to concentrate their efforts and resources are different. To this end, all subjects of their entire drivers come into considerations. It can be noticed that while out of sixteen studied organizations twelve are involved in “design” discipline, ten also engaged in “planning”. It has also been noticed that fourteen out of sixteen organizations are just focusing on the early stage of the process consisting of architecture, design, briefing, planning and so on. The rest are concentrating on the technical innovations, property management or/and capital financing of the whole procurement process.

2.3 Discussion

As an initial result, it has been concluded that the most important role the target organizations are playing is acting as a hub and being a centre for sharing lessons learned and acquired experiences. As stated, they do so by forming web-based networks and cooperative proceedings in order to know their counterparts and be able to interact with them. In fact, these organizations construct an actual network parallel to the abstract one (web-based network) consisting of professionals, academics and all others who share an interest in healthcare facilities. In addition, being scattered in different geographical spans can show a strong tendency toward giving and receiving knowledge about healthcare facilities. As stated, all studied organizations do have an English website even though for many of them English is not the official language of the country where they are actually located. This matter, as well, can show their interest toward being a hub for sharing experiences and skills. This way, the so-called supporting network can assist in coordination goal that the institutions of the healthcare system aim to acquire. These institutions are actually those previously-mentioned smaller organizations that were created during the decentralization and privatization processes. These decentralized or privatized smaller organizations need to get connected and coordinated as their activities are fully interrelated to each other. In fact these scattered organizations are acting as complements for each other and can be regarded as essential particles of a united body. Actually, the absence of any of them can harm the healthcare system. This matter can strongly show the importance of coordinating activities among them. Meanwhile, the supporting network feeds these smaller organizations with their required services and helps them out to stay tuned. It can be concluded that findings in this regard can be fully supported by existing reviewed literatures.

Furthermore, it can be noticed that the supporting network is concentrated within some limited regions (United Kingdom, Nordic region and Netherland). In order to find out the probable reason for this phenomenon, it has been noticed that according to Ogg and Bonvalet (2006) during 1939-1948 the total fertility rates (TFR) of Sweden, United Kingdom and Netherland got doubled (the second-world-war baby boom). In fact, baby boomers of the mentioned period (1939-1948) formed the current elderly society (65 years old and over) in these countries. Since elderly people are among the main consumers of healthcare services, these countries need to be more secured about the healthcare provisions. This matter lonely can be regarded among other important issues that can explain and clarify why the so-called supporting network has been limited in these specific areas. As a conclusion, it can be noticed that existing reviewed literature also strongly support findings about locations in which studied organizations that host the supporting network are situated.

Moreover, the most important outcome of "Findings and Analyses" part seems to be the tendency of the majority of studied organizations toward *architecture and design* of the healthcare facilities. This result can strongly be supported by findings such as:

- The most frequent indication within their titles were *architecture and/or design*
- Most of the studied organizations aim to concentrate their efforts on the early stage of the project including *architecture and/or design*

As stated, nowadays we are facing an enormous increase in demand for healthcare services and this will amplify the demand for healthcare facilities. This matter, thus, will lead to a construction boom in regard to healthcare buildings; and consequently, healthcare architecture will come to a huge importance for designing and constructing required healthcare facilities. It can be concluded that the recent finding is strongly supported by the existing reviewed literature.

Moreover, in order to find out the origin of the importance of architecture and design issues in the healthcare facility domain, a brief flash back to the history of healthcare architecture and design seems to be beneficial.

The international history of healthcare facilities with regard to architectural developments dates back to three thousand years ago. During the ancient period, city-states were established in order to provide healthcare services. Also, throughout this era the early Middle Eastern hospitals excelled over their equivalents in Europe. Afterward and during the Medieval time, "Christian religious orders" were in charge of hospitals. Medical buildings were complied with a cross-ward plan in which the sacred and secular parts were totally separated from each other. This can be regarded as the origin for contemporary modern hospital buildings. During this period, hospitals in Middle East still had remained more advanced in comparison with their European counterparts. Renaissance can also be mentioned as a noticeable era in architectural advancement of healthcare facilities. During this time, hospital design and architecture was fully under the influence of design and architecture of palaces. Also, the concept of "public" hospitals came true by rich philanthropists who donated hospitals to the public. In fact, this era was the origin of humanism and human-centric beliefs within healthcare domain. Besides, during this time, the scientific ways of medical educations and practices have been developed. The Nightingale period, later on, can be regarded as the modern transformation of medical theories and principles into architectural spaces and forms. In fact, this era was fully under the strong impact of Florence Nightingale's architecture. The international influence of Nightingale's works and principles can be traced by some prominent concepts such as "skyscraper hospitals" and also "Nightingale's ward". Afterwards, the era for modern mega-architecture within healthcare facilities had been started and mega-hospitals had been built. Throughout this time, hospitals had been dominated by the International Style and advancement in building technologies had led to hospital enlargements. Also, during this period, health planning had been emerged as a defined discipline. In fact, flexibility in interior spaces as well as the expansion of exterior envelope came into consideration for mega-hospitals. At the end of the twentieth century, a new era has been started in healthcare architecture. In fact, downsizing of healthcare facilities along with the rearrangement of healthcare services into new buildings have led to

