



## **Defining specific problems in the thai government hospital buildings. A study of architectural planning and space management of maharaj hospital, Chiang Mai Thailand**

**Prugsiganont, Supuck; Jensen, Per Anker**

*Publication date:*  
2017

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*

Prugsiganont, S., & Jensen, P. A. (2017). *Defining specific problems in the thai government hospital buildings. A study of architectural planning and space management of maharaj hospital, Chiang Mai Thailand*. Paper presented at Salford University's International Research Conference: Shaping Tomorrow's Built Environment: Construction and Design for the Modern World, Manchester, United Kingdom.

---

### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# DEFINING SPECIFIC PROBLEMS IN THE THAI GOVERNMENT HOSPITAL BUILDINGS. A STUDY OF ARCHITECTURAL PLANNING AND SPACE MANAGEMENT OF MAHARAJ HOSPITAL, CHIANG MAI THAILAND

Supuck Prugsiganont, Per Anker Jensen

*DTU Management Engineering, Technical University of Denmark*

Email: [prug@dtu.dk](mailto:prug@dtu.dk)

## **Abstract:**

The purpose of this paper is to present and analyse the preliminary results of field work observation in one of the biggest government hospitals in Thailand – the Maharaj Hospital, Chiang Mai, Thailand. Hospitals in Thailand are the result of the imported concept from the European and American hospitals. The ideas of hospital architecture from Western countries have been adopted since nineteenth century until the contemporary period. Many of the Thai government hospitals constructed between 1960s and 1970s are still in use. The government hospitals are expanding (incremental development) without considering long term effects in the hospital planning. Therefore, this study investigated what are the factors that cause the incremental development of medical buildings in the Thai government hospitals. Moreover, this study investigated the current situations in a Thai government hospital (Maharaj hospital) where the hospital spatial arrangement is effected by the incremental development. The methodology of this study is done by reviewing literature of the Thai hospital landscape, building assessment tools such as Usability, Space management, and USEtool concepts. Later, an empirical survey (walk-through observations) is conducted to explore daily situations in the Maharaj Government hospital where the hospital is facing the incremental development. Data was collected by documentation such as architectural drawings and photographs and architectural plan analysis was implemented to analyse the spatial arrangement of the Maharaj Hospital planning and identify problems caused by the incremental development. This paper synthesize the findings from literature review of the Thai healthcare context and a walk-through observation in Maharaj hospital. According to the review of the Thai healthcare general context, there are three main factors that cause the incremental development of the hospital buildings (1) the lack of local general practitioners and poor services of primary care offered by community healthcare centers (2) limited number of government hospital (3) the implementation of Thailand's universal coverage scheme. These three factors resulted in an easy access to government hospitals and dramatically increase of patient number. Therefore, hospitals need to expand to enabler sufficient services for the high number of patients. Walk-through observations identify and emphasis the effects caused by the incremental development of hospital buildings. The results from empirical survey show that confusion of way-findings and the overlapping between waiting areas and non-clinical areas are the problems caused by the incremental development. The problems caused by incremental development was created by two factors (1) the lack of planning in hospital architecture (2) the lack of integration of the Thai culture in hospital design.

**Keywords:** government hospital, incremental development, walk-through observation, plan analysis, Thailand

## **1. INTRODUCTION**

The development of hospital landscape, medical treatments, and hospital architecture in Thailand is influenced by the Western countries (Sarnpracharat, 1977; Seangwichean, 1988; Jungsteansup, 2016). This concept has begun since the beginning of nineteenth century and has never stopped. Nowadays Thailand provides public and private hospitals, both are under the authorization of the ministry of public health.

The healthcare industry is becoming more important around the world due to the raise of elderly population including Thailand. The Thai government plans to spend 2,865 billion Baht (7 billion Euros) on healthcare infrastructure (Thai Bureau of the Budget, 2015) between 2016 and 2018. Part of the budget will be spent on hospital construction (2.8 billion Euros). Thus, the government expects to constantly increase a long-term allocated budget (2016 to 2025) on healthcare and public health in order to improve the country's healthcare infrastructure.

The interests regarding hospital design including existing and new hospitals in Thailand has been raised due to the increase of allocated budget on healthcare construction. Moreover, modern trends of facilities planning has also become popular. The trends have been used as major strategies among healthcare facilities planners and professional practices in the past twenty years (Becker & Parsons, 2007). The focus of hospital design has shifted from building function to users, especially patients and staff. Moreover, Hamilton, (2003) stated that the design decisions based on information available from research is the best way to improve organization's clinical outcomes, economic performance, productivity, customer satisfaction, and cultural measure.

This paper focuses on related literature review of the Thai healthcare landscape and field work observations on Maharaj hospital Chiang Mai, Thailand. The review of literature and observations will present the current situation and also the problems in the Thai hospitals. The results from assessing the current physical settings of Maharaj hospital and the study of how the hospital has developed will illustrate a clearer view of the hospital architecture. Therefore, the suitable hospital design trends can be applied in order to improve the architectural problems in the Thai hospital.

### **1.1 Problem statement of this study**

The purpose of this study is to have a better understanding regarding the general context of Thailand healthcare system and therefore the purpose of the study leads to problem statement of this study which are what is the general context of Thailand healthcare landscape and why the government hospitals are expanding rapidly what is the cause of the incremental development?

### **1.2 Research questions**

- 1) What cause the incremental development in government hospitals?
- 2) What is the current situation in the hospitals that are encountering the rapid expansion?
- 3) What is the resulted caused by the incremental development of the hospital buildings?

### **1.4 Aims – this study aims to;**

- 1) Identify factors that cause the rapid expansion of the government hospitals in Thailand
- 2) Collect preliminary data through a walk-through observation to experience the actual everyday situation in the Maharaj Government hospital
- 3) Identify problems that caused by the incremental development of the government hospitals

## **2. THEORY AND METHODOLOGY**

This study is based on the literature review of the overall context of Thai healthcare system and an empirical survey with walk-through observations. Main purpose of the study is to identify factors which cause the incremental development of the hospital buildings and the way to improve the physical settings of the Thai government hospitals that comply with the context of the Thai local culture. Therefore, the Usability, Space Management, USEtool concepts have been employed for this study.

### **2.1 Usability**

The usability concept stemmed from the evaluation strategies of consumer software products which involve user interfaces (Fronczek-Munter, 2016). The concept is a new paradigm that can be used to assess each individual satisfaction and their opinion toward the products.

Fronczek-Munter, 2016 stated that the concept of Usability in the field of architecture is known and often translated as functionality. However, some researchers claimed that there is a distinction between functionality and usability, the functionality in the building industry is objective measurable, whereas usability introduces the subjective view of users (Alexander ,2006, 2008, 2010; Jensen, 2010; Fronczek – Munter, 2011 stated in Fronczek- Munter, 2016). Therefore, the concept of usability can be used to evaluate the building differently depends on the groups of users. Nonetheless, the Usability depends on other major factors which includes context, culture, situation, and experience (Alexander 2008, 2010; Fronczek-Munter, 2016).

### **2.2 Space Management**

Space Management (SM) is an essential aspect of Facility Management (FM) (Tinsfeldt & Jensen, 2014). The purpose of FM is to support and improve the effectiveness of the primary processes in an organization whereas SM is the concept of management space in facilities (CEN, 2006 stated in Tinsfeldt & Jensen, 2014). The main purpose of FM concept is to add value and optimize the use of space. Tinsfeldt & Jensen have defined the meaning of space optimization as there are two different approaches of the concept. A quantitative approach focuses on space utilization in terms of cost reduction and maximize the use of space whilst a qualitative approach aims to change the way that space is used to improve the effectiveness of the primary processes. Value Adding Space Management is the combination between the qualitative and qualitative approach of space utilization.

### **2.3 USEtool Evaluation usability**

USEtool is the evaluation method used to evaluate the usability of building the concept stemmed and developed from the research project of Norwegian University of Science and Technology (NTNU) (Hansen; Blakstad & Knudsen, 2011). The USEtool focuses on the performances and effectiveness of the usability of the building. The tool can be a useful methodology for the Facilities Management field in large organization or complex projects to evaluate their facilities together with the users (Tinsfeldt & Jensen, 2014). The essential part of USEtool is a facilitated walk-through in the buildings followed by a workshop together with users ((Hansen; Blakstad & Knudsen, 2011).

This study combines different methods which includes literature review regarding the generic context of Thai healthcare system the selected methodologies of usability, space management, and USEtool (a walk-through survey). Thus, a walk-through survey will give a clear view of the real situation in the government hospitals (Maharaj hospital) and a clear focus regarding the problem in the hospitals with the incremental development. However, the core of this study is to determine factors that cause incremental development and the effect of this development in the government hospitals (in this case Maharaj Hospital).

The research approach consisted of two parts; the first part is the review of general information of Thai healthcare system and its current situation. The second part is the empirical observation (a walk-through survey) of Maharaj Chiang Mai Hospital

The tool of the empirical research is the synthesis between three building evaluation concepts (Usability, Space management, and USEtool) and a walk-through survey. Thus, several walk-through routes were conducted regarding patient perspective. The walk-through routes include: out-patient department and in-patient department. Besides the walk-through survey hospital plans and blue prints were collected for architectural plan analysis; this methodology is well-known for the architectural research (Phaholtep, Sawadsri & Skates, 2016; Lantaron, 2016; and Verma, 2016). Architectural plan analysis is an efficient and a notable methodology used by many architects to present and understand the architectural design (Cabrero & Blas, 2012 stated in Vermo, 2016). Different type of drawings which include plan analysis have been used for a better analysis for selected cases and as a common code on results presentation (Vermo, 2016). An architectural plan analysis was used in this study to analyze spatial arrangement of existing buildings; it is important to understand the impact of physical environment between users and spatial arrangement of the building (van der Zwart and etc, 2016). Three out of five architectural plans (Boonsom Martin, Sujinno, and Tawan buildings) had to be digitally redrafted by the researcher from the original blue print, because the plans were originally drawn by hand in the 70s.

A walk-through survey took place in Maharaj Government hospital Chiang Mai Thailand. The hospital is one of the large scale teaching hospitals in Thailand where it provides 1,500 bed in the inpatient department (Ministry of Public Health Thailand, 2016). Thus,

Architectural plan analysis of the hospital observation in Maharaj hospital will define a future research focus and problems in the Thai government hospitals where the incremental development occurred. This paper briefly summarized the general context of Thai healthcare system and the empirical findings. The main focus of this study based on the results of the walk-through observations where the survey will present current situation in Maharaj hospital.

### **3. REVIEW OF GENERAL CONTEXT OF THAI HOSPITAL LANDSCAPE**

According to literature review of the general context of Thai hospital landscape, there are three main factors of the Thai healthcare system that cause an incremental development of the hospital buildings.