functional changes of spaces and buildings of postmodern hospitals. Smaller care facilities have been emerged and in acute care centres smaller numbers of beds have been positioned. In fact, hospitals are specialized for the sickest patients who need to become hospitalized in an acute care centre and smaller facilities are specified for the other patients who are in better conditions. In this era, the advancement of information technology and internet has helped out in equal distribution of health services and the generation of new ideas within healthcare architecture (Verderber, 2004).

It can be concluded that the advancement of architecture discipline within healthcare facility domain has been rooted in the parallel improvement in healthcare services. In fact, architecture has always been regarded as an important means to relinquish the ever-changing nature of healthcare services. In the other word, by appropriate architectural solutions, changes in healthcare services could be properly accommodated and welcomed.

A tremendous number of different trends can be found within healthcare facility design and architecture such as: acoustics, lightings (artificial and natural lightings), artworks, colours and textures, etc. According to Verderber (2004), in order to be able to accommodate all the existing trends in healthcare facility design and architecture, "Interdisciplinism between architecture and allied disciplines will be essential in the coming decade". This matter can show the importance of further research on how architecture and other related disciplines in regard to healthcare facilities are actually interconnected to each other? And what are the other possibilities in this regard? These can be suggested as research questions for further studies.

2.4 Conclusion

To sum up, it can be concluded that demands in healthcare facilities are increasing because demands in healthcare services are rising. Thus, it seems essential to know more about the main drivers in this regard. Demographic trends, the changing role of patients, research and technological development, and also decentralization and privatization are introduced as main demand drivers for healthcare services; and consequently, for healthcare facilities. Nowadays, more healthcare services are needed in result of the current growth in life expectancy along with chronic diseases like obesity. In addition, the growing population of elderly people which are also going to become a wealthier and more educated cohort (in comparison with former elderly society) can fuel the demand for healthcare facilities in the near future. This well off and well educated group of elderly tends to be more aware of the advancement in research and technologies regarding healthcare services. Thus, they would claim for better and more up-to-dated healthcare services. In this regard, the changing role of the patients can be noticed. In fact, their role changed from being passive end users of medical services to active patients who are aware of their rights and also able to choose their required healthcare services. The advancement in information technology and also the internet have had a huge influence on the prevention of information asymmetries between service providers and end users of these services. This increasing level of awareness and consequently the patients' choice lead to the creation of a competitive market for healthcare services. Service providers are competing with their counterparts in the healthcare market in order to attract more clients for their business. In such a market, different healthcare professionals start their private medical centres (privatization). In fact, not only the advancement and consequently the expansion of healthcare technologies lead to less number of beds in hospitals and accordingly decentralized smaller healthcare facilities, but also the private specialized care centres are added to these outpatient facilities. This way, construction boom cannot be seen as an unexpected consequence. This way, healthcare facilities, nowadays, have got an important role to play in healthcare system along with its all formal institutions and their backup organizations which act as a network. This supporting network has been found in its predicted locations (as it strongly supported by existing reviewed literatures) and also with some special characteristics such as tendency to act as a hub in order to facilitate the coordination goal of the target institutions (those that are receiving supporting services), and also the tendency toward healthcare facility design and architecture. The result extracted from all previously reviewed literatures (more demands for healthcare facilities and consequently the construction boom) have strongly supported this finding as the early stage of the construction projects, including design and architecture phase, play an important role in strategic planning of the healthcare facilities. Thus, the finding regarding the importance of design and architecture disciplines within healthcare facilities cannot be considered as an unexpected outcome. Also, as there are actually plenty of various trends in healthcare facility design and architecture, further interdisciplinary studies are suggested in this regard.

Table 1 Analysis of findings

Organizations	Title						Location						Span			Driver																								Aim					
	General	Architecture	Design	Engineering	Management	Planning	England	Finland	Netherland	Norway	Scotland	Sweden	International	Europe	National	Advice	Advocacy	Article	Book	Case studies	Conferences	Congress	Course	Debate	Exhibition	Graduate Study	Journal	Newsletter	Presentation	Portal	Project	Report	Research	Review	Seminar	Study visit	Symposium	Thesis	Workshop	Construction	Design	Engineering	Finance	Management	Planning
Architects for Health		●					●								●			●		●		●		●	●					●		●			●	●	●			●				●
Commission for Architecture and the Built Environment (CABE)	●	●					●								●	●		●		●										●	●	●		●	●				●		●				
Chalmers Research Centre for Healthcare Architecture		●										●			●						●					●				●			●					●			●				
European Health Property Network (EuHPN)	●								●					●		●			●	●	●							●		●	●	●	●						●		●		●	●	●
Dutch Centre for Health Assets (DuCHA)	●								●						●	●						●				●				●			●		●			●			●	●	●	●	●
European Centre for Health Assets and Architecture (ECHAA)	●	●							●					●				●	●			●							●	●					●					●	●	●	●	●
Health and Care Infrastructure Research and Innovation Centre (HaCIRIC)	●						●								●						●	●		●				●	●	●		●							●	●	●	●	●	●
Department of Health (DH)-Estates and Facilities Management Division					●		●								●	●					●	●								●											●	●	●	●	●
Sykehusplan						●				●					●															●															●
Competence Network for Hospital Planning (CNHP)						●				●					●						●									●	●		●		●				●	●					●
Scottish Executive Health Department Property and Capital Planning (Capital Planning and Asset Management Division)					●	●					●				●	●														●				●								●	●	●	●
Health Facilities Scotland (HFS)	●										●				●	●							●							●												●	●	●	
International Academy of Design and Health			●									●	●			●	●	●	●			●				●	●			●			●	●			●	●			●				
Institute of Healthcare Engineering and Estate Management (IHEEM)				●	●		●						●								●	●	●		●		●			●				●								●		●	
Medical Architecture Research Unit (MARU)		●					●								●			●					●			●				●	●							●		●	●		●	●	●
Research Institute for Health Care Facilities (SOTERA)	●							●							●			●								●				●	●	●	●					●		●	●	●			
Total	7	5	1	1	3	3	6	1	3	2	2	2	2	2	12	7	1	6	3	3	6	7	3	2	2	5	2	2	2	16	5	5	6	3	7	1	2	5	3	4	12	8	8	9	10

Table 2

Architects for Health

Location	*England*
Geographical span	*National*
Aim/Vision/Mission	*"The aim of Architects for Health is to promote and campaign for better healthcare environments through bringing together individuals and organizations who share an interest in excellence in the planning and design of healthcare facilities."*

Drivers	• *"Events are wide ranging in scope and include joint events with clinical societies and royal colleges, or with representatives of organizations active in the procurement of health facilities. An event is held each year at the Reform Club to debate a topical issue such as design quality or the NHS plan, and one event each year has an overseas focus."*
	• *"Arrangements are made to visit health facilities at home and abroad including presentations and discussion with their designers and management."*
	  ○ *Awards and Exhibitions*
	  ○ *Debates and open discussions*
	  ○ *Study visits, tours and trips*
	  ○ *Congresses, symposium and seminars*
	• *"All AfH Events are CPD accredited. Furthermore, due to our status as a RIBA Linked Society, all Events are considered RIBA Events, and therefore attendees can claim double CPD points."*
	• *Publications and case studies. Some of their titles:*
	  ○ *Design for the Older Adult in the Acute Sector*
	  ○ *Doctors and Architects: Who needs the medicine?*
	  ○ *Patient-Focused Architecture for Health Care*
	  ○ *Integrated art: issues in the design of healthcare facilities*
	  ○ *Context, Challenge and Creativity: Designing for Acute Mental Healthcare*
	  ○ *Architects for Health: Sustainability in the Health Sector*

Table 3

Commission for Architecture and the Built Environment (CABE)

Location	*England*
Geographical span	*National*
Aim/Vision/Mission	*"We aim to influence the processes, structures, policies, skills and resources used to achieve well designed, successful places."*