**1.) The lack of local general practitioners and poor services of primary care offered by community healthcare centers:** primary healthcare services in rural districts of the country provided by small local healthcare centers. However, the acceptability of local health centers

as first line facilities is poor, when compared with the competing hospital-based services: all hospitals (community until large) provide all services including primary care, which is also available at local health centers (Srivanichakorn & Van Dormael, 1998; Pongpirul & Starfield, 2009; Prakongsai *et al.*, 2009; Guinea & Sela, 2015; Satayavongtip, 2016). Moreover, the Ministry of Public Health Thailand has not launched strict regulations that every citizen is obliged to go to a local health center for primary care services (Ministry of Public Health, 2016). Therefore, people prefer to go to government hospitals, where the medical expenses are fully covered by government universal coverage welfare and social security service scheme (Srivanichakorn & Van Dormael, 1998; Satayavongtip, 2016). Furthermore, Thai people have strong belief that community hospitals are fully equipped with equipment and can, therefore, perform better treatment. According to the report of Ayutthaya Research Project (1990) doctors attending community hospitals at the out-patient department stated that 230 out of 442 cases (52%) could have been adequately treated at a local health center. Thus, government hospitals are overloaded with patients with simple problems. The daily routine in government hospitals is often chaotic. Hospitals are inefficient due to the overwhelm of number of patients with simple problems (Van Lerberghe & Lafort, 1990; Pongpirul & Starfield, 2009). Therefore, it is difficult to promote and improve health care service and hospital physical environment due to the lack of general practitioners and poor services of primary care of local healthcare centers.



*Figure 1: Everyday situation at Siriraj Hospital (government hospital)*  
([http://www.bloggang.com/mainblog.php?id=tipsyg&month=26-07-15\)2009&group=14&gblog=1](http://www.bloggang.com/mainblog.php?id=tipsyg&month=26-07-15)2009&group=14&gblog=1))  
retrieved on November 10, 2016



*Figure 2: Everyday situation at Maharaj Hospital*  
Taken by: Supuck Prugsiganont  
(February 10, 2015)

**2.) Limited number of government hospitals:** major hospitals are usually situated in the cities (mono centric location). There are 202 government hospitals however, 78 hospitals are located in Central Thailand where 60 (77%) of these hospitals are based in Bangkok (Ministry of Public Health report, 2016). Nonetheless, there are only eight main hospitals in Chiang Mai the second largest city and less in small cities and suburb areas. Therefore, the ratio between number of hospital and its patients is 1: 320,000 from total Thai population 65.9 million ([http://stat.bora.dopa.go.th/stat/y\\_stat58.htm](http://stat.bora.dopa.go.th/stat/y_stat58.htm) retrieved: 15 January, 2106). People from rural districts commute into the cities in order to visit hospitals. As consequences hospitals are always overcrowded.

**3.) The implementation of Thailand's universal coverage scheme:** the scheme has been introduced to the country in 2002. Thailand's universal coverage scheme (UCS) has directly impacted on healthcare access among Thai citizens; the scheme has given Thai people an easy access to healthcare services and utilization since it was first implemented in the last decade (WHO Report Background paper, 2010; Limwattananon, 2011; Pake & etc, 2016). Pake, Meemon, and Wan, (2016) stated that the implementation of universal coverage scheme (UCS) has impacted on health-seeking behavior. The number of patients has increased; especially the number of low-income, vulnerable, and female patients. This resulted in two major aspects; accessibility (such as a long waiting queue or transportation; hospital wards that are overloaded with patients) and acceptability issue (low service quality and dissatisfaction) (Limwattananon & etc, 2007; Damrongplasit & Melnick, 2009; Kirdouang, 2011; Limwattananon & etc, 2011; Health Insurance System Research Office, 2012; Limwattananon, 2013; Pake, Meemon, Wan, 2016). Hospital wards are overloaded with patients.

These three factors are the general context of Thailand's healthcare landscape which includes financing of Thai government hospitals, structure of governmental hospitals, and healthcare services provided by the Thai government which caused the imbalance between the number of hospital and patients. Easy access to government hospitals resulted in a high number of patients and therefore, government hospitals are expanding rapidly causing incremental development of the hospital buildings.

## **4. RESULT FROM WALK-THROUGH OBSERVATIONS AT MAHARAJ HOSPITAL**

### **4.1 General information of Maharaj Chiang Mai hospital**

Maharaj Chiang Mai hospital was established in 1956 as an academic hospital of Chiang Mai University (Faculty of Medicine Chiang Mai University). Three years later, the Thai government with Chiang Mai municipality saw the significance of a regional hospital. Therefore, in 1959 Maharaj Chiang Mai Hospital was founded (Faculty of Medicine Chiang Mai University, 2009). According to the record of the hospital the first main building was constructed in 1972 and still in use as a main medical building for the whole hospital compound. The hospital expands throughout the years nowadays, there are five main medical buildings in the hospital compound (table 1).

*Table 1: List of medical buildings in Maharaj hospital and year the buildings constructed  
source: Faculty of Medicine Chiang Mai University, 2009*

<b>Buildings</b>	<b>Built</b>	<b>Number of floors</b>
Boonsom Martin	1972	8
Tawan	1975	6
Sujinno	1984	15
Sriphat	1994	15
Charempabaramee	2006	15

*\*remark: all the buildings named after important professors and people of Chiang*

Maharaj hospital, is the largest hospital in the Northern part of Thailand with 1,500 beds, and it is one of the most important government hospitals in the country. Moreover, the hospital is the affiliation between the Ministry of Public health Thailand and Faculty of Medicine Chiang Mai University and as part of a teaching hospital. It provides primary, secondary, and referral treatments.

The hospital compound contains several medical buildings which include; educational buildings, medical service buildings, and a parking building. Each medical building offers different type of medical services.

## **4.2 Current state of Maharaj Hospital**

As mentioned previously, there are five main medical buildings in Maharaj hospital. The buildings were added up randomly, where there was an empty space. Moreover, the incremental development of hospital buildings was done without long term planning. The functions in the hospital have been changed and remodeled several times in order to adjust to the present stage of the medical functions and services. The incremental development of hospital buildings stemmed from the dramatically increase of patient number in the past twenty years. According to the statistic record of the Thai Public Health, the number of patients between 1992 and 2012 has increased from 3.7 to 12 million (Ministry of Public Health Thailand, 1992 - 2012), while the number of inhabitants has only increased from 58 to 67 million. In the year 2015, the outpatient department of Maharaj hospital served 1.2 million people (Maharaj Hospital, 2015). Therefore, the hospital is always chaotic and crowded.

Waroonkul and Jenjapoo (2016) did an evaluation study regarding healing environment medical wards in Maharaj hospital. The evaluation results, which examined the assessment from patients and the visitors of the medical ward, was rated as poor. Spatial layout criteria of the hospital received the lowest evaluation score (rated as poor) especially (1) unclear sign of telling paths and (2) distance between medical wards. Therefore, the investigation of Maharaj hospital by a walk-through observation will provide more precise information that can underpin the specific problems in the government hospitals. Moen, (2014) stated that a walk-through survey is of great methodology to evaluate the work environment. Moreover, important decisions can be made based upon the results from the walk-through inspection (Green & Thorogood, 2014).

Eight walk-through observation routes were conducted; three routes in outpatient department (OPD) and five routes in inpatient department (IPD). Nevertheless, in this paper only five different routes were analyzed (1) walk-in patient (2) patient with appointment (3) patient appointed to specialize clinic (4) walk –in patient (inpatient department) (5) specialize clinic (inpatient department); these routes are complex routes which happens as daily routes in the hospital.

## **4.3 Results from walk-through observations**

A walk-through survey gives overview and in-depth information regarding the spatial arrangement (non-clinical spaces and medical wards) in Maharaj hospital. Moreover, this methodology provides users experience and usability related to selected topics (Hansen & etc, 2011 Fronzcek- Munter, 2013; Tinsfeldt & Jensen, 2014) where the effect caused by the incremental development of government hospital is the main focus of this study.



The results of walk through routes show that the routes are complex and confusing. There are several areas that overlapped; wayfinding and orientation are difficult to find, because all the buildings are connected. There are routes that the patients have to walk outside the buildings to enter another building without signage. The analysis is divided in two different parts; the OPD department (walk-in patient, patient with appointment, patient appointed to special clinic) and the IPD department (walk-in patient, specialize clinic); figure 5 illustrates architectural legends of each medical ward and area while figure 3 & 4 illustrate diagrams of the walk-through routes.

- **OPD walk-in and patient with appointment route:** there is no signs or clear information stating where is the main outpatient department/entrance or where is the registration area. Patients have to walk from the parking building to the hospital compound, which is approximately one kilometer. Because there is no clear sign most of the time, patients have to walk to the information center for the information regarding the route.

Way-finding is difficult due to the lack of the signage and the overlapping of the areas. Figure 6 explains the route of the walk-in/patient with appointment route; the red-line explains the route, where patients have to go since they are registered until discharged. It is clear that the overlapping areas (waiting areas with non-clinical areas) and disorganized or medical wards due to the incrimination of the buildings, create chaotic and inefficiency patient flow. For example: patients have to walk through restriction areas such as x-ray rooms and laboratories, before they could reach registration areas of outpatient department.

OPD Patient with the appointment route is also similar to the OPD walk-in route however, they do not have to go through the intake areas. Patients can directly go to the registration point. However, the route is still confusing with the lack of signage, too many overlapping areas, and unorganized medical functions.

- **OPD specialized clinic route:** the problems of the OPD specialized clinic route is very much alike the OPD walk-in route; no clear signage, several overlapping areas, unorganized medical wards due to the incrimination of the buildings. Nonetheless, the route is more complex due to the location of specialized clinics where the clinics located in four different buildings. This creates confusing way-finding to new patients regarding how to get from the registration point to the specific wards. Patients are obliged to walk from one to another building without any clear signs indicating where or which direction they have to go. Consequently, they often get lost. It is also difficult for vulnerable group of people, due to the distance that they have to walk to different buildings (figure 6 illustrated a walk-through route from a parking building until patients are discharged).

- **IPD walk-in patient route:** the IPD walk-in route is the most confusing route among the five walk-through survey routes. Before admitted, walk-in patients are required to register as a normal patient at the outpatient department. Thus, doctors will make the decision based on each individual case whether he/she is allowed admission. The process involves a lot of walking; begins with the registration point at the OPD department, if further examine is needed; patients have to walk to a laboratory or x-rays room. If a doctor requests a bed for the patient, then the patient needs to register as an IPD patient and later, they will be transferred to patient rooms which are located in four separate buildings. The location of the rooms depends on the treatments or patient deceases. Maharaj hospital offers both single bed and multi bed patient room. The most difficult route is the walking route from the registration areas to patient room which located in different buildings and different floors;

without any clear sign. Moreover, IPD patients share the route with OPD patients such as; elevators, corridors; waiting areas. The overlapped areas and routes create even more confusion in way-finding.

**- IPD specialized clinic route:** the route is similar to OPD specialized clinic route unless, the doctor made a decision that patients needed to be admitted to the hospital, then patient needs to go to the registration point again to register as inpatient department patient. The IPD specialized clinic route then share similar process as the IPD walk-in patient route.