Drivers	• *"We occasionally hold design workshops, or 'charrettes', where our enablers explore options together with chosen design teams."*
	• *"Enabling provides targeted professional advice at the early stages of projects for hospitals, community hospitals and LIFT buildings."*
	• *"We also support design champions in the Department of Health, Strategic Health Authorities, Primary Care Trusts and other bodies procuring health buildings."*
	• *"The fourth wave of LIFT projects are undergoing design review at CABE alongside several other health projects. We provide panelists for the NHS design review panel, which assesses all health building projects worth over £15 million."*
	• *"At the local level, we encourage local authorities, primary care trusts, those commissioning healthcare buildings and those commissioning services to talk to each other more."*
	  ○ *Joint events and seminars*
	• *"At the national level, we work on government reviews such as the Foresight and Marmot reviews. We advise on the role of the built environment in tackling health inequalities from obesity to mental health and wellbeing, as well as preparing for the challenges of an ageing society."*
	• *Lunched a new campaign named "Designed with care" to challenge existing way of working through in depth case studies.*
	• *Publications and case studies. Some of their titles:*
	  ○ *Future health: sustainable places for health and well-being*
	  ○ *Homes for our old age: independent living by design*

Table 4

Chalmers Research Centre for Healthcare Architecture

Location	*Sweden*
Geographical span	*National*
Aim/Vision/Mission	*"The vision of the Research Centre for Healthcare Architecture is to become a national arena for the creation, translation, exchange and dissemination of research-based knowledge on Healthcare buildings and environments."*
Drivers	• *"The Research Centre for Healthcare Architecture will conduct research and graduate studies and encourage education and training within the field of physical environments for care."* • *"The Research Centre for Healthcare Architecture will support the Swedish healthcare sector by providing research-based knowledge within Healthcare Architecture."* • *The Centre will also act as a platform for collaboration around knowledge-building among those who builds for Healthcare.* ○ *Held its first conference* • *The Centre will also be linked to the international research within Healthcare Facilities and ensure that new research continually are made available in Sweden.*

Note: The Centre will be part of Chalmers new area of advance - Built Environment. The establishment takes place in collaboration with Forum for Healthcare Building, which is cooperation between all Swedish county councils, a number of major municipalities and architectural firms active within Healthcare Architecture. The centre has not been established yet.

Table 5

European Health Property Network (EuHPN)

Location	*Netherland*
Geographical span	*Europe*
Aim/Vision/Mission	*"Our aim is to promote better standards of investment in, and management of, health property throughout Europe. Our network capability enables members to pool and share knowledge, and to keep pace with leading edge developments in this central area of health care."*

Drivers	• *"EuHPN acts as a hub for its members to exchange information, pool knowledge, and keep abreast of the latest developments concerning health property."*
	• *"EuHPN members are interested in learning from each other. To this end, the network holds an annual workshop, which takes place in a different country each year." Some of their titles are:*
	  ○ *Hospital planning priorities across Europe*
	  ○ *Innovation in medical and communication technology, and the impact on hospital planning*
	  ○ *Design and the healing environment*
	  ○ *Strategic Asset Planning and master planning*
	  ○ *Designing for the user.*
	• *"Some member organizations are able to offer an advisory service."*
	• *"From time to time members come together to take part in collaborative research or to engage in joint European projects."*
	• *Joint events and conferences.*
	• *Publications such as newsletters, reports and books. Some of their titles:*
	  ○ *A series of case studies from across Europe, each illustrating a core issue facing those investing in hospitals and other health facilities*
	  ○ *Developments in primary care provision*
	  ○ *A review of capital financing across the Europe*

Table 6

Dutch Centre for Health Assets (DuCHA)

Location	*Netherland*
Geographical span	*National*
Aim/Vision/Mission	*"The aim is to maintain and establish our organization (as part of TNO) as THE knowledge centre for healthcare buildings."*

Drivers	• *generation of innovation*
	  ○ *Portal healthcare and design* ***to download information about Healthcare, Architecture, Design, Legislation, Costs and Tools.***
	• *"The Centre delivers advisory services ((strategic) planning, design and costing)"*
	  ○ *Strategic advice-Hospitals*
	  ○ *Strategic advice-Care for elderly*
	  ○ *Plan check/Plan support*
	  ○ *Strategic property advice*
	• *"DuCHA offers a broad program on seminars and congresses.*
	• *Master classes*
	• *Conduct research on quality healthcare buildings*
	• *Healing environment measurement*