#### OPD PATIENTS ROUTE SPECIALIZE CLINIC

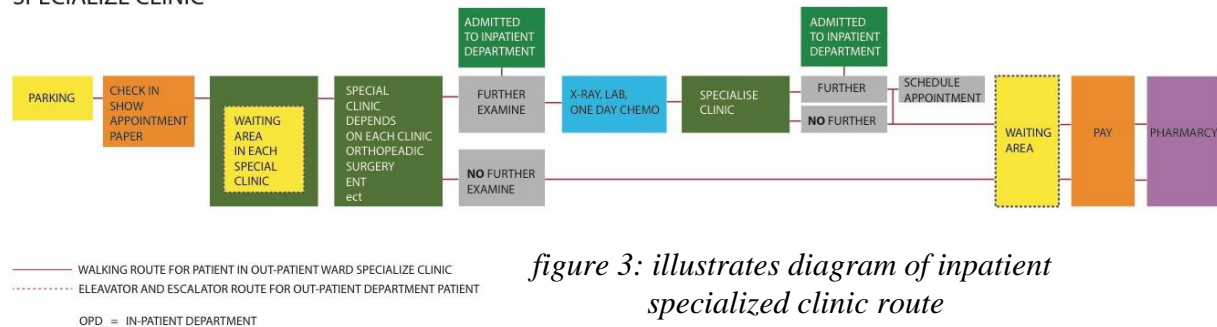


figure 3: illustrates diagram of inpatient specialized clinic route

#### IPD PATIENT ROUTE WALK- IN PATIENT ADMITTED TO IPD WARD

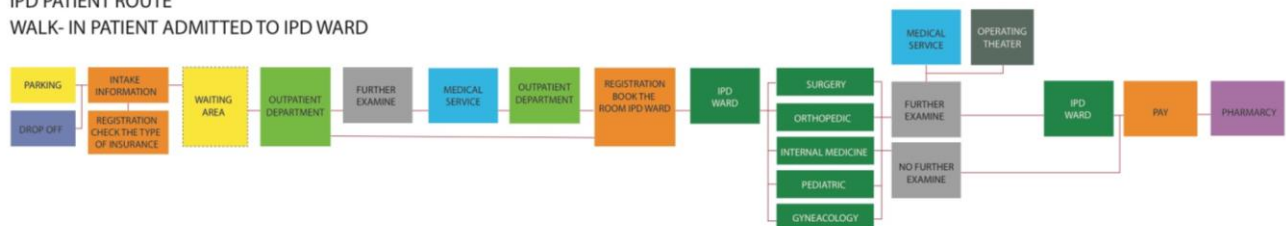


figure 4: illustrates diagram of inpatient specialized clinic route

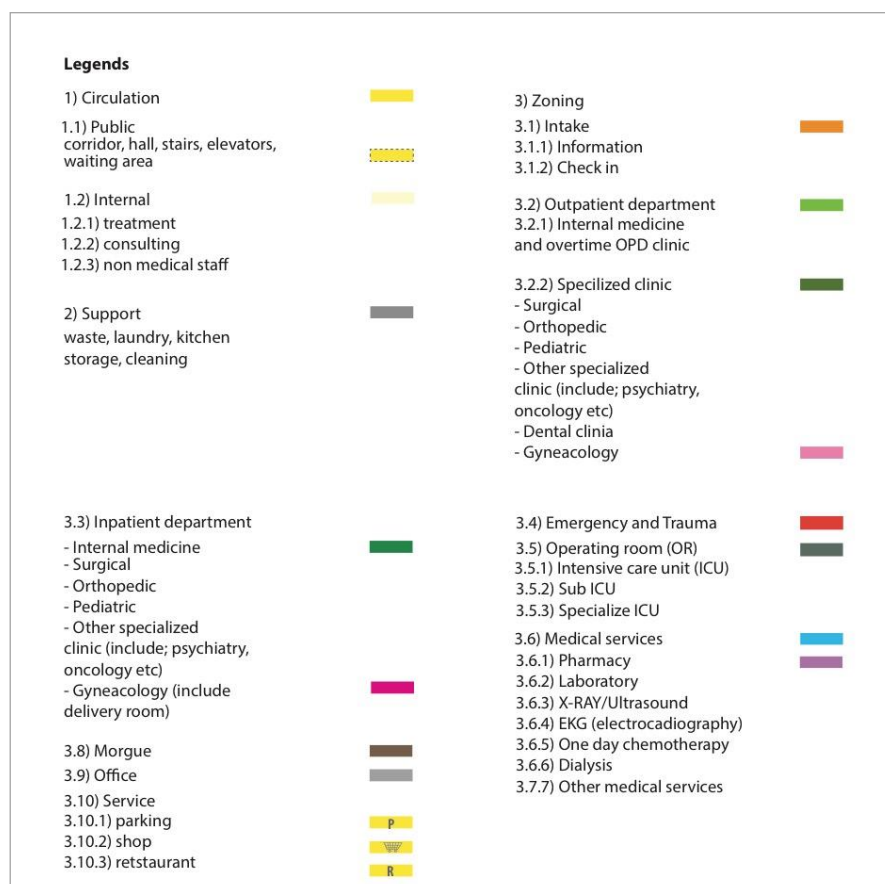
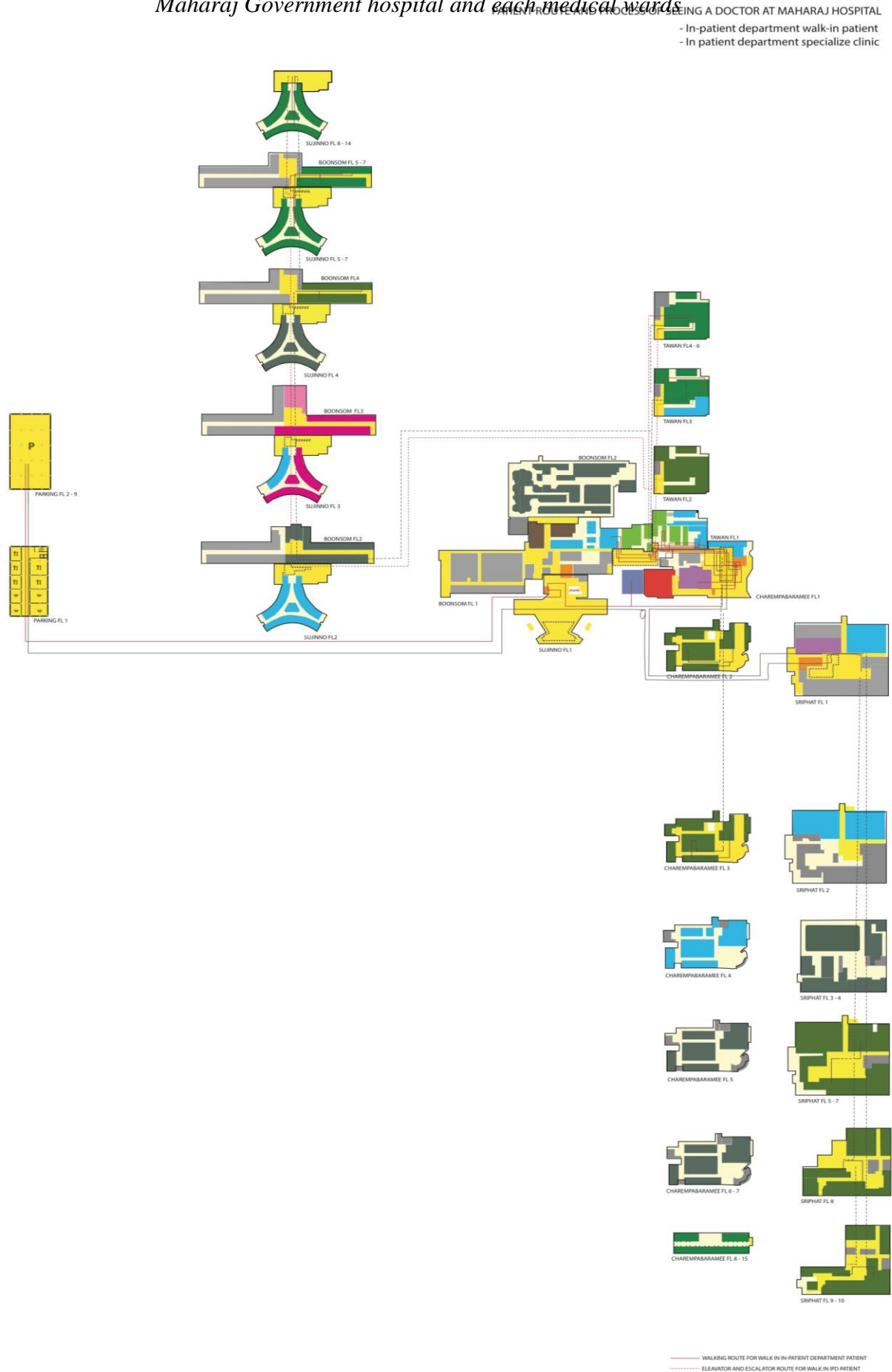


figure 5: illustrates architectural legends of each areas of Maharaj Government hospital and each medical wards



*figure 6: illustrates a walk-through route  
and architectural plan analysis of IPD specialized clinic route*

#### **4.4 Analysis of the empirical survey**

According to walk-through observations, the interior settings of Maharaj hospital were explored and problems caused by the incremental development were identified; which are (1) lack of clear signs and symbols which resulted in difficult way-finding and confusing orientation (2) the overlapping areas (waiting areas, hallways, medical ward, patient routes, visitor routes) (3) unorganized medical wards. These problems caused by the incremental development stemmed from two factors which root from the lack of long term planning and lack of research regarding the specific users (Thai people). Alexander (2008 & 2010) Fronczek- Munter (2011 & 2016) stated that the usability concept covers the subjective view of users. Moreover, usability buildings should be designed based on the context, culture, situation, and experience. Therefore, problems in government hospital, where the hospital is now facing the incremental development (Maharaj hospital) can be summarized into two aspects.

**1.) The lack of integration of Thai culture in hospital design and architecture:** There is no connection between physical setting of the hospitals and Thai culture due to the design, which is based mainly on Western design principles. Most of the government hospitals in Thailand were built during the 70s and most of the buildings are still in use. The lack of culture integration into the design is obvious for example: As a collective culture system (Hofstede, 2011; Riratanphong & van der Voordt, 2015). Thais usually visit hospital with the accompany of family and friends for social support. However, most of public spaces including waiting areas in government hospitals do not serve high number of visitors and long waiting times (figure 7 & 8).

As the new trends of hospital design have emerged in the past twenty years, hospitals are no longer responsible only for the medical treatment but also to serve people well-being (Phaholthep , Sawadsri , & Skates, 2016). Healthcare buildings and space usability should be designed based on users' activity and behavior (Fronczek- Munter, 2011; 2014 & 2016; Sahachaiseri, 2012; Phaholthep, Sawadsri, & Skates, 2016; Waroonkul & Jenjapoo, 2016). The built environment is an important factor to provide and support strong mental and physical of patients and staff.

**2.) The lack of planning in hospital architecture:** most of government hospitals are large scale hospitals. In the past twenty-years government hospitals have expanded rapidly due to the increase number of patients. Thus, Maharaj hospital was founded in the 1970s where at the contemporary period there are five main medical buildings in the hospital compound. These buildings are embedded into the existing ones without long term plan. The buildings are randomly added to the existing ones and placed on any available spaces creating the incremental development (figure 9 and 10). This development has resulted in a difficult way-finding which similar to a labyrinth. The catastrophe of architectural grown- mess in hospital architecture is happening in almost every complex and large scale hospital due to high number of patients.