Table 7

European Centre for Health Assets and Architecture (ECHAA)

Location	*Netherland*
Geographical span	*Europe*
Aim/Vision/Mission	*"Its mission is to support and promote evidence-based policy decisions related to the contribution of the built environment to the health sector, by means of comprehensive and rigorous analysis of what works and what does not. The Centre is committed to working for the public good and will provide a new forum for reviewing European and global experience, uniting academic and practical expertise, as well as creating a link with the Private Sector."*

Drivers	• *Seminars*
	• *Congresses*
	• *Presentations*
	• *Publication such as books and articles*
	• *"In general ECHAA's work will cover the following areas:*
	  ○ *Strategic capital planning for service needs*
	  ○ *Concept development*
	  ○ *Life-cycle economics*
	  ○ *Economic, social and environmental sustainability*
	  ○ *Health architecture and design*
	  ○ *Technology including IT interface of healthcare capital assets*
	  ○ *Capital procurement and financing*
	  ○ *Project implementation*
	  ○ *Facilities management*
	  ○ *Wider economic and social impact of healthcare capital assets*
	  ○ *EU Structural Funds and other capital funding"*

Table 8

Health and Care Infrastructure Research and Innovation Center (HaCIRIC)

Location	*England*
Geographical span	*National*
Aim/Vision/Mission	*"The centre's purpose is to deliver research findings which will be instrumental in ensuring this investment achieves its full potential by improving the way infrastructure is planned, delivered and managed."*

Drivers	• *Congresses, conferences, seminars, Presentations and debates*
	• *Publication such as repots and newsletter*
	• *"HaCIRIC's focus is on the underlying built and technical infrastructure for health and social care, and the interaction between this infrastructure and change and innovation in care services."*
	• *"HaCIRIC has identified four core collaborative areas for research:*
	  ○ *Stimulating innovation through finance and delivery models: This area of work looks at how procurement, contractual and financing models – along with targets and incentives - influence innovation in healthcare infrastructure and services.*
	  ○ *Managing change and innovation: This area of work aims to ensure that HaCIRIC's mission of innovation as normal business' becomes a reality. So we have developed projects to understand how to support better the adoption, spread and sustainability of innovations in healthcare services and infrastructure systems. We want to understand how innovative capacity can be maximized and translated into better healthcare for patients.*
	  ○ *Innovation impacts - outcomes and value: This area of work develops new ways to capture the potential and realized value delivered by innovative infrastructure and services. It fosters a better understanding of the relationship between health outcomes and innovation in infrastructure and services. This knowledge is critically important for planning services and infrastructure.*
	  ○ *Design and decision making: Decisions on new healthcare services often seem to be made with little evidence of their potential impact on building service performance, occupancy, patient wellbeing and care outcomes. We need more integrated approaches to planning healthcare infrastructure and services."*

Table 9

Department of Health (DH)-Estates and Facilities Management Division

Location	*England*
Geographical span	*National*
Aim/Vision/Mission	*"Strategic development of a flexible and responsive environment for health and social care, delivering improved health outcomes through innovative estates and facilities solutions which enable high quality, safe patient care. "*

Drivers	• *Congresses and conferences and also Publication such as repots and newsletters*
	• *Their works cover the following areas:*
	  ○ *"The Design and Costing section provides leadership and expertise to help improve the design of the healthcare built environment. Information available covers design guidance and standards, capital investment and costing advice."*
	  ○ *Engineering, technology and environment: DH Estates and facilities aims to support and facilitate, at a local level, best in class physical environments for health care to support the delivery of improved clinical and social outcomes as outlined in High Quality care for All and current NHS Operating Framework clinical delivery targets.*
	  ○ *Knowledge and information: DH Estates and Facilities produces guidance for NHS organizations and individuals with an interest in land, property, equipment and facilities. This information can be used to support the effective management and utilization of property and equipment and procurement of new buildings.*
	  ○ *Property management*
	  ○ *Specialist property advice: DH Estates and Facilities provides specialist property advice and guidance to ministers and the Department of Health. In addition, it supplies best-practice guidance to NHS organizations in England on all aspects of managing their land and property.*
	  ○ *Strategic Health Asset Planning and Evaluation (SHAPE): Strategic Health Asset Planning and Evaluation (SHAPE) is a web-based, planning software application aimed primarily at Strategic Health Authorities (SHAs) and Primary Care Trusts (PCTs)."*

Table 10

Sykehusplan

Location	*Norway*
Geographical span	*National*
Aim/Vision/Mission	*"Sykehusplan.no is primarily an arena for exchange of experience and information concerning hospital planning and hospital development in Norway. We also hope to become an information vehicle for the international hospital planning community."*
Drivers	• *"Sykehusplan.no wants to communicate with regional health authorities and local health trusts, research communities, user groups in hospital projects, hospital planners and consultants, contractors, decision-makers and politicians."*

Table 11

Competence Network for Hospital Planning (CNHP)

Location	*Norway*
Geographical span	*National*
Aim/Vision/Mission	*"The goal of the CNHP is to contribute to competent and efficient planning, development and construction of somatic and psychiatric hospitals and other health care buildings through information and exchange of experience."*
Drivers	• *develop and operate the web portal sykehusplan.no* • *gather and communicate competence between hospital projects and planning communities* • *develop co-operation with specialist environments and research communities, nationally and internationally* • *develop and spread guidance material* • *assist in evaluation and approval of hospital projects* • *initiate and implement conferences, workshops and seminars on hospital planning* • *initiate and implement research and development projects within hospital planning*

Table 12

Scottish Executive Health Department Property and Capital Planning (Capital Planning and Asset Management Division)

Location	*Scotland*
Geographical span	*National*
Aim/Vision/Mission	*"To advice on all asset management matters impacting upon the Health Directorates responsibilities for NHSScotland."*

Drivers	• *"Capital Planning and Investment*
	  ○ *Responsibility for the Health Directorates capital planning policy and strategy for NHSScotland including inputs to the 2 yearly comprehensive spending reviews, the development and maintenance of a 5 year capital plan, the monitoring of capital investment and the provision of policy guidance in respect of the management and approval procedures for projects."*
	• *"Asset Management*
	  ○ *Advice on all asset management matters impacting upon the Scottish Government Health Directorates responsibilities for NHSScotland. This requires the ongoing and periodic review of existing asset management related policies and strategies which are designed to make best use of NHSScotland physical assets and to provide an appropriate quality of healthcare facilities which complement and support the wider health policies and priorities of the Scottish Government. Particular areas of policy responsibility are:*
	  ▪ *Property Transactions*
	  ▪ *Property Management*
	  ▪ *Fire Safety*
	  ▪ *Environmental Management*
	  ▪ *Design Quality*
	  ▪ *Car Parking | Travel Planning*
	  ▪ *Provision of Single Room Accommodation and Bed Spacing"*

Table 13

Health Facilities Scotland (HFS)

Location	*Scotland*
Geographical span	*National*
Aim/Vision/Mission	*"To deliver and co-ordinate effective advice, guidance and support in relation to national facilities, equipping and technical matters which support and improve health and wellbeing services in Scotland."*

Drivers	• *"Property and capital planning:*
	  ○ *establish professional and technical standards, introduce best practice procedures and new technologies / innovations that will support NHS Boards to achieve their operational targets*
	  ○ *deliver a wide range of courses as part of the National Education and Training Program*
	  ○ *developing guidance specific to NHSScotland in Developing an Estates Strategy, Estate code and providing an Asset Management System*
	• *Engineering and environment:*
	  ○ *HFS promotes sustainability in the provision of healthcare by providing a framework within which healthcare bodies can measure, manage and prioritize their environmental performance.*
	  ○ *HFS also works with colleagues to develop management tools which enables organizations to measure their level of compliance with a range of aspects of legal compliance and produce a simple prioritized high-level summary for consideration at board level*
	• *Facilities services:*
	  ○ *providing professional technical input to the development and implementation of national policy in the fields of catering services and telecommunications*
	• *Equipping and technical:*
	  ○ *constantly researching new products, examining new services and using our impressive purchasing power to deliver economy of scale savings*
	• *Business services:*
	  ○ *Business Services provides Health Facilities Scotland with a full range of confidential administrative and secretarial support services, effective financial management."*

Table 14

International Academy of Design and Health

Location	*Sweden*
Geographical span	*International*
Aim/Vision/Mission	*"The vision of the International Academy for Design & Health is to develop and disseminate knowledge within international communities through the promotion and advocacy of high quality 'research-based' design and professional practice in the development of physical environments and technologies that improve human health and wellbeing."*