*Figure 7 & 8: anonymous waiting areas  
by the stairways and in front  
Supuck Prugsiganont  
(February, 2016)*

*Figure 9 &10: Development of Maharaj  
hospital in 1990s and 2015  
Source: Facilities Management department  
Maharaj Hospital (February 10, 2016)*

## 5. DISCUSSION AND CONCLUSION

This study is the investigation of the general context of the Thai healthcare landscape and current situation in the Maharaj government hospital Thailand. However, the core of this research is to identify the specific problems regarding planning and space management of government hospitals and the effect caused by incremental development of the hospital buildings. The study can be concluded as the way Thai healthcare system is implemented result in the incremental development. There are three factors that cause the development (1) the lack of general practitioners and poor services of primary care offered by community healthcare centers (2) limited number of government hospitals (3) the implementation of Thailand's universal coverage scheme. The results are the findings from the review of the Thai healthcare landscape. The walk-through survey gives the information regarding the current situation in the government hospital and the effect caused by the incremental development which can be summarized as (1) lack of clear signs and symbols which results in difficult way-finding and disorientation (2) the overlapping of areas (waiting areas, hallways, medical ward, patient routes, visitor routes) (3) unorganised medical wards. These problems are the results (1) the lack of long term plan and (2) the lack of integration in the Thai hospital design. Nevertheless, one of urgent problems that need attention is the overlapping areas between public areas and non-clinical spaces, especially the waiting areas that does not support long waiting queue and high number of patients. During the investigation it is clear that there are many information waiting areas created by patients and visitors and these areas are important among users. A study development and investigating on the use of informal waiting areas will be useful in order to develop further research.

## 6. FURTHER RESEARCH

After this study a continuation of an empirical case study will be conducted in St. Olavs Hospital Trondheim, Norway. The hospital is a precedent case study, where it had been through an incremental development in the 90s, remodelled, and finally rebuilt in 2000s. The

core of this empirical observation is to conduct a comparative analysis between the Thai and Norwegian hospitals and to what extent that culture and context influence the design of the hospital and users? Thus, a more development study regarding the culture and behaviour of people will be considered during the observation and analysis. Further case study will be in Denmark. A cross case studies analysis between three cases studies (Thai, Norway, and Denmark) will be conducted focusing on the use of public areas concerning the cultural context. Final result will be generic recommendation on the improvement of the public areas in government hospitals and specific recommendation and design guideline for Maharaj hospital Chiang Mai University, Thailand.

## 7. REFERENCES

- Alexander, Keith. "Usability of Workplaces - Report on Case Studies." In *CIB International Council for Research and Innovation in Building and Construction*, 2006.
- Alexander, Keith. "Usability of Workplaces - Phrase 2." In *CIB- report 316*, edited by 2008 CIB and Euro FM Joint Project, 2008.
- Alexander, Keith. "Usability of Workplace - Phrase 3." In *CIB report 330*, edited by 2010 CIB and Euro FM Joint Project 2, 2010.
- Budget, Bureau of the. "Thai Bureau of the Budget 2015." 119, 2015.
- C. Phaholthep, A. Sawadsri, and H. Skates. "An Evaluation of Public Space Accessibility Using Universal Design Principles at Naresuan University Hospital." In *Designing Around People* edited by P. Langdon et. al: Springer International Publishing Switzerland 2016, 2016.
- Cabrero, Gabriel, Martin Blas, Sergio. *Casas En Suiza (Swiss Houses)*. NUTAC. Madrid: Marea Libros, 2012.
- CEN/TC. "Facility Management - Part 1: Terms and Definitions." 2006.
- Charanya Phaholthep, Antike Sawadsri, and Henry Skates. "An Evaluation of Public Space Accessibility Using Universal Design Principles at Naresuan University Hospital." Paper presented at the CWUAAT 2016 Designing Around People, 2016.
- Charanya Phaholthep, Antike Sawadsri, and Henry Skates "A Comprehensive Process for Investigating Service Efficiency Based on Universal Design Principles: A Case Study of Public Zones in Naresuan University Hospital." In *50th International Conference of the Architectural Science Association 2016*, edited by L. Daniel J. Zuo, V. Soebarto, 517-26. Adelaide, Australia: The Architectural Science Association and The University of Adelaide, 2016.
- Churngsathiansap, Koson. *Healthcare Architecture and Healing Environment*. Phim Khrang thi 1 ed. 2015.
- Division of Health Statistic Bureau of Health Policy and Plan office Ministry of Public Health, Thailand. "Public Health Statistic Thailand 1992." (1992).
- Dormael, Supattra Srivanichakorn and Monique van. "Conditions, Constraints, and Strategies for Increased Contribution of General Practitioners to the Health System in Thailand." *Human Resources for Health Development* 2 (1998): 15.
- etc, Johan van der Zwart and. "Building up/on Evidence, Healthcare Architecture Research in the Nordic Countries." Paper presented at the ARCH17 3rd International Conference on Architecture, Research, Care and Health, Copenhagen Denmark, 2016.
- etc, Viroj Tangcharoensathien and. "Universal Coverage Scheme in Thailand: Equity Outcomes and Future Agendas to Meet Challenges." In *Background Paper, 43*, edited by World Health Report 2010: World Health Organization (Health System Financing), 2010.
- Fronczek-Munter, Aneta. "Usability and User Driven Innovation - Unity or Clash?" In *13th International FM & REM Congress January 19-21, 2011*. Kufstein, Austria, 2011.
- Fronczek-Munter, Aneta. "Usability Briefing for Hospital Architecture - Exploring User Needs and Experiences to Improve Complex Buildings." In *European healthcare design conference* 1-14. London 11-14 June 2017, 2016.
- Geir K. Hansen, Siri H. Blakstad, Wibeke Knudsen. *Usetool Evaluating Usability: Methods Handbook*. NTNU 2011, Norway, 2011.
- Hamilton, D. Kirk. "Four Levels of Evidence-Based Practice." 2004.
- Health, Ministry of Public. "Thailand Public Health Statistic between 1992 and 2012." <http://ghdx.healthdata.org/organizations/bureau-policy-and-strategy-ministry-public-health-thailand>.
- Hofstede, Geert. "Six Important Aspects of Cultural Dimension." <https://geert-hofstede.com/thailand.html>.
- J. Guinea, E.Sela and etc. "Impact Oriented Monitoring : A New Methodology for Monitoring and Evaluating of International Public Health Research Projects." *Research Evaluation Advance Access* 2015 (2015): 1-15.