Drivers	• *"Master programs in "Design and Health"*
	• *Research projects, some of their topics are:*
	  ○ *Health Supportive Design in Elderly Care Homes: Swedish Examples and their implications on Korean Counterparts*
	  ○ *Health Promotion by Design in Elderly Care*
	• *Congresses and Symposium*
	• *Advocacy*
	  ○ *International academy award*
	  ○ *Advocating the value of design in the international healthcare and architectural press*
	  ○ *Advocating improvements in standards and guidelines for healthcare infrastructure*
	• *architectural consultancy and design review*
	• *Publications*
	  ○ *The world's first journal dedicated research and practice in the field of design & health*
	  ▪ *World Health Design*
	  ○ *The latest books published around the world in the field of design & health*
	  ▪ *UK Healthcare Design Review*
	  ▪ *Design & Health IV- Future Trends in Healthcare Design*
	  ○ *The latest research papers in the field from around the world "*

Table 15

Institute of Healthcare Engineering and Estate Management (IHEEM)

Location	*England*
Geographical span	*International*
Aim/Vision/Mission	*"The Institute is established for the public benefit to promote the art and science of Healthcare Engineering and Estate Management and to advance research, education and training."*

Drivers	• *Awards and Scholarships*
	  ○ *Lifetime Achievement Award*
	  ○ *John Bolton Memorial Award for Excellence in the Field of Education and Training*
	  ○ *Lucas Scholarship Award for Significant Contribution to Branch Activities*
	  ○ *William E Schall Award for Excellence in Medical Technologies*
	• *Publications*
	  ○ *Health Estate journal*
	• *CDP approved courses and seminars*
	• *Congresses and Conferences*
	• *Exhibitions and meetings*
	• *Some of their titles are:*
	  ○ *Patient safety innovation in complex healthcare systems*
	  ○ *Planning to achieve Carbon Reduction Targets for Healthcare Premises - Practical Information and Guidance*

Table 16

Medical Architecture Research Unit (MARU)

Location	*England*
Geographical span	*National*
Aim/Vision/Mission	*"Our vision is to explore the interface between health service organizational culture and the built environment response. The core of our knowledge is the best thinking from around the world about architecture for health care."*

Drivers	• *"MSc Planning Buildings for Health: with our colleagues in the Department of The Built Environment, we offer a multi-disciplinary course for health design and construction professionals who are involved in or wish to be involved in the planning and construction or development of buildings for healthcare delivery."*
	• *"We have established a training program developed in partnership with overseas government agencies and academic institutions."*
	• *"We have a number of master classes under development that will be lead by industry and professional leaders in the UK. It is intended that these will provide CPD updating for alumni and CPD accreditation will be arranged.*
	  ○ *Capital Investment Manual Process*
	  ○ *Procure 21 and partnering*
	  ○ *Leadership*
	  ○ *Performance specification*
	  ○ *Sustainability*
	  ○ *Design Champions"*
	• *"MARU provides valuable expertise through the complete life-cycle of buildings for health care, from strategic analysis of health care provision, project briefing, design strategies, through to evaluations."*
	• *"Publications and studios: Our publications cover the wide spectrum of planning, management, and design of buildings for healthcare.*
	  ○ *Art and Architecture in Acute Hospitals*
	  ○ *Evaluation of design quality in selected PFI Hospitals*
	  ○ *Designing for primary care: a resource"*

Table 17

Research Institute for Health Care Facilities (SOTERA)

Location	*Finland*
Geographical span	*National*
Aim/Vision/Mission	*"The Institute's area of research is basic technology in the social and health sector, i.e. design and construction of buildings, related telecommunications technology, information technology and automation of operations as well as instrument technology."*

Drivers	• *"The Institute carries out basic and applied research, publication of topical literature and various expert assignments."*
	  ○ *Development of spatial solutions and equipment that support the independent living of the elderly at home - IKU*
	  ○ *Development Project for Finnish Health Care Property (VALSAI)*
	  ○ *Evaluation and Development of Housing for the Disabled - KEVÄT*
	  ○ *Technology based solutions to support the elderly, TAAS*
	• *"SOTERA publishes reports and articles related to its ongoing research projects."*
	• *Bachelor's theses, doctoral dissertations, licentiate theses and Master's theses related to research projects are completed in the Institute.*

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