- Jenjapoo, Tanut Waroonkun and Teeradat. "Evaluation of Attributes for Healing Spaces of Medical Ward " Paper presented at the 20th World Buidling Congress (Intelligent Built Environment for Life) 30 May 2016 - 03 June 2016, Temepere, Finland, 2016.
- Jensen, Matte Tinsfeldt and Per Anker. "Value Adding Space Management in Higher Education." In *CIB Facilities Managment Conference 2014*, 369-80, 2014.
- Jensen, Per Anker. "Management for Usability of Learning Buildings " In *Usability of Workplace Phrase 3*, edited by In Alexander K (Ed.) (2010), 2010.
- Jungsteansup, K. (2016). Healthcare Architecture and Healing Environment. Nonthaburi, Thailand: Suksala and the Thai Health Promotion Foundation.
- K. Damrongplasit, GA Melnick. "Early Results from Thailand's 30 Baht Health Reform: Something to Smile About." *Health Aff (Millwood)* 28, no. 3 (2009): 457-66.
- Krit Pongpirul, Barbara Starfield, Supattra Srivanichakorn, and Supasit Pannarunothai. "Policy Characteristics Facilitating Primary Health Care in Thailand: A Pilot Study in Transition Country." *International Journal for Equity in Health* 2009 8, no. 8 (2009).
- Lantarón, Heiter G. "Promoting Identity: Design Strategies for an Active Ageing." Paper presented at the ARCH17 3rd International Confernece on Architecture, Research, Care and Health, Copenhagen Denmark, 2016.
- Moen, Bente E. "The Importance of Walk-through at Workplaces." *Ocuupational Medicine & Health Affairs* 2, no. 4 (2014).
- Parsons, Franklin Becker and Kelly S. "Hospital Facilities and the Role of Evidence-Based Design." *Journal of Facilities Management* 5, no. 4 (2007): 263-74.
- Phusit Prakongsai, Tassanee Yana, and Supattra Srivanichakorn. "Enhancing the Primary Care System in Thailand to Improve Equitable Access to Quality Health Care ". *SSRN Electronic Journal - December 2009* (2009).
- Publisher, Sarnpracharat. *The Father of Thai Modern Medicine*. Sarnpracharat Publisher Bangkok, Thailand, 1977.
- S. Limwattananon, V. Vongmongkol, P. Prakongsai, W. Patcharanarumol, K. Hanson and etc. "The Equity Impact of Universal Coverage: Health Care Finance, Catastrophic Health Expenditure, Untization and Goverment Subsidies in Thailand " <http://r4d.dfid.gov.uk/Output/188980>.
- S. Limwaththananon, S. Neelsen, V. Tancharoensathein and ect. "What Does Universal Coverage Do? The Impact of Health Care Utilization and Expenditure in Thailand " [https://editorialexpress.com/cgi-bin/conference/download.cgi?db\\_name=CSAE2013&paper\\_id=674](https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2013&paper_id=674).
- Seangwichean, Sunchai. *100th Year Siriraj Hospital; History and Evolution*. Chulalongkorn Publication 1988.
- Seung Chung Paek, Natthani Meemon, and Thomas T. H. Wan. "Thailand's Universal Coverage Scheme and Its Impact on Health-Seeking Behavior." *Springer Open* Paek et al. SpringerPlus (2016), no. 5:1952 (2016).
- Team, Ayutthaya Research Project. "Twenty Months Experience from Ayutthaya Project." In *Presented at the International Seminar on Collaborative Health Systems Research, Ayutthaya, 1990*. Ayutthaya: Ayutthaya Project, 1991, 1991.
- Thailand, Maharaj Hospital Chiang Mai. "History of Suan Dok (Maharaj Government Hospital) Faculty of Medicine Chiang Mai University, Thailand." <http://web.med.cmu.ac.th/index.php/th/main-aboutus/med-cmu-history>.
- Thailand, Ministry of Public Health. "Thailand Public Health Statistic 2016." <http://ghdx.healthdata.org/organizations/bureau-policy-and-strategy-ministry-public-health-thailand>.
- Thorogood, Judith Green and Nicki. *Qualitative Methods for Health Research*. Los Angeles: SAGE, 2014, 2104.
- Verma, Ira. "Housing for Elderin in a Changing Social and Health Care Service Structure." Paper presented at the ARCH17 3rd International Confernece on Architecture, Research, Care and Health, Copenhagen Denmark, 2016.
- Voordt, Chaiwat Riratanaphong and Theo van der. "Measuring the Added Value of Workplace Change: Performance Measurement in Theory and Practice." *Facilities* 33, no. 11/12 (2015): 773-92.
- Waranyou Satayavongtip, Aroonsri Mongkolchati, and Supattr Srivanichakorn. "The Percieved Transformation and Transactional Leadership Styles among Tambon Health Promting Hospitals Directors Related to Job Satisfaction in Nakhonratchasima Province, Thailand." *Journal of Public Health and Development* 14, no. 1 January- April 2016 (2016): 37-52.
- Wil van Jerberghe, Yelle Lafort. "The Role of the Hospital in the District: Delivering or Supporting Primary Healh Care?" In *In current concerns, SHS Paper No. 2* Geneva: World Health Organization, 1990.